



Frozen Ground

Number 12

The News Bulletin of the International Permafrost Association

December 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	Japan	Switzerland
Denmark	Netherlands	United Kingdom
Finland	Norway	USA

Cover Photograph:

Aerial view of collapsed pingo and ice wedge polygons in the Tuktoyaktuk Peninsula area of the Northwest Territories, Canada. Approximately 1400 pingos occur in this area, the largest concentration of pingos in the world. For almost four decades Professor J. Ross Mackay of the University of British Columbia has studied and published results of his extensive investigations of this region. (Photograph no. 1047 by Troy L. Péwé, 18 August 1954.)

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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. 13 is the end of April 1993. 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 24 or Chairman, IPA Editorial Committee, P.O. Box 9200, Arlington, Virginia 22219-0200, USA.

Issue No.12 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

It is a pleasure to report that the Seventh Council Meeting of the International Permafrost Association, held in Washington, D.C., 7–8 August 1992, was very successful and memorable for many of us. Not only was it the first Council Meeting held in the United States since the founding of IPA in 1983 in Alaska, but it was 29 years earlier that the first International Conference on Permafrost was held in the United States at Lafayette, Indiana, under the auspices of the US National Academy of Sciences. It was appropriate that the Academy was our host for this Council Meeting.

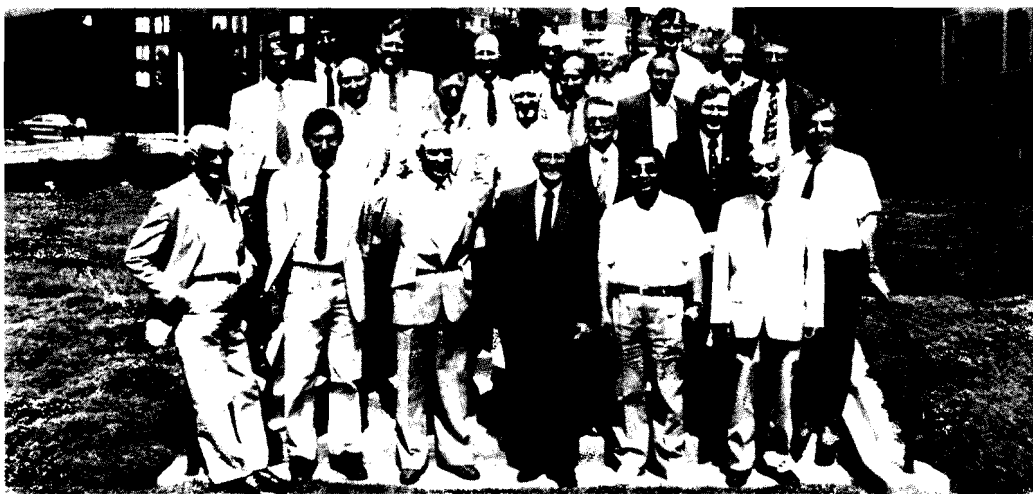
Perhaps of interest to our organization is that the term *permafrost* was coined in Washington, D.C., just 50 years ago. Dr. Simon Wm. Muller of Stanford University (with the Military Geology Branch of the US Geological Survey during World War II) was given the charge of gathering data on perennially frozen ground. Dr. Muller extracted and summarized much material from the Russian literature and, in the absence of a suitable English term, coined the word *permafrost* in 1942. The word first appeared in a 1943 publication of the US Geological Survey.

In addition to members of the Executive Committee, Council members representing 10 of the 18 IPA adhering countries were present. Details of the meeting can be found elsewhere in this news bulletin. It is encouraging to note that additional countries are inquiring about

membership in IPA: Estonia, Mongolia, and a multinational group representing several countries in southern Africa. It has just been learned that scientists in Spain are also interested. It is a pleasure to report that the IPA President has received a letter from Dr. P.O. Perron, President, National Research Council of Canada, inviting IPA to hold the VII International Conference on Permafrost at Yellowknife, NWT, Canada, in 1998. The Council went on record as being in favor of recommending the acceptance of the invitation when it is made formally at the next meeting of the Council in Beijing in 1993.

A considerable part of the Council meeting was devoted to the report of Professor Cheng Guodong, Organizing Chairman of the VI International Conference on Permafrost. The conference will be held at the new Beijing Conference Center where the XIII International Congress, International Union for Quaternary Research, was held in 1991. The Center has splendid conference facilities and includes the large new continental Grand Hotel. Numerous committees are preparing for an excellent conference, which includes three technical field excursions to Tibet, Tian Shan, and Northeast China. Please plan to participate in the Conference in China. Additional information is provided on the inside back cover of this issue of *Frozen Ground*.

Troy L. Péwé, President, IPA



Participants in seventh council meeting. Front row (left to right): Alfred Jahn, Jerry Brown, Ross Mackay, Troy Péwé, Cheng Guodong, Shi Yafeng. Middle Row (left to right): Jonas Akerman, George Gryc, John Zarlring, Nikolai Grave, Arvind Phukan, Bill Lovell, J.P. Lauridou, Hugh French, Francesco Dramis. Back row (left to right): Charles Harris, Alan Heginbottom, Rupert Tart, Bruce Henshaw, Max Britton, Bernard Hallet, Frederick Nelson, Wilfried Haerberli.

