

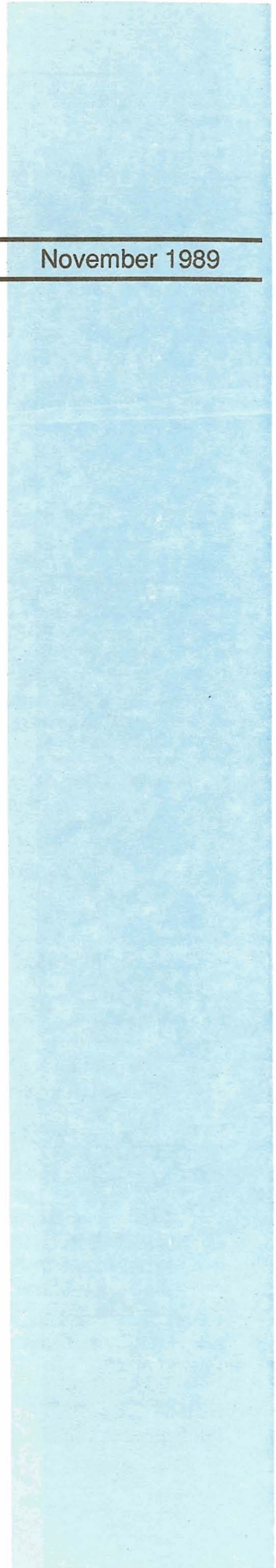


Frozen Ground

Number 6

The News Bulletin of the International Permafrost Association

November 1989



International Permafrost Association

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

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Argentina
Belgium
Canada
China, People's Republic of
Denmark
Finland

France
Germany,
Federal Republic of
Italy
Japan
Netherlands
Observer: Sweden

Norway
Poland
Switzerland
United Kingdom
U.S.A.
U.S.S.R.

Cover phot: Clear "blue" bedded buried ice under frozen clayey till capped with loess. Center of Yamal Peninsula, 68° N. Lat., northwest Siberia, U.S.S.R. Photograph PK 29448 by Troy L. Péwé, August 5, 1989 (see page 13 for related article).

Bulletin Credits: Logo Design, S.M. Selkirk, Arizona State University. Logo illustrates that part of the northern hemisphere underlain by permafrost; Composition, Kevin P. Brown.

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IPA News--page 2

President's Column • Fifth International Conference on Permafrost • Sixth International Conference on Permafrost
• Adhering National Bodies • Standing Committees and Working Groups

News from Member Countries--page 7

Canada • China • Federal Republic of Germany • Finland • Japan • USA • USSR

News of Recent and Forthcoming Meetings and Activities--page 13

International Symposium on Geocryological Studies in Arctic Regions • Fifth Canadian Permafrost Conference •
International Commission on Snow and Ice • Intergovernmental Panel on Climate Change

Calendar of Recent and Forthcoming Meetings--page 18

Recent Publications and Related Journals--page 20

On behalf of the IPA Editorial Committee, I have the privilege of assisting the IPA Executive Committee in preparing this issue of the News Bulletin. Previous newsletters have been published as follows: No. 1, May 1986; No. 2, December 1986; No. 3, December 1987; No. 4, January 1988; No. 5, April 1989. Copies of past newsletters are available from your national IPA organization. This issue inaugurates a new format for our Association's News Bulletin. We would like to include in future issues more information on preliminary results of current studies and Working Groups activities. Individuals are invited to provide brief project reports of current research to their national IPA organization which in turn will provide reports to the Secretary General. We plan to issue No. 7 following the June 1990 IPA Council meetings (June 4-5) and the Fifth Canadian Permafrost Conference (June 6-8) in Quebec City. Thank you for your assistance in making the News Bulletin a more useful source of information on our frozen ground activities.

Jerry Brown, Guest Editor
and Chairman, IPA Editorial Committee

IPA News

President's Column

Let's start off with some good news. After a week of frenzied activities at the International Geological Congress, in Washington, D.C., the president, on behalf of IPA, cemented relations of the IPA and the International Union of Geological Sciences (IUGS) leading to the formal approval (by unanimous vote) of the IPA as an official affiliate of the IUGS on Saturday, July 15, 1989. One of the highlights was a personal meeting with IUGS President Dr. Umberto Cordani to become better acquainted and to exchange information on IUGS and IPA. We learned that the IUGS has funds for special projects proposed by affiliates. At a special reception held by the IUGS during the Congress, it was possible to meet many representatives of other member countries and further discuss IPA-IUGS. So after five years of correspondence and meetings, we are now an affiliate of the IUGS, and in the International Council of Scientific Unions family.

Unfortunately, after five years of meetings and letters requesting affiliation with WFEO (World Federation of Engineering Organizations), the IPA Secretary General learned in October that the WFEO recommended at its September meeting that it cannot accept new technical members (affiliates), and the IPA was suggested to look elsewhere. IPA is now considering the next move.

The successful International Symposium on Geocryological Studies at Yamburg, northwest Siberia (discussed elsewhere in this News Bulletin) provided the opportunity to hold the 7th Executive Committee meeting of the IPA, August 6, 1989. All members of the Committee were present except the Secretary General. Hugh French attended as a proxy for the Secretary General and took the minutes. J. Brown, Chairman of the Editorial Committee attended as did Professor N.

Grave and Valery Volgina, both members of the USSR National Committee to the IPA. Although the minutes will be distributed later, the highlights of the meeting are as follows. The Committee approved the request of Professor Haeberli, Chairman of the Mountain Permafrost Working Group, that the full members of the Working Group be: Cheng (China), Gorbanov (USSR), Harris (Canada) and Giardino (USA). Dr. French announced that there would be two IPA Executive Committee meetings and two Council meetings during the Fifth Canadian Permafrost Conference in June, 1990 at Quebec City, with several luncheons and banquet honoring IPA.

Cheng Guodong presented an outline of dates for activities and planning of the Sixth International Conference on Permafrost to be held in Beijing, China, July 5-9, 1993. A brief discussion was held for the need to increase IPA dues. Canada and USSR felt they could increase their contribution.

Suggestions were made at the meeting to add the letters "IPA" to the logo. This has now been done and appears on new stationery and on the cover of this News Bulletin. Supplies of the new stationery are available to members of the Executive Committee, Standing Committees, Working Groups and Adhering National Bodies.

I look forward to seeing some of you in Quebec City next June. We have serious items to discuss, including possible changes in our financial structure(dues) and reviewing substantive reports from the Working Groups. Please keep us informed of your activities for inclusion in future issues of the News Bulletin. With your cooperation we plan to publish it twice a year.

Troy L. Péwé, President

Fifth International Conference on Permafrost

Norway hosted the Fifth International Conference on Permafrost in Trondheim in August, 1988. Pre- and post-conference excursions to Svalbard and northern Scandinavia continued the tradition of field trips to examine permafrost and periglacial features and engineering problems and solutions. The newly organized International Permafrost

Association (IPA) held its council meeting during the conference, elected a new slate of officers and established a number of working groups and administrative committees to develop and carry out its programs.

The conference, held at the Norwegian Institute of

Technology, was organized by a 14 member committee chaired by Kaare Flaate of the Norwegian Road Research Laboratory. Three hundred scientists and engineers from 18 countries participated. The U.S. had the largest number of attendees (89), followed by Canada (54), Norway (35), China (27), the United Kingdom (13), U.S.S.R. (12), Japan (12), Sweden (11), F.R.G. (10), Finland (10), Belgium, Denmark, France, Israel, Italy, the Netherlands, Poland and Switzerland. A two-volume publication containing 288 peer-reviewed papers was available at the conference and is being sold by Tapir Publishers (N-7079, Flataasen, Norway). The majority of the papers were prepared by the U.S.S.R. (79), U.S. (64), China (45) and Canada (42). In addition, the Soviets produced a separate 193-page volume containing 30 papers in Russian.