SUMMARY OF IPA COUNCIL MEETING

The Seventh Council Meeting, International Permafrost Association, was held at the National Academy of Sciences, Washington, D.C., USA, 7–8 August 1992. Present were:

Executive Committee

President	T.L. Péwé (USA)
Vice-President	G.D. Cheng (China)
Secretary-General	J.R. Mackay (Canada)

Council Members and Working Group Representatives:

Canada	H.M. French and J.A. Heginbottom
China	Shi Yafeng
France	J.P. Lautridou
Italy	F. Dramis
Poland	A. Jahn
Russia	N. Grave
Sweden	J. Akerman
Switzerland	W. Haerberli
United Kingdom	C. Harris
USA	W. Lovell and B. Hallet

Other Chairmen or Representatives of Working Groups and Committees

Editorial	Jerry Brown
Foundations	Rupert Tart
Freezing & Thawing	Arvind Phukan

Major agenda items are summarized below.

Opening Remarks

President Péwé welcomed all present. Bruce B. Henshaw (NAS) welcomed the Council to the National Academy of Sciences. Dallas Peck (Director, US Geological Survey) then spoke on some permafrost engineering problems such as the design and construction of the trans-Alaskan pipeline and the use of deep borehole temperature profiles in Alaska in studying past climatic change. Tom Ovenshine (Chief, Office of International Geology, USGS) spoke about the preparation and publication of the IPA *Circumpolar Map of Permafrost and Ground Ice* and indicated support for Jerry Brown (nominated for Secretary-General, IPA, 1993–1998) and related IPA activities. The USGS provides secretariat support for the IUGS.

The minutes of the 31 July and 1 August 1991 meetings in Beijing, which had been previously circulated, were accepted and approved (moved by French, seconded by Lovell).

Membership

Secretary-General report on membership

1. A letter had been received from Rein Vaikmae, Chairman of the Estonian Polar Research Committee, asking about membership in IPA. The Council was receptive to an application for membership from Estonia should one be received.
2. No reply had been received regarding Mongolia.
3. At the 1991 Council Meeting there was discussion on the possibility of a southern African Association (i.e. a multinational group involving South Africa, Swaziland, Lesotho, and Zimbabwe) joining IPA. Membership of a multinational group would require a modification to the IPA constitution.

In a recent letter Kevin Hall (University of Natal, South Africa) wrote that on 3 July 1992 there was a meeting of the Southern African Association of Geomorphologists (SAFG) attended by more than 80 people, including members from Lesotho, Kenya, Namibia, Swaziland, and South Africa. The proposal for a multinational “Southern African Permafrost Group” was put to a vote and accepted unanimously. The IPA Council discussed the desirability of changing the constitution to accommodate multinational groups in cases where there were too few individuals with permafrost interests in any given country to form a National Adhering Body. The concept met with considerable favor and was discussed several times on 7 and 8 August. C.W. Lovell (USA) was asked by the Council to suggest changes in wording in the IPA constitution so that multinational groups could join IPA. These changes in wording of the IPA constitution were reviewed. The Council then voted unanimously to recommend that the constitution be changed (moved by French, seconded by Harris), and a mail ballot will be prepared for those eight countries without representation at the Council. The Council also noted that other multinational groups might wish to join IPA in view of recent political changes in Eastern Europe and the former Soviet Union.

Summary reports of Adhering Bodies

Canada (H.M. French): The Adhering Body is the Canadian National Committee for IPA and is supported by the Bureau of International Affairs, National Research Council of Canada (NRCC). H.M. French is Chairman, J.A. Heginbottom is Secretary, and there are five other members. The committee normally meets once a year.

It is planning for the VII International Conference on Permafrost in Yellowknife, NWT, Canada.

China (Shi Yafeng): Considerable effort is being spent upon preparations for the VI International Conference on Permafrost.

France (J.P. Lautridou): Besides the normal functions carried out by an Adhering Body, theoretical studies on freezing problems and associated predictions are being compared with field conditions.

Italy (F. Dramis): Activities include periglacial mapping and permafrost terminology.

Poland (A. Jahn): Research continues on Svalbard. L. Starkel joined the meeting and reported on the INQUA-GLOCOPH program.

Russia (N. Grave): The Russian National Permafrost Committee of the Russian Academy of Sciences includes about 30 members drawn from institutes, university departments, and agencies engaged in research and industry. The committee is financed by the Permafrost Institute of the Siberian Branch of the Russian Academy of Sciences. In spite of limited funds, extensive permafrost research, both applied and basic, is still being carried out in Russia.

Sweden (J. Akerman): The Department of Physical Geography, University of Lünd, is the provisional Adhering National Body. A field symposium was held in August 1991 at Abisko on the theme "High Alpine Environmental Fluctuations and Slope Processes in the Holocene." A Swedish index of permafrost terms has almost been completed and it will be coordinated with the IPA multilingual list of permafrost terms.

Switzerland (W. Haeblerli): The permafrost group of the Swiss Academy of Sciences continues its work on the distribution and characteristics of permafrost and associated phenomena in the Alps. Plans are being developed to merge the coordinating group on permafrost with the glacier commission to form a new Glaciological Commission in the mid-1990s.