Both the proceedings volumes and the conference sessions were arranged according to science and engineering themes. The five scientific topics included climate and geothermal regimes, regional permafrost, physics and chemistry of frozen ground and frost heave, hydrology and ecology of natural and disturbed terrain, and periglacial phenomena. The four engineering topics included site investigations, terrain analysis and subsea permafrost; geotechnical properties and frost heave parameters; geotechnical engineering and pipeline construction; and other engineering including petroleum, mining and municipal. A third post-conference proceedings volume contains invited papers of three special sessions that emphasized topics of current interest: climate change and permafrost, coastal processes, and transportation. In addition, a workshop reflecting interests in global change and the need to archive data on permafrost was organized by Roger Barry of the World Data Center-A for Glaciology in Boulder, Colorado. The second, five-year *Permafrost Bibliography Update* was prepared by the Data Center and was distributed at the conference. Over 3300 new citations are presented. The bibliography is available as Glaciology Data Report 21 (ISSN 0149-1776). The 16-member Council of the International Permafrost Association held its second meeting during the conference. The first order of business at Trondheim was election of a new Executive Committee. Troy L. Péwé (U.S.) replaced P.I. Melnikov (U.S.S.R.) as President; the new Vice Presidents are Cheng Guodong (China) and Vladimir Melnikov (U.S.S.R.). J. Ross Mackay (Canada) remained on as Secretary General. The

Council reaffirmed its desire to affiliate with both the International Union of Geological Sciences and the World Federation of Engineering Organizations. To conduct and sustain the activities of the Council between conferences and provide advice to the Executive Committee, three standing committees and six working groups were established. The standing committees are to provide advice on finance, working groups and editorial policies. Working groups will organize on the following topics: mountain permafrost, terminology, foundations, global change and permafrost, frost-action environments, and permafrost. In a significant advance in periglacial and permafrost terminology, the Canadians announced the availability of the recently published glossary of permafrost and related ground-ice terms (National Research Council of Canada, Technical Memorandum 142). The Soviets announced plans to publish a new quarterly journal with an English edition for foreign sales.

Field excursions were organized by Johan Ludvig Sollid, Geografisk Institutt, Oslo University, and his colleagues from Norway, Sweden and Finland. The 430 km-long pre-conference bus trip from Narvik to Tromsø traversed typical fjord and inland landscapes, comprising moraine systems dated from Younger Dryas time (10,000-11,000 years BP), numerous rock glaciers, and vast inland palsa bogs with local occurrences of permafrost. Road construction and maintenance problems associated with differential thaw settlement, frost heave, erosion and slope instability were observed. The pre- and post-conference excursions to Svalbard included a comprehensive visit to the Norwegian coal-mining town of Longyearbyen and a four-day boat trip to Sveagrava, Ny-Alesund and several stops along Isfjorden, including a visit to the Soviet mining town of Barentsburg. Permafrost occurs in the coal mines and influences the construction of buildings, utilities, roads and airfields in much the same ways as in Canada, Siberia and Alaska. Permafrost ranges in thickness up to 200 m or more in ice-free areas. Splendid examples of sorted circles, polygons, rock glaciers, chaotic push moraines and karst topography were viewed and discussed. Following the conference a special Arctic seminar included lectures on the Arctic and an overnight return flight to Svalbard. A limited edition of the revised field guidebooks will be available for purchase from Professor Sollid.

J. Brown

Sixth International Conference on Permafrost

The Chinese Organizing Committee, chaired by IPA Vice President Cheng Guodong, officially announced the dates of the sixth conference to be July 5-9, 1993, in Beijing. Field trips to Northeast China, the Plateau and Tien Shan are planned. A provisional schedule has been established as follows:

- November 1990: Preliminary announcement including costs (First Bulletin)
- August 1991: First call for papers
- December 1991: Abstracts deadline
- February 1992: Notification to authors of abstract acceptance
- June 1992: Manuscript deadline

- November 1992: Paper review completed
- December 1992: Second Bulletin
- March 1993: Final manuscript deadline
- April 1993: Pre-registration deadline
- July 5-9 1993: Conference

The IPA Editorial Committee is attempting to arrange for special issues of cold regions and permafrost journals for publication prior to the Conference. If authors wish to consider publication in these journals, as well as have the paper printed in the Conference Proceedings, these deadlines will have to be accelerated. More information will be provided in subsequent newsletters.

Adhering National Bodies, Officers and Members

The following are the current organizations and representatives for the IPA. Please send changes to the Secretary General.

Argentina

Committee for the International Permafrost Association. President: A.E. Corte; Vice-President: H. Fournier. Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET). Contact: Head, International Relations, Rivadavia 1917-1033, Buenos Aires, Republic of Argentina.

Belgium

National Committee of Geography. Chairman: Professor A. Pissart, Geomorphology and Geology of the Quaternary, University of Liège, Place du 20-Août 7, 4000 Liège, Belgium. Secretary: Dr. P. Haesaerts, IRSNB, Rue Vautier 31, B-1040 Bruxelles, Belgium. Plus nine members.

Canada

Canadian National Committee for IPA, National Research Council of Canada. Chairman: Professor H.M. French, Departments of Geography and Geology, University of Ottawa, Ottawa, Ontario, K1N 6N5, Canada. Secretary: Mr. J.A. Heginbottom, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario, K1A 0E8 Canada. Plus seven members.

China

Chinese Society of Glaciology and Geocryology. Chairman: Professor Shi Yafeng, Honorary Director, Lanzhou Institute of Glaciology and Cryopedology, Academia Sinica, Lanzhou, China.

Denmark

Danish Society for Arctic Technology. SAT officers: Gunnar P. Rosendahl, Chairman; Henrik Mai, Vice Chairman; Thorkild Thomsen, Secretary General; Secretariat c/o GTO, 20 Hauser Plads, DK 1127, Copenhagen K, Denmark.

Federal Republic of Germany

National Permafrost Committee. Chairmen: Dr. Ing H.L. Jessberger, Civil Engineering, Ruhr-University Bochum, P.O. Box 102148, 4630 Bochum 1, FRG ; Dr. H. Liedtk, Ruhr-University Bochum. Professor L. King, Justus Liebig University, Giessen.

Finland

National Committee for Permafrost Studies. Chairman: M. Seppälä, Department of Geography, University of Helsinki, Hallituskatu 11-13, SF-00100 Helsinki 10, Finland; Secretary: Dr. Martti Eerola, Tie- ja vesirakennushallitus, PL 33, SF-00521 Helsinki, Finland.

France

French Permafrost Association. Executive Committee. President: J. Aguirre-Puente; Vice President: J. Malaurie; Treasurer: J.P. Lautridou; Secretary: A.M. Cames-Pintaux.

Italy

Glaciology Section of the National Coordinating Group of Physical Geography and Geomorphology. Councillors: F. Dramis, Department of Geology, Università di Camerino, Viale E. Betti 1, Camerino, Italy; G. Orombelli, Department of Earth Sciences, University of Milan, Milan Italy. Plus about 20 members.

Japan

Committee of Frozen Ground Research, Japanese Society of Snow and Ice. Chairman: M. Fukuda, Institute of Low Temperature Science, Hokkaido University, Sapporo 060, Japan. Plus four members.

The Netherlands

Subcommission on Permafrost of the National INQUA Commission for The Netherlands. Officers: E.A. Koster, Geographical Institute, State University Utrecht, P.O. Box 80.115, 3508 TC, Utrecht; J.Vandenberghe, Institute of Earth Sciences, Free University, De Boelelaan 1085, 1081 HV Amsterdam; G.H.J. Rugg, Geological Survey of The Netherlands, P.O. Box 157, 2000 AD Haarlem. Secretariat: Mrs. M.K. van Helden, Secretariat INQUA Commissie Nederland, c/o Koninklijke Nederlandse Akademie van Wetenschappen, P.O. Box 19121, 100 GC, Amsterdam, The Netherlands.

Norway

Norwegian Committee on Permafrost. Chairman: K. Flaate, Norwegian Public Roads Administration, P.O. Box 6390, Etterstad, 0604 Oslo 6, Norway; Secretary, O. Gregersen, Norwegian Geotechnical Institute, P.O. Box 40, Tisen, 0801 Oslo 8, Norway.

Poland

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

Switzerland

Swiss Coordinating Group on Permafrost, Swiss Academy of Sciences. Contact: W. Haebertli, Versuchsanstalt für Wasserbau, Hydrologie und Glaziologie, ETH-Zentrum, CH-8092 Zurich,

Switzerland. Plus about 15 members.

Sweden (Observer)

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

United Kingdom

British Permafrost Coordinating Committee, British Geomorphological Research Group. Convenor: Dr. C. Harris, Department of Geology, University of Wales, P.O. Box 914, Cardiff, CF1 3YE United Kingdom. Members: Professor P. Worsley, Geography, University of Nottingham; Dr. R. Jones, Civil Engineering, University of Nottingham; Professor E. Derbyshire, Geography, University of Leicester.

USA

U.S. Committee for the IPA, U.S. National Committee for Geology, National Research Council. Chairman: J. Brown, Division of Polar Programs, National Science Foundation, Washington, DC 20550; Vice-Chairman: C.W. Lovell, Jr., School of Civil Engineering, Purdue University, West Lafayette, IN 47907; other members are: G. Gryc, USGS; D. Hopkins, University of Alaska; V.J. Lunardini, Jr., CRREL; and R.G. Tart, Jr., Anchorage.

USSR

U.S.S.R National Committee on Permafrost, U.S.S.R. Academy of Sciences. Head: Academician P.I. Melnikov, Scientific Council on Earth Cryology, U.S.S.R. Academy of Sciences, Fersman Street 11, 117312 Moscow B-312, U.S.S.R. Secretary: N.A. Grave and A.P. Gorbunov are the representatives on the Council. The National Committee includes about 40 members from institutions and ministries of the U.S.S.R (see Newsletter number 4).

IPA Standing Committees and Working Groups

The following Committees and Working Groups were approved at the IPA Council Meeting in Trondheim, Norway in 1988. Working Groups are expected to report on progress at the next Council meeting to be held in Quebec City, June 4-5, 1990 and to submit reports for the next Bulletin. Please send corrections and additions in membership to the Secretary General.

Standing Committees

Advisory Committee on Working Groups
C.W. Lovell, Chairman, USA

M. Seppälä, Finland
V. Melnikov, USSR

Finance Committee

H.M. French, Chairman, Canada
A. Pissart, Belgium
Shi Yafeng, China
J. Ross Mackay, Ex Officio, IPA Exec. Comm.

Editorial Committee

J. Brown, Chairman, USA
G.D. Cheng, China
H.M. French, Canada

L. King, FRG
E. Koster, The Netherlands
N. A. Grave, USSR
T.L. Péwé, Ex Officio, IPA Exec. Comm.

Working Groups

Membership of some working groups are incomplete or not available at this time.

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
G.D. Cheng, China
A. Gorbunov, USSR
J. Giardino, USA
S. 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

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

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. Koster, Chairman, The Netherlands
A. Judge, Secretary, Canada
T. Osterkamp, USA

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
A. Heginbottom, Canada
Bangjun Wu, China
N. A. Grave, USSR
B.F. Molnia, USA

Periglacial Environments (IPA)

Purpose: To promote geomorphological research related to permafrost.

J.-P. Lautridou, President, France
C. Harris, Secretary, United Kingdom
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

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 environments, processes, landforms, and 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 to is being issued.

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

News from Member Countries

Reports are normally compiled and submitted by representatives of Adhering National Bodies. For this bulletin, the guest editor has taken the liberty of including in these national reports news items available from other sources.

Canada

Both the Canadian National Committee for the IPA (CNC/IPA) and the Permafrost Subcommittee of the Associate Committee on Geotechnical Research (ACGR) met in November 1988. Permafrost activities in Canada over the past 12 months are summarized as follows:

At the Geological Association of Canada Annual Meeting in Montreal, Quebec, on May 16, 1989, a special session entitled "Massive Ground Ice: Delineation, geology and origin" was organized by F. A. Michel (Carleton University) and A. S. Judge (Geological Survey of Canada). Fifteen papers were presented including several from Soviet participants. There were approximately 60 participants.

Following the annual meeting of the Canadian Geotechnical Society in Winnipeg, a workshop on Saline Permafrost was held at the University of Manitoba on October 26, 1989. The workshop was sponsored jointly by the Permafrost Subcommittee and the Cold Regions Geotechnology Division of the Canadian Geotechnical Society. The organizers were D. Sego (University of Alberta), T.H.W. Baker (National Research Council of Canada), P. Vician (Government of the Northwest Territories). There were approximately forty participants.

On October 27, 1989, a workshop on Permafrost and Climate Change was organized and conducted by the Geological Survey of Canada. Conveners were J. A. Heginbottom, A.S. Judge, and D. G. Harry. The workshop was chaired by D.A. St-Onge, Director, Terrain Sciences Division. It was attended by approximately forty people and followed the Symposium on the Arctic and Global

Change organized by the Climate Institute (Washington, DC) and sponsored by several U.S. and Canadian agencies.

The Permafrost Subcommittee under the chairmanship of D.W. Hayley coordinates much of the permafrost activities within Canada. The Subcommittee's priorities for the next four years are: (1) carry through the organization of the Fifth Canadian Permafrost Conference; (2) complete the Permafrost Testing Manual; (3) examine the scope and methods for a research test facility for pipelines with permafrost. Such a project would build upon the Carleton University-France initiative at Caen; (4) investigate the possibilities of reproducing the book Permafrost Engineering: Design and Construction, edited by G.H. Johnston. For additional information on activities of the Subcommittee contact T.H.W. Baker, Research Advisor, Permafrost Subcommittee (ACGR), Geotechnical Section, Institute for Research in Construction, National Research Council, Ottawa KIA OR7, Canada.

The Permafrost Subcommittee continues to coordinate preparations for the Fifth Canadian Permafrost Conference which is also sponsored by the CNC/IPA, the Canadian Geotechnical Society and the Université Laval. The CNC/IPA will host the IPA Executive Committee and Council meetings in Quebec in June 1990. Canada expressed interest at Trondheim in holding the VII International Conference on Permafrost in 1998. Discussions are currently underway in the permafrost community and it is hoped an invitation will be issued at the time of the VI Conference in China.

H.M French

China

The Lanzhou Institute of Glaciology and Geocryology (LIGG) celebrated its 30th anniversary and hosted the Fourth Conference on Glaciology and Geocryology from October 5-9, 1988, in Lanzhou. A total of 142 scientists from seven

nations participated.

The conference was broken into concurrent sessions on glaciology and permafrost. The topics discussed under glaciology included snowfall,

glaciology, geomorphology, surging glaciers and hydrology (particularly related to the glaciers of western China). The permafrost sessions dealt with periglacial landforms and processes, recharge of groundwater in permafrost regions, hydroengineering construction and the ecological environment in permafrost regions. Most papers dealt with studies in the Soviet Union and Canada, as well as glaciological studies in the Alps, also were presented.