United Kingdom (C. Harris): Since the last Council meeting the British Adhering National Body has been formally organized through a committee:

Charles Harris, Cardiff, Geology (Chairman)
Michael Clark, Southampton, Geography (Secretary)
Edward Derbyshire, Leicester, Geography
Peter Worsley, Reading, Sedimentology
Ronald Jones, Nottingham, Engineering
Tony Mayer, NERC, Secretary, Polar Science
Committee

The Adhering National Body acts primarily as a source of information concerning IPA activities for British scientists, but will in future seek to organize meetings,

and foster links with other organizations concerned with cold climate regions. The British Royal Society has agreed to pay \$500 per annum in dues to the IPA on behalf of the British Adhering Body, and the first payment (for 1992) has been made.

USA (C.W. Lovell): The USC/IPA is a committee of six, currently chaired by C.W. Lovell and composed of equal numbers of engineers and scientists. It is a subcommittee of the US National Committee on Geology. It coordinates with numerous engineering and scientific professional organizations, which provide assistance in payment of dues (ASCE, ASME, AAG). The Newsletter *Frozen Ground* is prepared and printed in the United States.

Report on VI International Conference on Permafrost (Professor G.D. Cheng)

The conference will be held at the Beijing Convention Centre. The Centre was chosen on the basis of favorable comparison of costs and facilities. There was lengthy discussion on costs, facilities, the number of papers received from China, Russia, and other countries, the technical program, number of parallel sessions, special sessions, poster sessions, social arrangements and the banquet. Provisional registration information and other details on the conference are in the Second Bulletin and provided in this issue of the News Bulletin (inside back cover).

Report of the Nominating Committee

The report of the nominating committee was presented by F. Dramis (Chairman) (see p. 9 for details).

Cheng Guodong	President (China)
Hugh M. French	Vice-President (Canada)
Nikolai N. Romanovskij	Vice-President (Russia)
Jerry Brown	Secretary-General (USA)

The report (moved by Dramis, seconded by Lovell) was approved unanimously.

Reports of Standing Committees

For more details, see pages 7 to 9.

Advisory Committee on Working Groups: C.W. Lovell (chairman) reaffirmed the 13 points relating to Committee procedures submitted to the Council in June 1990, at Quebec City, Canada. Lovell discussed the new Working Group on "Seasonal Freezing and Thawing of Permafrost Areas," proposed activities at the Beijing Conference, funding of Working Groups, and plans to have Working Groups prepare reports for the 1993 Council meeting. He stressed that "operational procedures" for Working Groups should be formalized, at the earliest opportunity, by the Council. It was subsequently agreed that Chairmen of Standing Committees and Working Groups would meet in Beijing to agree on common procedures.

Finance Committee: The report was presented by H.M. French (Chairman) who reviewed the financial status and pointed out that some countries who normally pay substantial dues (\$250/unit) have recently been unable to do so. The committee recommended that unit dues be reduced from 12 to 8 for Canada, Russia, and USA and from 6 to 4 for China. The reduced dues structure was well supported, but not voted upon formally, since the recommendations of the report were for discussion, not for adoption. At Beijing, a financial statement will be made covering the 1988 to 1993 period.

Editorial Committee: J. Brown (Chairman) stated that *Frozen Ground* is prepared and printed in the USA with no direct cost to IPA, a fact of considerable financial importance to IPA; he asked for suitable cover photos to be sent directly to him; and he stated that *Frozen Ground* should not be sold by Adhering Bodies or professional organizations. The length of *Frozen Ground* is restricted to 24 pages. Short review papers could appear in *Frozen Ground* and the Editorial Committee is agreeable to cooperating with Working Groups with respect to their publications that bear the IPA logo.

The committee undertook the review of approximately 100 manuscripts from 16 countries using two reviewers for each paper. Additionally, 125 Chinese and Russian papers have been processed in both countries using similar review procedures. Procedures for preparation of final camera copy of the conference volumes are under consideration.

Progress of the IPA "Circumpolar Map of Permafrost and Ground Ice Conditions" is satisfactory. J.A. Heginbottom discussed aspects of the legend and showed the recently published map of permafrost and ground ice conditions in parts of northwest Canada. Cartographic support for the IPA map is being provided by the USGS, who will also print and publish the map. Haeberli commented upon the problem of distinguishing between continuous and discontinuous permafrost regions in mountain areas and several Working Groups will assist on this question.

Reports of Working Groups and Discussions of Future Activities

For more details see pages 10 to 12.

Data and Information: In the absence of the Chairman and Secretary, J.A. Heginbottom reported on recent activities and plans of the Working Group, including the development of a prototype inventory of data on permafrost, the active layer, and related climate/terrain variables. The Working Group has expressed support for the preparation of a 1988–1992 permafrost bibliog-

raphy by WDC-A Glaciology for the Beijing Conference. A recommendation will be made to the Council at Beijing that the WG be continued for another five years.

Foundations: In the absence of Academician Melnikov (Chairman) who, unfortunately, has been ill, R. Tart reported on the meeting held at Norilsk and he suggested that the Working Group address the issue of standardization of terms, procedures, etc. in permafrost engineering considerations. The WG plans to request a five-year extension at Beijing.

Mountain Permafrost: W. Haeberli (Chairman) presented a detailed report of activities and suggested one major workshop every five years may be enough. He commented upon problems arising in the scheduling of IPA and related activities in order to avoid or lessen conflict and overlaps.

Periglacial Environments: J.P. Lautridou (Chairman) reported on activities for the 1991–1992 period. In association with the IGU Frost Action Commission, a symposium and field trips were held in the spring of 1991. The Working Group is active in participating in joint meetings (e.g. with the IPA Working Group on Mountain Permafrost) and has plans for future meetings at Beijing in 1993 (with Corte, IGCP 297) and in 1994 (e.g. Field trip on "Grèzes litées in France"). The Working Group plans to continue to promote research into periglacial processes. The emphasis will be on fundamental research through the development of field stations for process monitoring, microscale studies of cryogenic processes affecting both soils and rocks, laboratory experimentation and simulation, and numerical modeling.

Present Global Change and Permafrost: In the absence of the Chairman and Secretary, J.A. Heginbottom summarized some of the activities of the Working Group. An annotated bibliography of permafrost and global change has been prepared and will be released as an Open File Report by the Geological Survey of Canada. No attempt has been made to make the bibliography comprehensive for all areas of the world. French reported that a special issue of *Permafrost and Periglacial Processes*, with papers relating to global change, will be provided to all registered participants at the Beijing Conference. E. Koster, Chair of the Working Group, has indicated that he wishes to retire from the WG in 1993 and a new chairman will need to be appointed.

Seasonal Freezing and Thawing of Permafrost Areas: A. Phukan (Chairman) reported on the initial activities of the Working Group, and particularly on an international symposium, "Frost in Geotechnical Engineer-

ing,” to be held in Anchorage, Alaska, shortly before the Beijing meetings in 1993. A proceedings volume is planned and discussions are underway with publishers.

Terminology: A summary of the report prepared by R.O. van Everdingen (Chairman) appeared in the June 1992 issue of *Frozen Ground*. The WG has had considerable success in encouraging preparation of multilingual glossaries in a number of languages, most recently including Italian, and it is hoped that a set of internationally accepted permafrost terms for use in both engineering and science will be developed.

International Affiliations

J. Brown drew attention to some of the forthcoming meetings of interest to IPA (see *Frozen Ground*, no. 11, June 1992, p. 21–22) and stressed that IPA can make important contributions, such as to global change. He drew attention to the IGCP Project 253 “Termination of the Pleistocene,” and suggested that contacts should be through Working Groups. During the discussion of International Affiliations and, indeed, previously in this and other Council Meetings, the topic of conflicting dates for symposia, conferences, etc. has arisen frequently. Brown spoke briefly on correspondence that he had with the British Ground Freezing Society and C. Harris (IPA) offered to make contact with them. Brown suggested that we maintain close contact with the International Arctic Science Committee (IASC) and should name an IPA representative to the next IASC Council Meeting to be held in Abisko, Sweden, in April 1993.

VII International Conference on Permafrost

H.M. French (Chairman, CNC/IPA) stated that Canada raised the possibility of holding the VII Conference in Canada at the Council Meeting on 31 July 1991 at Beijing, China. Since then, discussions have been held in Canada on hosting the VII Conference in Canada. President Péwé pointed out that Switzerland had also been investigating the possibility of a multinational group jointly hosting a 1998 “alpine” IPA conference. The general view, expressed by a number of Council members, was that IPA should take a long view and start planning not only for 1998 but also for the VIII Conference in 2003. H. French out-

lined the nature of the Canadian support for the VII Conference. After some discussion, there was a motion to receive the report (moved by French, seconded by Lovell). The Council voted unanimously to receive the report and to go on record in favor of accepting the Canadian invitation when it is made formally at the next meeting of the Council at Beijing in 1993 when the Council is required to vote on the location of the next conference.

Future Meetings and Related Conferences

The next meetings of the Executive Committee and the Council will be held at Beijing in 1993. The possibility of European Alpine countries hosting the VIII Conference in 2003 or a regional conference in 2000 was discussed further. F. Dramis stressed that a meeting in Europe would increase interest in permafrost. W. Haeberli spoke in favor of holding the VIII Conference in European alpine countries in 2003. The Council voted unanimously (moved by Lovell, seconded by French) to encourage W. Haeberli to continue planning for a 2003 Conference and to report on progress at Beijing in 1993.

G.D. Cheng announced that there would be a “Symposium on the Impacts of Climatic Change/Global Warming on Hydrology and Water Resources in Mountainous and Cold Regions,” in mid-July 1993, at Lhasa, Tibet, China. The symposium is organized by the IGU Study Group on Regional Hydrological Responses to Climate Change/Global Warming.

Other Business

The main item of concern was the function, formation, longevity etc. of Working Groups. C.W. Lovell will request that reports on all Committee and Working Groups be received three months before the Council meets at Beijing, 1993. W. Haeberli suggested that some Working Groups might be merged and stated what has been felt by many individuals, that some IPA members have too many commitments and this dilutes activities.

Adjournment

The meeting adjourned at about 1100 hours. Working Group chairs and representatives met informally to discuss future procedures and cooperation.

REPORTS OF IPA STANDING COMMITTEES AND WORKING GROUPS

Advisory Committee on Working Groups

1. A new Working Group on Seasonal Freezing and Thawing of Permafrost Areas was approved in 1991 by the IPA Council. There are now *seven* Working Groups: mountain permafrost, foundations, present global change and permafrost, data and information, periglacial environments, terminology, and the new one.
2. Reports to the Council have been requested from all Working Groups. Such reports should contain requests for renewal (by the Council) if that is desired.
3. Other issues which the Working Groups may bring before the Council are:
 - a. Activity at the Beijing Conference
 - b. Funding of Working Groups
 - c. Scheduling of Working Group meetings, seminars, symposia, etc.
4. "Operational procedures" for Working Groups should be formalized into ByLaws/Procedures/Guides by the Council at the earliest opportunity.