Several key questions were discussed. One dealt with evidence for and against extensive glaciation of the Qinghai-Xizang (Tibetan) Plateau during the last glacial stage. The current estimates range from

a 10% increase in ice cover to complete coverage of the plateau by an extensive ice sheet. Prof. Li Jijun from the Department of Geography of the Lanzhou University argued, based on geomorphic information, that the ice cover during the last glacial stage was about 10% greater than present. Another key issue is whether the plateau was cold and dry or cold and wet during the last glacial stage. The latter condition would allow for greater growth of glaciers. The clear message from these discussions is the need for more research with better time control.

Based on a report by L. Thompson,
Ohio State University, USA

Federal Republic of Germany

The Second International Conference on Geomorphology took place at the University of Frankfurt between September 3 and 9, 1989. More than 650 abstracts of lectures and posters were accepted for presentation at this conference and are published. Permafrost related topics were mainly treated in section 5 (climate geomorphology), with a special subsection devoted to periglacial geomorphology. During several one-day field trips, relict permafrost and periglacial features were demonstrated.

A special symposium was devoted to "Polar Geomorphology" and took place before the main conference in Bremen (August 30 to September 3). It was organized by the Institute for Physical and Polar Geography of the University of Bremen (Professor G. Stäblin). 28 papers were presented to 35 participants from 15 different countries. Most of the papers presented in Frankfurt and in Bremen will be published in scientific journals, mainly in the Zeitschrift für Geomorphologie or in Permafrost and Periglacial Processes.

A group of about 50 scientists, (mainly physical

geographers) will visit the Liefdefjord area in northern Spitzbergen from June to August 1990. Geomorphological, geoecological and geological studies will be undertaken. A small group visited the area this past summer and brought along some of the scientific equipment and accommodation material. The head of the project is Professor W. D. Blümel, Stuttgart.

No engineering work in permafrost regions is reported so far. For road construction in areas with seasonal frost action the requirements are ready to be published by the Research Institute for Traffic (Forschungsgesellschaft für das Strassen und Verkehrswesen). Much activity is related to artificial ground freezing for application in tunneling (Mannheim, Düsseldorf) and in shaft sinking (Gorleben, Rheinberg).

Further information on activities in the Arctic and Antarctic are available from the Alfred Wegner Institute for Polar Research.

L. King and H.L. Jessberger

Finland

The Finnish Geotechnical Society sponsored the International Symposium on Frost in Geotechnical Engineering on March 13-15, 1989, in Saariselka, Finland. Approximately 150 researchers from around the world attended. Three sessions were held, including special lectures on the mechanics of freezing and thawing by B. Ladanyi, the frost heave properties of soils by D.M. Anderson, and frost protection in design and construction by R. Nordal. Other lectures were:

- Simulation of freezing and thawing of soil materials by E.A. Bondarev
- Frost problems in road construction by H. Brandl
- Modeling of thermal soil behavior by M. Fremont
- Frost susceptibility of soils by H. Jessberger
- Frost protection of design and construction in Japan by F. Kohno
- Preventative measures against frost action in soils by S. Kinoshita
- Freezing and thawing in cylindrical coordinates by V.J. Lunardini

- Preventative measures against frost action in soils by A. Phukan
- Evaluation of frost heave properties of soils by S. Saarelainen
- Adfreeze strength of soils by A.V. Sadovsky
- Physical changes in clay due to frost action and their effects on engineering structures by E. Chamberlain.

52 related papers were presented and discussed and were published in two volumes, available from

Technical Research Center of Finland. Following the symposium there was a two-day field trip to observe roads and road construction techniques in Lapland. Methods of dealing with road icings, cracking and snow drifting were examined. The next symposium is scheduled for Anchorage, Alaska in 1993.

Based on a report by V. Lunardini, CRREL, USA

Japan

Dr. Fujino and his members conducted a field survey near Tuktoyaktok from late February through mid-March, 1989. A ground radar system was employed to check the distributions of massive ice bodies.

Dr. Oho, of the Environmental Science Department of Hokkaido University, and his group conducted a field survey in Svalbard from mid-June through mid-August this summer. Main objectives were the measurement of the growth of A-Pingo in Adventalen, hydrological study of ground water from glaciers, and recent developments of ice-wedge relation to the cracking process. During the previous year they installed ground temperature recorders and other necessary equipment at the site. Precise ground levelings were made to detect the recent upheaval of ground associated with pingo growth. A chemical analysis of the ground water was also performed on site.

Dr. Fukuda and his group conducted a field survey at Mt. Daisetu in central Hokkaido where they had previously reported the presence of alpine permafrost. Geophysical surveys were made by means of electrical resistivity and seismic profiling. According to a preliminary report, the permafrost table of alpine permafrost was estimated as 15 m thick. This reading matched a previous figure determined through annual ground temperature fluctuations.

Dr. Fukuda and his group will also conduct a field survey on permafrost occurrence in the Antarctic Peninsula area. They will cooperate with Prof. E. Retamal from the University of Chile and Dr. J. Strelin of the Instituto Antartico Argentino. They will visit King George Island, Seymour (Marimbio) Island, and James Ross Island. The expedition will start in mid-November and will end in late January, 1990

M. Fukuda

USA

Both the US Committee for IPA (USC/IPA) and the Committee on Permafrost within the National Research Council represent the permafrost interests of scientists and engineers throughout the United States (see IPA Newsletter Number 5 for memberships). Professional membership organizations and other committees perform numerous activities related to permafrost and seasonal frost. Following are reports of some of those activities.

The Committee on Permafrost cosponsored with the American Society of Civil Engineers a workshop on Permafrost and Climate Change, February 6, 1989, in St. Paul, Minnesota, as part of the ASCE Fifth International Cold Regions Specialty Conference. A special volume will be published by the ASCE.

The ASTM Committee D18 (Soil and Rock) formed a new Subcommittee, D18.19, Frozen Soil and Rock. The Subcommittee prepared draft standards on: (1) axial load tests on piles in permafrost; (2) laboratory frost susceptibility testing of soils; and (3) laboratory creep testing of frozen soils. The Subcommittee is also responsible for updating an existing standard on the Visual/Manual Classification of Frozen Soils. Subcommittee chairman is C.W. "Bill" Lovell, School of Engineering, Purdue University, West Lafayette, Indiana, 47907, USA.

The Technical Council for Cold Regions Engineering of the American Society of Civil Engineers has been in existence for over a decade and has a membership of over 4000. TCCRE has an Executive Committee, four Administrative Committees (Awards, Programs,

Publications, and Research), and three Technical Committees (Education, Design and Construction, and Control and Prevention of Frost Action). The Council sponsors International Conferences on Cold Regions at two to three year intervals. The Fifth Conference was held in St. Paul, Minnesota, in February, 1989; the Sixth will be held in Hanover, New Hampshire, February 26-28, 1991. The Council also sponsors the preparation of monographs on various civil engineering activities in the cold regions. These publications are prepared by task groups of experienced engineering specialists. Present TCCRE chairman is Howard P. Thomas, Harding Lawson Associates, 601 East 57th Place, Anchorage, Alaska, 99518, USA.

Following discussions at Trondheim (August 1988) and Leningrad (December 1988), the U.S. Geological Survey organized a small workshop in Menlo Park, California, to discuss climate and permafrost measurements. In addition to U.S. participants led by Arthur Lachenbruch, A. Judge (Canada) and V. Melnikov (USSR) attended. Comparison of circumarctic permafrost temperatures require uniform techniques. These discussions were continued in Yamburg (August 1989) by several workshop participants. The U.S. Geological Survey is also leading an U.S. interagency data activity to acquire long-term data sets that can be used in global change research. More information can be obtained from Bruce Molnia or Douglas Posson, U.S. Geological Survey, Reston, Virginia, 22092, USA.