Submitted by C.W. Lovell, Chairman

Finance Committee

The previous report of the Finance Committee was presented to the IPA Council at its last meeting in Beijing, China, August 1991.

As of 30 March 1992, the IPA bank balance was \$16,410.14 (Can.). At the previous Council meeting in Beijing, the balance was \$10,955.46 (Can.).

This apparent increase in funds should not be allowed to obscure the serious financial situation facing the IPA. There are a number of encumbrances against the account. Travel expenses of executive members with regard to the Washington meeting may exceed \$5000. In 1991, amounts of \$1000 each were allocated to the President, the Editorial Committee and IPA Secretariat. Similar amounts must be envisaged for 1992 to maintain the smooth running of the Association. Only one disbursement to Working Groups was made in 1991; \$500 to the Russian Terminology Group.

The major source of revenue for IPA is dues. The revised dues structure, put in place following the Quebec City Council meeting of 1990, had the aim of making the IPA self-funding by 1993. This is meeting with only partial success. Of the "Big Four" (Canada, USA, Soviet Union [Russia], China) only Canada is paying with 12 units (\$3000). Dues for 1991 and 1992 have not been received from China or Russia, and the USA has made only a partial payment for 1992 (3 units). A number of other members have paid dues for 1991 and 1992: Italy (3 units), UK (2 units), Germany (2 units), Belgium (1 unit), Denmark (1 unit).

The IPA receives small contributions from several publishers for announcements in *Frozen Ground*.

The National Research Council of Canada is supporting the IPA rather heavily, especially since it also contributes to the expenses of the IPA Secretariat (approximately \$4000 Can. in 1991). This support will cease in 1993.

The following actions are recommended: 1) That the unit dues structure be unofficially revised to reflect the current economic realities, such that Canada and the USA pay with eight units each and that dues for Russia and China be reduced to appropriate levels on a temporary basis. 2) That the Big Four try to pay regular dues at appropriate levels and on time. 3) That other members continue to pay dues as they are able. 4) That the IPA investigate ways to reduce operating costs in the years subsequent to 1993 to reflect its revenue base.

If the IPA Secretariat moves to the USA, sources of logistical and other support should be investigated. At present, the annual costs of producing *Frozen Ground* (\$2000–\$3000) are covered by sources in the USA. Funds supplied to Working Groups and the Executive Committee should be carefully controlled.

The IPA should investigate the possibilities of generating additional revenues through advertising, charging for *Frozen Ground* (in the USA and Canada), and by using the international conferences every five years as a method of generating revenue (e.g. sale of proceedings volumes, a built-in IPA "donation" to registration fees, etc.).

Submitted by H.M. French, Chairman

Editorial Committee

The main activities this past year focused on:

- Processing of abstracts and papers for the VI International Conference on Permafrost
- Preparation of the circumarctic permafrost map
- Preparation and distribution of two issues of *Frozen Ground*.

More than 350 titles and abstracts from 24 countries were submitted to the Chinese Organizing Committee by early 1992. Of these, approximately 150 papers were invited to be submitted directly to the IPA Editorial Committee for international review. In order to meet the review deadlines of Fall 1992 the remainder of the Chinese, Russian and Mongolian papers were processed in China and Russia, using review procedures similar to those for the other manuscripts. Approximately 200 potential reviewers from North America, Europe and Japan were contacted in Spring 1992 to determine their availability to review manuscripts. Deadline for submission of manuscripts to the Chairman of the Editorial Committee was 1 June 1992. Approximately 100 papers were received by the Editorial Committee and two reviewers requested for each paper (approximately 120 reviewers from North America, Europe and Japan).

Members of the Editorial Committee (Brown, Cheng, French, and Grave) met in conjunction with the August 1992 IPA Council meeting to complete the necessary steps in the review process. At that time, China delivered 77 papers and Russia 38 papers to the Editorial Committee, all in English and reviewed by two reviewers. Procedures and instructions for preparation of camera copy were discussed. Authors of accepted papers will receive instructions for revision of the manuscripts and preparation of the final camera copy. The following countries submitted abstracts and manuscripts for review:

Country	Abstracts	Papers
China	186	77
Russia	~ 150	40
United States	61	34
Canada	46	33
Germany	9	6
Japan	7	3
Switzerland	6	5
Mongolia	5	1
France	4	2
Poland	3	3
Belgium	3	1
Finland	2	1
Italy	2	2
Netherlands	2	1
Norway	2	1

Country	Abstracts	Papers
Argentina	1	1
Chile	1	0
Estonia	1	0
India	1	0
Romania	1	0
South Africa	1	1
Spain	1	1
Ukraine	1	0
United Kingdom	1	1

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 20 April 1992. These included Alan Heginbottom (Canada), Evgeny Melnikov (Russia), and Oscar Ferrians and Jerry Brown (USA). The meeting was arranged to coincide with the completion of the joint Canadian–Russian 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 were prepared. The Canadian segment utilizes the new permafrost map prepared for the National Atlas of Canada which employs a legend similar to the IPA map. A new layout for the base map was prepared at the US Geological Survey. A partial compilation and revised legend were available for review at the August IPA Council meeting. Details on mapping mountain and plateau permafrost were discussed with members of the Editorial Committee, Council and Working Groups. Plans were agreed upon for preparation of a complete draft by January 1993. 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; it should be published in the Proceedings of the Sixth Conference and will accompany the map. We anticipate that the final map can be available in Beijing in July 1993. A small meeting will be needed early in 1993 to review the final map manuscript.