A workshop on Cold Regions Engineering Research was held on November 30, 1988, in Hanover, New Hampshire. Over 40 engineers and scientists identified 14 research programs in 4 broad groups: offshore technology; watersheds, rivers and coastal zones; facilities infrastructure technology; and transportation infrastructure technology.

Robert Ettema, University of Iowa, led a group that considered topics on watersheds, rivers, and nearshore coastal processes and engineered structures. The offshore technology group, led by S. Shyan Sunder of MIT, considered programs in ice technology, offshore geotechnology, materials science and pollution control. Virgil Lunardini of CRREL led the group on facilities infrastructure technology, which addressed the special problems in designing buildings, utilities and other public and private facilities in cold regions. The transportation infrastructure technology group, led by Ted Vinson of Oregon State University, considered the problems of transporting goods

and personnel in support of resource development activities in cold regions. The group selected as its first priority the impact of global climatic change on the cold regions transportation infrastructure.

The workshop report was published by the University of Alaska-Fairbanks (UAF) in September, 1989, and is available through the School of Engineering at UAF. The editors of the report are Robert F. Carlson and John Zarling of the University of Alaska-Fairbanks and Ed Link, Technical Director of CRREL.

The Alaska Department of Transportation and Public Facilities completed a 20-year performance analysis on the Chitina insulated roadway study site. This site is believed to be the first permafrost roadway insulated with foamed polyethylene insulation. The insulation has survived well, but the roadway continues to be affected by thermal instability due to the warm permafrost (-0.5° C) and the warming effects of the side slopes. In the reconstruction of 30 miles of Glennallen to Tok Highway, 12.5 miles has been reinforced with 290,000 square yards of high strength geotextile to prevent spreading and cracking of the pavement. Design of the Bethel airport road has taken into account "greenhouse warming". A rate of air temperature warming of 0.6° C per 10 years was used to analyze future thaw-settlement. Extensive use of insulation and a trial installation of thermosyphons will be used to slow permafrost thaw.

The Circum-Pacific Map Project (CPMP) has added an Arctic Sheet, scale 1:10,000,000, to the ongoing program of compiling and publishing geological and resource information of the Pacific Basin and surrounding land areas. The new Arctic base views the region from the Pacific Basin and covers the entire Arctic Ocean Basin and surrounding land areas. Compilation of thematic maps by an international panel of experts is underway and will include the following individual maps: geographic, geologic, geodynamic, plate-tectonic, mineral resource, energy resource, and tectonic. The Base Map is available from the distributor, the American Association of Petroleum Geologists, AAPG Bookstore, P.O. Box 979, Tulsa, Oklahoma 74101, USA. For further information on the CPMP contact George Gryc, U.S. Geological Survey, 345 Middlefield Road, MS 952, Menlo Park, CA 94025, USA.

A limited number of U.S. published permafrost volumes are still available:
Permafrost: A Bibliography 1978-1982 (GD 14)

Permafrost Bibliography Update 1983-1987
(GD 21)

Proceedings: Permafrost Fourth International Conference, Volume 1 only, 1524 pages.

The first two items are available for \$5.00 each from the World Data Center for Glaciology, CIRES, University of Colorado, Boulder, CO 80309, USA. The last item is available prepaid for \$45.00 from Bruce Molnia, U.S. Geological Survey, MS 917, Reston, VA 22092, USA. All prices quoted are in U.S. currency.

The Cold Regions Science and Technology bibliography is now available both on-line and as a subscription on a CD-ROM. For on-line searches contact ORBIT Search Service, 8000 Westpark Drive, Mclean, Virginia 22102, USA, (703) 442-0900 or (800) 421-7229. For CD-ROM contact Fred Durr, National Information Services Corporation (NISC), Suite 6, Wyman Towers, 3100 St. Paul Street, Baltimore, Maryland 21218, USA, (301) 243-0797; FAX (301) 454-8061. Subscription \$595.00 per year, updated semi-annually.

J. Brown, C.W. Lovell and D.C. Esch

USSR

The annual meeting of the Scientific Council for Earth Cryology of the USSR Academy of Sciences was held in March, 1987 in Moscow. About 60 papers were discussed at 8 sessions. The Plenary papers were:

- The problems of regional study
- Landscape mapping
- Construction of hydros in the Far North
- Cryogeostuctures and its regionalizing
- Gas-hydrate accumulation in subsea permafrost
- The cryogenic factors in soil-meliosation process
- Heat flow in the Earth crust and its deep freezing
- Geocryological study for the Amur-Yakutsk railway construction

The progressive agenda of permafrost research is part of the Academician program of priority studies "Cryogenesis and a Development of the North," as was elaborated by the Scientific Council.

Important meetings held by the Academy included "Site Investigations for Oil and Gas Facilities" in Tyumen in April, and "Cryolithogenesis on the Arctic Sea-shelf" in Murmansk during October.

Two books prepared by the Council and edited by "Nauka" in Moscow were A Geocryological Prediction by the Development of an Area (Geocryological Prognoz i Osvoenie Territorii) edited by V.V. Baulin, and A Snow Cover in Mountains and Avalanches (Snejnii Pokrov v Gorach i Lavini) edited by K.F. Voitkovski.

At the Council's March 1988 annual meeting in Moscow, approximately 70 papers and posters were presented. The plenary session included the following paper subjects:

- The scientific basis of hydros construction in the North
- The influence of the gas hydrate deposits on the

cryogenic structure of the marine sediments

- Icings and the underground ice
- The geocryological monitoring by extraction and transportation of gas in permafrost
- The geochemical methods of prospecting in permafrost
- A treatment of the frozen rocks
- Research methods in geocryology

Several meetings concerning geocryologic issues were held during the year. At Tallinn in May the 11th Baltic Conference on Soil Mechanics and Foundation Engineering was held. In September, the All Union Conference on the Physics and Mechanics of Ice met in Moscow, and the International Conference on Arctic Research met in Leningrad in December. In October, the officers of the IPA (P.I. Melnikov, V.P. Melnikov, A.P. Gorbunov and N.A. Grave) attended the National Permafrost Conference at the Lanzhou Institute of Glaciology and Geocryology in China, and took part in excursions to the Tien Shan glaciological station. An agreement of common work was made.

Books prepared by the Council and edited by "Nauka" included this year The Problems of Geocryology: The Russian Papers of the V International Permafrost Conference in Norway (Problemi Geocryologii) edited by P.I. Melnikov, and Thermodynamical problems of Frozen Soil Mechanics (Thermodynamiceskie Problemi Mehaniki Merzlich Gruntov).

Details of the International Symposium on Geocryological Studies in Arctic Regions held in Yamburg, West Siberia, August 1-10, 1989, are reported in a following section of this Bulletin.

N.A. Grave

The Fifth Scientific-Practical Conference "Engineering and Geological Site Investigations within the Permafrost Zone" took place October 3-6, 1989, in Magadan, U.S.S.R. It was organized by the Department of Geocryology of Moscow State University and the Northeastern Trust of Engineering and Geological Site Investigations in Magadan, with the help of the Scientific and Industrial Association on Construction and Site Investigations, according to the drafts of the Scientific Board of the U.S.S.R. Academy of Sciences on Engineering Geology and Hydrology, the Academy's Board on Earth Cryology and the Academy's Lithological Committee.