Two issues of the *Frozen Ground* News Bulletin have been prepared since the last Council meeting. We plan to continue the publication of two issues per year dated June and December. Although members have been contributing reports and other information, it still takes many reminders to obtain timely submissions, which are required in October and/or April to meet the deadlines. Approximately 1600 copies are printed and distributed. Cost to IPA has been approximately \$900 per year for mailing with composition and printing on

a volunteer basis in the USA. Since it is easier to communicate within smaller geographic regions, the Committee identified regional representatives whose principal responsibilities are to obtain at least one report per year from each member and Working Group chairman and other non-IPA countries and organizations in their regions and to submit other timely information. The following representatives were nominated and their participation will be confirmed in writing:

Canada—Alan Heginbottom
Russia—Nikolai Grave
United States—Jerry Brown
Nordic countries—Jonas Akerman
(*Finland, Sweden, Norway, Iceland, Denmark and Greenland*)
Europe—Lorenz King
(*Italy, France, Germany, Switzerland, United Kingdom, Netherlands, Belgium and Spain*)
China and Mongolia—Zhu Yuanlin

Japan—Masami Fukuda
Southern Hemisphere—Kevin Hall
(*Argentina, southern Africa and Antarctica*)

The Chairman has been providing reports of the IPA activities to the International Arctic Science Committee, the *Polar Library Newsletter*, and the *Man and The Biosphere Northern Sciences Network* newsletter. Members should be encouraged to report IPA activities to other professional organizations and publications. The Chairman also provided announcements of the Sixth Conference to numerous organizations for publication in their calendar of events.

A long discussion took place at the August 1992 meeting on the role of the Editorial Committee in the review of Working Group reports and other IPA products and documents. The Committee plans to meet in Beijing with Working Group chairmen to discuss review procedures and responsibilities.

Submitted by Jerry Brown, Chairman

Nominating Committee

At the beginning of June 1990, Dr. Troy Péwé, as President of the International Permafrost Association, formally asked Mme. Zhou Youwu (China), Mr. J. Alan Heginbottom (Canada) and myself (Italy) to serve as members of the Nominating Committee for the 1988–1990 interconference period. In order to furnish the best possible list of nominees, the committee members had several contacts (mostly by letters and phone), both among themselves and with members of the Council. Important chances for exchanging ideas were the Council Meeting held at the end of July 1991 in Beijing, where Mme. Zhou and myself met, and the Workshop held in Interlaken at the end of August 1991. We thoughtfully examined the scientific curricula of several possible nominees and decided to submit the following list of officers for the period 1993–1998, to be voted during the next conference:

President—Cheng Guodong, China
Vice President—Hugh M. French, Canada
Vice President—Nikolai N. Romanovskij, Russia
Secretary General—Jerry Brown, USA

The proposal of Dr. Cheng Guodong as President resulted from both his outstanding scientific activity and the capabilities shown during his service as Vice President, also taking into account his organization of the VI International Conference on Permafrost to be held in China.

For the appointment of Dr. Hugh French as Vice President, besides his extremely high level of scientific curriculum, it was also considered both that Canada will be hosting the VII International Conference on Permafrost (Yellowknife, 1998) and his activity as representative of Canada as well as Chairman of the Finance Committee.

The indication of Dr. Nikolai Romanovskij as the other Vice President is an acknowledgment of the scientific relevance of his activities and his organizational capabilities.

Finally, considering that Dr. J. Ross Mackay is not available to serve again, we nominate Dr. Jerry Brown as Secretary General. Besides the importance of his scientific work, he has widely demonstrated his organizing capabilities both operating in the Editorial Committee (and most of all for *Frozen Ground*) as well as past representative for the USA.

All the nominees have been personally contacted by letter and declared that they are willing to serve if elected. The Nominating Committee hopes that the suggested names will meet with the agreement of the Council. Finally, the Nominating Committee wishes to thank the officers of the International Permafrost Association for their extremely valuable work.

Submitted by Francesco Dramis, Chairman

Permafrost Data and Information

The purpose of the Working Group is 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. A major presentation and workshop will be arranged for the Sixth International Conference on Permafrost. There was a Working Group proposal to publish a volume provisionally titled *Permafrost Data and Information: New Horizons*.

One of the primary aims of the Working Group is to achieve maximum communication with the permafrost community on matters concerning data standards. The potential for developing an E-mail bulletin board for permafrost matters is under investigation. The Working Group will encourage the submission of data set descriptions to the Arctic Environmental Data Directory, and of data sets to WDC-A for Glaciology.

The possibility of incorporating selected permafrost glossaries and other informatics data sets into the CD-ROM Arctic Environmental data series produced by the US Geological Survey is being explored. The potential for undertaking GIS/mapping manipulation of any georeferenced data distributed in this form is also under review.