This conference was attended by 208 specialists from nine trusts of the Engineering and Geological Site Investigations located within the permafrost zone, 10 project institutes, 33 research institutes and 26 education institutions from 29 cities in the U.S.S.R. as well as four participants from the U.S. and one from China.

Fifteen papers were presented and discussed in the plenary sessions including three American papers. Poster papers were discussed in five parallel sessions, as follows:

- Scientific foundations, techniques of engineering and geological site investigations
- Problems of cryolithogenesis in regions of intensive industrial development
- Experience and techniques of engineering and geological site investigations in permafrost zone
- Engineering and geological forecast and measures on environmental protection under construction
- Engineering geocryology and design of structures on perennially frozen soils.

Proceedings were published by Kolyma Publishers were available to participant at the Conference.

E.D. Ershov and V.E. Roujansky

News of Recent and Forthcoming Meetings and Activities

International Symposium on Geocryological Studies in Arctic Regions

The symposium, held in northern West Siberia, August 1-10, 1989, provided the opportunity to examine permafrost, geological, geographical, engineering, and environmental field conditions and present and discuss papers on a wide range of permafrost topics. Highlight of the symposium was two full days of field excursions by helicopters north of Yamburg in the remote tundra regions of the Gydan and Yamal Peninsulas. Magnificent exposures of massive underground ice were examined. The main symposium was devoted to plenary and technical sessions including both invited and contributed papers, informal discussions on future cooperation and local field excursions to examine pipelines, drill rigs, and gas field facilities and environmental conditions in the Yamburg area. Yamburg is a new town of as many as 30,000 workers built solely to support the immense gas developments in the Taz Peninsula.

The symposium was organized by the U.S.S.R. Academy of Sciences under the auspices of its National Committee on Permafrost and Scientific Council on Earth Cryology. Sponsors included the Academy's Institute of Northern Development, Tyumen, and Permafrost Institute, Yakutsk, and Arctic Neftegazstroi, Nadym, with the support of the Ministry of Construction for Oil and Gas Enterprises and the Ministry of Gas Industry. Vladimir Melnikov was the symposium's presiding officer.

In addition to the approximate 100 Soviet participants from throughout the Soviet Union, participants from Canada (9), China (4), Finland (1), Norway (1) and the U.S. (9) attended. Opening plenary sessions included statements from national IPA representatives and the President of IPA and 18 scheduled papers including a number of presentations by the foreign participants. The three concurrent sessions of contributed papers dealt with permafrost structure and evolution (17 papers), stability and protection of permafrost (20 papers), and construction problems particularly related to gas and oil developments (18 papers). Excellent simultaneous translation facilitated exchange of information.

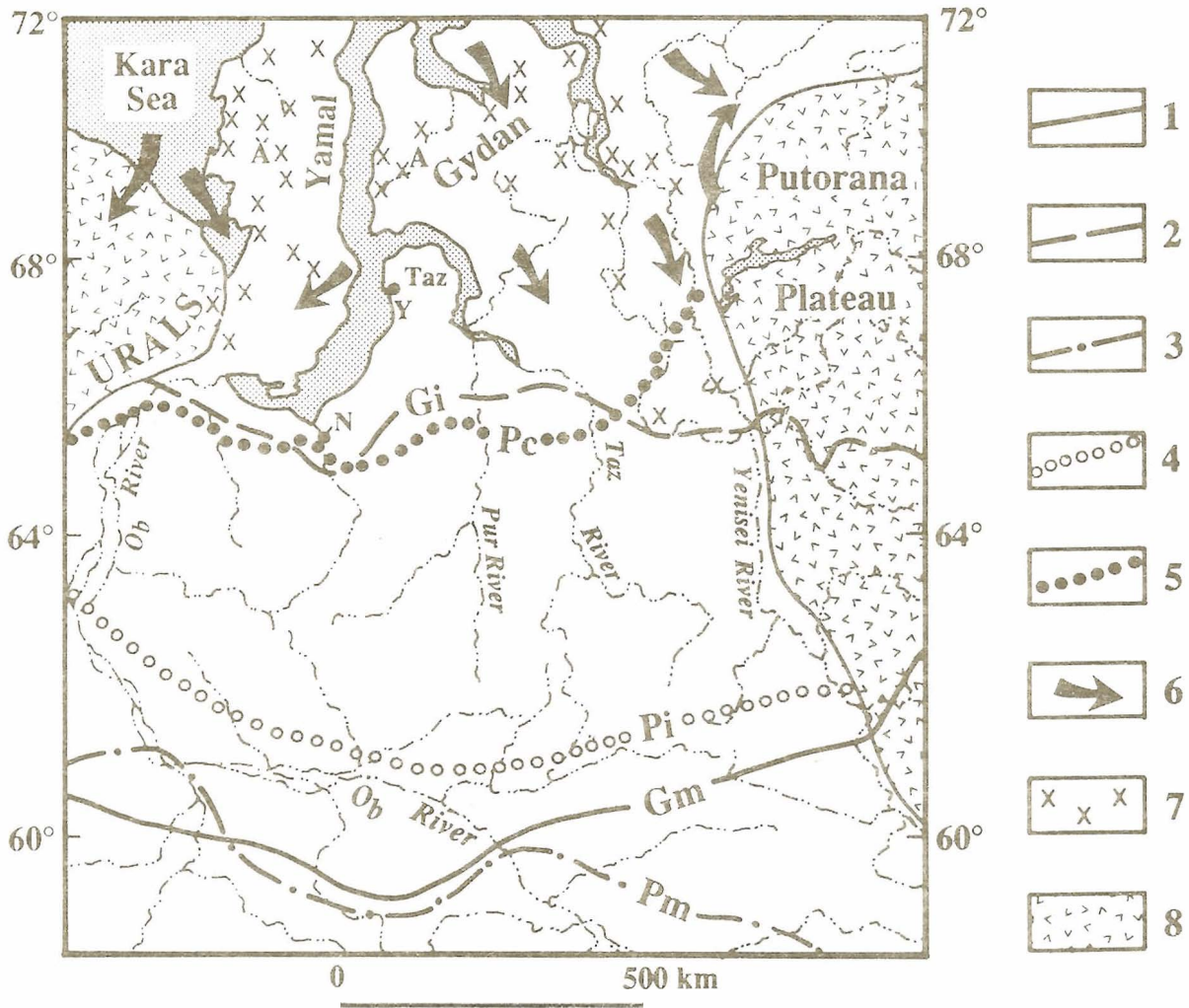
A principal reason for this symposium was to introduce foreign scientists and engineers to the environmental and engineering problems associated with gas development in this ice-rich,

sandy permafrost terrain. Major environmental concerns have arisen and, in fact, we learned that further gas developments in the Yamal are curtailed pending the outcome of a major review of the project and its potential impacts on the permafrost, environment and the local people. As a result of the gas developments, many geocryological and geobotanical studies were undertaken over the past ten years involving many experts from Soviet academic institutions and ministries. Discussions during the symposium led to a proposal for the establishment of at least one year-round field station on the Yamal to continue basic and applied geocryological investigations and to include researchers from other countries. Other recommendations included the expansion of mapping techniques developed here and in North America to the entire circumpolar region at a suggested scale of 1:5,000,000.

The West Siberian Plain, one of the world's largest and flattest lowlands that extends from the general region of the Trans-Siberian Railroad on the south at 55° N. Lat. to the Arctic Ocean, 2000 km to the north at 73° N. Lat. The northern part is a sandy plain approximately 1000 to 1500 km wide and less than 100 m above sea level. This poorly drained, lake-spotted area is bounded on the west by the Ural Mountains and on the east by the Putorana Plateau. This region produces more than 60% of the natural gas and petroleum of the U.S.S.R.