The Working Group has expressed support for the preparation of a 1988–92 permafrost bibliography by WDC-A Glaciology in readiness for the Sixth International Conference on Permafrost. Funding is provided by the US. It has also been agreed that it would be worthwhile for J.A. Heginbottom (Canada) to update the index of permafrost conference volumes which currently covers the period 1958–83. Cumulative indices for both these project could be included on future CD-ROMs.

Individual members of the Working Group have undertaken various independent projects in support of the Working Group's objectives. These have included:

1. Development of a prototype inventory of data on permafrost, the active layer, and related climate/terrain variables. Input is invited from any IPA member holding significant records or data sets of this type, or archives of which they may be aware. Individuals with such information are invited to communicate with R.G. Barry, WDC-A for Glaciology. The descriptions should include, if possible, data specifications (content, format, spatial coverage, record length, frequency of observation); form of data storage (media); ownership; and availability (contact person).
2. A survey of permafrost data availability by R.G. Barry and his colleagues at the WDC-A for Glaciology (USA); reports on this work have been presented at the 14th Polar Libraries Colloquy (May 1992, Columbus, Ohio) and submitted for presentation at the VI International Conference on Permafrost (Beijing, China, July 1993). The survey involved the mailing of a questionnaire on data holdings to 310 individuals, which elicited 76 responses from 13 countries. Of these, 49 respondents hold permafrost-related data, and 37 indicated a willingness to make it available through a central coordinating body; 30 were agreeable to having the data published. WDC-A for Glaciology plans to assemble a selection of such data sets and seek funds to release them on appropriate media as a demonstration product and for international exchange.
3. J.A. Heginbottom (Canada) presented a poster on reviews of six recent large-scale maps of permafrost and ground ice at the 40th Annual Conference of the Canadian Association of Geographers (Kingston, Ontario, Canada, June 1991). This poster included translations of the legends of two Russian maps. Other reviews and translations are now being incorporated to form a cartobibliography of permafrost maps.
4. Related to Items 1 and 2, the Working Group seeks information on "historical" records that may merit a data rescue effort to ensure their security and preservation. Recent national and international interest in this area may permit WDC-A for Glaciology to expand its efforts.
5. A report on the planned 15-year permafrost bibliography by A. Brennan and C. Hanson of WDC-A for Glaciology was presented at the Polar Libraries Colloquy (May 1992, Columbus, Ohio).

Submitted by M.J. Clark, Chairman
with updates by J.A. Heginbottom

Mountain Permafrost

Papers presented at the 1991 Interlaken Workshop on Permafrost and Periglacial Environments in Mountain Areas were edited and prepared for publication in *Permafrost and Periglacial Processes* (vol. 3, no. 2 and 3) with some overflow contributions planned for publication later in the same series. A state-of-the-art report on Mountain Permafrost and Climatic Change prepared by W. Haeberli, G. Cheng, A. Gorbunov and S.A. Harris was completed on behalf of the IPA Working Group on Present Global Change and Permafrost.

In cooperation with the IPA Working Group on Periglacial Environments and the IGCP Project 297, a five-day field trip to the Rocky Mountains between Jasper and Plateau Mountain, and a two-day workshop at Calgary, were organized by S.A. Harris from 27 July to 7 August 1992. With regard to mountain permafrost, the main objective was to compare methods applied and results obtained for the Alps and the Rocky Mountains of Alberta. Systematic research had started around 1970 in both areas. Emphasis in the Alberta Rockies was on drilling and altitudinal effects whereas research in the Alps rather concentrated on mapping and geoecological consideration of factors influencing the surface energy balance, such as direct solar irradiation, snow-cover redistribution by wind and avalanches or surface characteristics (coarse blocks, meadows, perennial snowbanks etc.). Extended discussions during the field trip and the Calgary workshop allowed agreement to be reached on a number of important questions.

At comparable sites (windblown ridges, active north-facing rock glaciers), permafrost in the Alberta Rockies appears to exist at altitudes which are about 600 m lower than in the (Swiss) Alps. This roughly corresponds to a general drop in permafrost boundaries at a rate of some 100 m per degree latitude. Differences in relative extent of altitudinal permafrost belts (continuous, discontinuous, sporadic) are mainly caused by differences in definitions and terminology. Using the Alpine sense of the term, a belt of discontinuous permafrost indeed extends over at least 600 m and prob-

ably even more in the Alberta Rockies. The most striking differences in nature concern:

- Structural–geologic influences (predominantly layered sedimentary rocks in the Alberta Rockies often forming steep rock walls and plateaus—mainly crystalline horns in the central parts of the Alps).
- The strongly limited extent of the meadow belt
- The overlap of discontinuous permafrost and forest in the Alberta Rockies.

Plateau Mountain still today represents the deepest low-latitude/high-altitude permafrost borehole in the western hemisphere. This important borehole exhibits reduced-to-zero vertical heat flow within the approximate 200-m-thick permafrost and, hence, may possibly indicate secular permafrost warming since the past century, which is about 2 to 3 times stronger than in the Alps. In contrast to this inferred secular permafrost warming, mean glacier mass loss during the same time interval (close to 0.5 m per year as indicated by the retreat of Athabasca Glacier in the Columbia Icefield area) appears to be quite comparable in both areas. This observation is at least semiquantitatively in accordance with the fact that glaciers in the Alps react more sensitively to changes in air temperature because of higher precipitation rates and mass balance gradients. Recently accelerated warming trends since the mid-1980s clearly show up in Alpine borehole temperatures as well as in accelerated degradation of rock glacier permafrost in the Alps. A comparable trend cannot be recognized in boreholes of the Alberta Rockies but more detailed documentation of the measured data would be necessary to rigorously test this hypothesis.