During the last interglaciation (Eemian/Sangamon), the Arctic Sea transgressed over at least the northern part of the lowland, producing a wave-washed sandy deposit containing marine microfossils. This plain was exposed to an arctic climate as the sea withdrew 100,000 years ago. Permafrost formed to a depth of at least 500 m. Today, continuous permafrost exists from the Arctic Sea southward to about 66° N.

Modern glacial geology concepts hold that the northern part of the West Siberian lowlands was invaded by southward moving glacial ice sheets several kilometers thick (Astakhov and Isayeva, 1988; Astakhov, 1976, 1979; Kaplyanskaya and Tarnogradsky, 1975). Because of the rigorous Arctic climate, abundant buried glacial ice bodies still occur in frozen till north of 67° N, the area of the latest glaciation. Buried glacial ice is also reported in thickly forested terrain underlain with



Location map with principal geocryologic phenomena of West Siberia plain (from Astakhov and Isayeva, 1988). Limits of: 1--maximum inland glaciation (Gm); 2--last glaciation (Gi); 3--maximum extension of lower permafrost layer (Pm); 4--insular upper permafrost layer (Pi); 5--continuous permafrost (Pc); 6--direction of ice flow for the last glaciation; 7--exposures of buried glacial ice; 8--mountainous borderlands. N--Nadym; Y--Yamburg; A --main locations of August 1989 field visit.

discontinuous permafrost near the Yenisei River as far south as the Arctic Circle (Astakhov and Isayeva, 1988). Permafrost studies have demonstrated that large foliated ice wedges formed later in the glacial ice and perennially frozen overlying loess, after the "withdrawal" of the last glacial ice sheet on the northern plain. It is well to note here that glacial ice and frozen till, especially of the last glaciation, is also still widely preserved in Antarctica (Péwé, 1960).

The melting of the large massive ground ice bodies on the Gydan and Yamal Peninsulas have given rise to a unique thermokarst topography of arcuate slumps termed "thermo-cirques" or thaw slumping features which have helped shape the

local tundra topography for the last 10,000 years. The low topography of the peninsulas is characterized by a myriad of various shaped slump areas from ellipses to funnels to arcuate and associated forms. There may be 20-25 slumps per km² or individual slumps hundreds of meters square. Slumps of various ages and degree of activity and preservation can be distinguished across the rolling tundra landscape. The origin and rate of formation of the slumps are being studied to more fully understand the stability of the surface and its utilization.

A helicopter reconnaissance was made from Yamburg northward to about 70° N. on the west side of the Gydan Peninsula (August 4). Vast

areas of lake-dotted tundra with winding rivers on a sandy plain spread out in all directions. Stop 1 was on the left bank of the upper reaches of the Yuribei River, where different types of ground ice crop out 30 m above the river. This exposure seems to be typical of many others described on the northwest Siberian Plain. A sheet of "clear" ice up to 2-3 meters thick inclined about 20 degrees and smaller ice lenses occur in what appears to be a clayey till with striated glacial cobbles of igneous rock and sandstone. The ice has crystals 50-100 mm in diameter and numerous air bubbles. The ice bed alternatively could be of Pleistocene injection ice or large ice segregations (the writer, T.L.P., prefers a glacial origin). This bedded ice is about 10 m below the surface. The till incorporates mollusk shells indicative of warmer water conditions, probably from the underlying interglacial sandy beds and peat beds.

Overlying the frozen and clayey till with relic glacial ice lies about 10 m of frozen, organic-rich silt 10-18,000 years old (the writer, T.L.P., interprets this as loess and retransported loess). Syngenetic ice wedges, up to 3 m wide at the top, have formed in the late Pleistocene loess and extend downward into the underlying relic ice bed.

Stop 2 was at a permafrost research station at Lake Parisento. The area has been mapped in detail and meteorological conditions and ground temperatures have been systematically registered since 1988 under natural and disturbed and insulated surface conditions. Work at the research station is designed to produce methods to aid in efficient and safe exploration of the Arctic for oil and gas.

Stops 3 and 4 illustrated thaw slumping, and Stop 5 provided an excellent exposure of bedded buried glacial ice about 30 m long and 10 m high.

A helicopter reconnaissance to the central Yamal Peninsula, site of natural gas exploration, exhibited many frozen ground phenomena (August 5). On both the Yamal and Gydan Peninsulas, vast areas of the tundra and underlying permafrost are criss-crossed by vehicle trails which have disrupted the tundra. Since 1988, off-road vehicle traffic has been prohibited during the summer.

Stop 1 was a cliff exposure of frozen silt with large

syngenetic ice wedges and typical upturning of the adjacent sediments, located on the west side of the Gulf of Ob at Sehch at the mouth of the Sehch River. The silt is typical loess of the late Pleistocene age.

Stop 2 was a construction camp for workers involved in surface mining of huge quantities of sand for road and pad construction. The numerous large, shallow borrow pits have created an enormous scarred area of many hundreds of acres extent. Late Pleistocene mammal bones, such as mammoth, have been recovered in the excavations. Stops 3 and 4 illustrated ice sheet exposures and thaw slumping. Flying to the last stop, a well-developed closed-system pingo was observed. The last stop was a cliff exposure at a large lake about 50 km northwest of Cape Komennie on the Gulf of Ob. Here several exposures exhibited beautiful clear "blue" bedded glacial ice under clayey till capped with loess (see cover photograph).

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Troy L. Péwé and J. Brown



Syngenetic foliated ice wedge in deformed perennially frozen retransported loess. Mouth of Sehch River on the west side of the Gulf of Ob on Yamal Peninsula, 70° N. Lat., northwest Siberia, U.S.S.R. Photograph PK 29418 by Troy L. Péwé, August 5, 1989.

Fifth Canadian Permafrost Conference

The Conference will be held June 6-8, 1990, at Laval University, Quebec City, Quebec, Canada. M. Allard is the chairman of the Organizing Committee. Titles of eighty six papers are listed in the registration bulletin. Registration is \$200.00 (Can.) before May 1, 1990 and \$245.00 after that date. A four-day field trip to Northern Quebec is still being planned at an estimated cost of \$2000 (Can.). The number of participants on the field trip will be limited to 40. The IPA Council will meet in open session on June 4 and 5, and IPA Working

Groups are scheduled to meet on June 8. Meetings of both U. S. and Canadian permafrost committees are also planned. Information on the Conference can be obtained from:

Nicole Leger, Conference Services, National Research Council of Canada, Montreal Road, Building M-19, Ottawa, Ontario, Canada K1A 0R6
Tel. (613) 993-9009 FAX: (613) 957-9828
Telex 053-3145P

International Commission on Snow and Ice

At the recent International Commission on Snow and Ice meeting at Davos, Switzerland, W. Haerberli, IPA liaison, was asked to report the following to the IPA members:
A symposium on "Water and Ice as Geophysical Agents" will take place at the IAHS Congress in Vienna 1991. Dr. J. Klinger, University of Grenoble, C.N.R.S., B.P. 96, 38402 St. Martin d'Hères Cedex, France, is the convenor and

technical contributions from the permafrost community would be greatly appreciated. A working group on "Terrestrial and Extraterrestrial Ground Ice" was established within the ICSI Division on "Ice as a Material". The chairman is J. Klinger. It is reported that he will seek informal collaboration with permafrost specialists and seek to form a joint ICSI-IPA working group.

Intergovernmental Panel on Climate Change

The United Nations established a series of committees to prepare a comprehensive document on the effect of climate change on the nations of the world. A permafrost subgroup is organized under Working Group II on Impacts, and is co-chaired by Canada and the USSR. The first meeting was held in Toronto, Canada, July 5-6, 1989 along with a Working Group on ecosystems. A second meeting was held in Ottawa, Canada, September 25-27. A draft report consisting of

sections on permafrost-climate relations, climate change and effects on permafrost and socio-economic implications is due in November 1989. Participants included U.S.: Lunardini, Haugen, Sayles, Assur, and Melillo; U.S.S.R.: Anisimov, Gavrilova, P. Melnikov; and Canada: Baker, Judge, Resborough, M. Smith, B. Maxwell, Findlay, J. Hall, Lapoukbine, Pagnam, A. French; U.K.: Callaghan and members of the Secretariat for Changing Atmosphere: Street, Hart, Brydges.

Calendar of Recent and Forthcoming Meetings

Geocryology of the Americas

October 1989, Mendoza, Argentina
Contact: Arturo Corte, CC 330-5500, Mendoza, Argentina
Phone: 061-241029
Telex: 55438 CYTME AR

Fifth Conference on Engineering and Geological Site Investigations within the Permafrost Zone

3-8 October, 1989, Magadan, USSR
Contact: E. Ershov, Engineering Geology Faculty, Moscow State University, Moscow, USSR

Symposium on the Arctic and Global Change

25-27 October, 1989, Ottawa, Canada
Contact: Climate Institute, Suite 403, 316 Pennsylvania Avenue, SE, Washington, DC 20003, USA

The 8th International Research Basins Symposium and Workshop

26-30 March, 1990, Abisko, Sweden
Contact: Christina Nilsson, Secretary Organizing 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 Tromsø, Geological Department IBG, P.O. Box 3085, N-9001 Tromsø, Norway.

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 (x3231)
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

13th Polar Libraries Colloquy

10-14 June 1990, Rovaniemi, Finland
Contact: Liisa Kurppa, Arctic Center, University of Lapland, P.O. 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

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, Pyzhevsky per. 7, Moscow 109017, USSR

1990 National Conference on Hydraulic Engineering (Cold Regions Hydrology and Hydraulics sessions)

30 July-August 3, 1990, San Diego, California
Contact: Howard H. Chang, Department of Civil Engineering, San Diego State University, San Diego, California, 92182, USA
Phone: (619) 594-6380

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 I, SF02150, Espoo, Finland

Symposium on Ice-Ocean Dynamics and Mechanics

27-31 August 1990, Hanover, New Hampshire

Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom
Phone: 233-355974; FAX: 233-336543

**Geocryology of Southern Africa
5-17 September 1990**

Contact: The Secretary, SASQUA, Department of Geography, Rhodes University, P.O. Box 94, Grahamstown 6140, South Africa

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

**Sixth International Conference on Cold Regions: Cold Regions Engineering Technology for the 21st Century
26-28 February 1991**

Contact: Devinder Sodhi, CRREL, 72 Lyme Road, Hanover, NH, 03755-1290, USA
Phone: (603) 646-4100

**Symposium on Water and Ice as Geophysical Agent--1991 IUGS General Assembly
Vienna, Austria**

Contact: J. Klinger, University of Grenoble, C.N.R.S., B.P. 96, 38402 St. Martin d'Hères Cedex, France

**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 ASCHICN; FAX: 8011095

Mountain Glaciology--Relation to Human Activities

26-30 August 1991, Lanzhou, China

Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom
Phone: 233-355974
FAX: 223-336543

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

6th International Symposium on Ground Freezing

September 1991, Beijing, China

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Recent Publications and Related Journals

All costs quoted in U.S. currency unless otherwise stated.

Glossary of Permafrost and Related Ground-Ice Terms, 1988, NRCC Technical Memorandum No. 142, Publication Sales and Distribution, National Research Council of Canada, Ottawa, Ontario, Canada, K1A 0R6. \$16.00 Canadian.

Geocryology of the USSR (5 Volumes), 1989, E.D Ershov, NEDRA Publishers, USSR. Order through V/O "Mezhdunarо Dnaya Kniga," 39 Dimitrov St., Moscow 113095, USSR.

Proceedings of the Fifth International Conference on Permafrost. Tapir Publishers, Vollabakken 15, 7030 Trondheim, Norway.

Volumes 1-3 \$240.00. Volumes 1-2 \$225.00. Volume 3 \$15.00.

International Symposium on Ground Freezing: ISGF '88 (2 Volumes). A.A. Balkema Publisher, P.O. Box 1675, Rotterdam, The Netherlands.

Proceedings of the Fifth International Conference of Cold Regions Engineering. R. D. Michalowski, Editor. ASCE, CR-89, 345 East 47th Street, New York, NY, 10017-2398. \$37.00

The Frozen Earth: Fundamentals of Geocryology. P.J. Williams and M.W. Smith, Cambridge University Press, The Edinburgh Building, Shaftesbury Road, Cambridge, CB2 2RU, UK. £30.00 sterling.

Journals:

Cold Regions Science and Technology. Malcolm Mellor, Editor, CRREL, 72 Lyme Road, Hanover, NH 03755. Free sample through Elsevier Science Publishers, P.O. Box 330, 1000 AH Amsterdam, The Netherlands. Subscription \$160.00.

Journal of Cold Regions Engineering. Bernard D. Alkire, Editor. Department CR-10, American Society of Civil Engineers, 345 East 47th Street, New York, NY, 10017-2398, USA. Subscription \$44.00 Non-member price.

Journal of Quaternary Science. J.J. Lowe, Editor, Geography Department, City of London

Polytechnic, Old Castle Street, London E1 7NT, United Kingdom. Free sample through Judy Higgins, Longman Scientific and Technical, Longman House, Burnt Mill, Harlow, Essex, CM20 2JE, United Kingdom. Subscription \$158.00.

Permafrost and Periglacial Processes. John Wiley and Sons, Ltd. Baffin Lane, Chichester, West Sussex, PO19 1UD, United Kingdom (see advertisement inside back cover).

Arctic and Alpine Research. Kathleen Salzberg, Managing Editor, INSTAAR, Campus Box 450, University of Colorado, Boulder, CO 80309, USA. \$40.00, foreign subscriptions \$45.00.

Arctic. Editor, Arctic Institute of North America, University of Calgary, 2500 University Drive N.W., Calgary, Alberta, T2N 1N4 Canada. \$35.00.

Quaternary Research. Stephen C. Porter, Editor, Quaternary Research Center, AK-60, University of Washington, Seattle, WA 98195, USA. Order through Academic Press, Inc., 1 East 1st St., Duluth, MN 55802, USA. \$160.00; \$196 Canadian. Special rates available.

Journal of Glaciology and Geocryology. Editor, Chinese Society of Glaciology and Geocryology, Chinese Academy of Sciences, 174 Dongganexi Road, Lanzhou, China. Distributor: Guoji Shudian, P.O. Box 2820, Beijing, China.

Actas Geocriogenicas, Laboratorio Geocriologico, CC 330-550 Mendoza, Argentina.

Journal of Glaciology and Ice, Editor, H. Richardson, International Glaciology Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom. £30 and £10 sterling, respectively.

Global and Planetary Change- A Daughter Journal of Palaeogeography, Paleoclimatology, Palaeoecology. Science Publisher B. V., Journals Department, P.B. Box 211, 1000AE, Amsterdam, The Netherlands. \$127.00

Polar Geography and Geology, W. Barr, Editor, Department of Geography, University of Saskatchewan, Saskatoon, SK, S7N 0W0, Canada. Subscriptions: V.H. Winston & Sons Inc., 7961 Eastern Avenue, Silver Spring, Maryland, 20910 USA. \$135.00.

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