Attempts are presently being made to contribute to the IPA map on circumpolar permafrost of the northern hemisphere in view of mountain and high-altitude permafrost. Plans were also developed for continuation of the Working Group activity during the 1993–1998 period with the main emphasis being on internationally coordinated mapping, modeling and monitoring of mountain permafrost.

Submitted by W. Haeberli, Chairman

Periglacial Environments

The Working Group will continue to promote research into periglacial processes, including ground ice phenomena and permafrost, soil deformation (cryoturbation), frost heaving, frost sorting, processes of slope instability, thermal contraction cracking and vein-ice formation, and cryogenic rock weathering.

Recent and future activities include:

- 27 July–7 August 1992: *Permafrost and Periglacial Environments*, IPA Working Groups (Mountain Permafrost and Periglacial Environments) with IGCP 297
- *Geocryology of the Americas. Pre- and Post-*

Congress Field Trips, S.A. Harris, Calgary.
14–18 August 1992: *Field Trip and Periglacial Geomorphology Paper Session*. IPA Working Groups on Periglacial Environments and Mountain Permafrost, IGU Commission on Frost Action Environments, Washington.

- July 1993: Congress in China, Joint meeting with A. Corte [IGCP 297]
- Summer 1994: Field trip “Grèzes Litées in France,” Symposium Dynamics of Deposits in the Periglacial Environments, Especially in the Mountains; J.P. Lautridou, organizer
- September 1994 Periglacial Structures, Glacial and Periglacial Relations in the Region of Leipzig (Germany), L. Eissmann, organizer

During the 27th International Geographical Congress held in Washington in August 1992 the IGU Commission on Frost Action Environments was renewed for another four years and new appointments made. The IGU/IPA Working Group on Periglacial Environments will continue to jointly promote meetings, field excursions, discussion sessions, research initiatives and international collaboration in the field of periglacial geomorphology.

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IPA Working Group on Periglacial Environments

Stefan Kozarski (Poland)
Bernard Hallet (USA)
Hugh French (Canada)
Albert Pissart (Belgium)
Matti Seppälä (Finland)
Jeff Vandenberghe (The Netherlands)

The emphasis will be on fundamental research through the development of field stations for process monitoring, microscale studies of cryogenic processes affecting both soils and rocks, laboratory experimentation and simulation, and numerical modeling. This implies encouragement of work on technological problems related to monitoring and recording of temperature, humidity, moisture migration, frost heaving, etc., design of appropriate laboratory procedures and problems of translating laboratory results to field conditions. Emphasis will also be given to poorly understood and little-studied aspects of periglacial geomorphology such as the interaction between cryogenic and non-cryogenic processes, the action of salts, biological processes and the impact of thermal shock.

An important aspect of the work will be to promote collaborative research that brings together the expertise and experience of different groups and nationalities to further the research goals set out above.

We will seek to integrate research into modern periglacial processes with studies of relict phenomena and Pleistocene periglacial environments. An example of research in present-day periglacial environments that may yield valuable information concerning Pleistocene phenomena is provided by slope deposits of the grèzes litées type. The paleoclimatic significance of Pleistocene periglacial features will therefore continue to be explored and refined.

Submitted by J.P. Lautridou, Chairman

NEWS FROM MEMBER COUNTRIES

The IPA Council approved a proposal by the Editorial Committee to assign regional representatives to request and submit news from member countries for *Frozen Ground*. The representatives are:

- Canada—Alan Heginbottom
- Russia and former republics—Nikolai Grave
- United States—Jerry Brown
- Nordic countries (Finland, Denmark, Sweden, Norway, Iceland, Greenland)—Jonas Akerman

- Europe (Belgium, France, Germany, Italy, Netherlands, Switzerland, UK)—Lorenz King
- Poland—Alfred Jahn
- China and Mongolia—Zhu Yuanlin
- Japan—Masami Fukuda
- Southern Hemisphere (Argentina, southern Africa, Antarctica)—Kevin Hall

The following reports were received in time to appear in this issue of *Frozen Ground*, including the regional reports from Europe as provided by Lorenz King.

CANADA

During the winter of 1991–92, Canada had issued a formal invitation to the IPA to hold the VII International Conference on Permafrost in 1998 in Yellowknife, NWT, Canada. The invitation was issued by the National Research Council of Canada, after discussions with the Geological Survey of Canada, the Canadian Geotechnical Society, and the Science Institute of the Northwest Territories, each of which has agreed to support the organization of the conference (see IPA Council discussion, p. 6).

The Canadian National Committee for the International Permafrost Association (CNC/IPA) held its annual meeting in Toronto on 28 October 1992, directly following the Canadian Geotechnical Conference. Two new members of the committee were welcomed: Michel Allard, Centre d'Études Nordiques, Université Laval, Québec; and J.F. (Derick) Nixon, Nixon Geotech Limited, Calgary.

At the meeting, the Committee received reports from the meeting of the Council of the IPA, the Cold Regions Division of the Canadian Geotechnical Society, the Permafrost Committee of the Science Institute of the Northwest Territories, and the Canadian Polar Commission. Brief progress reports were presented on IPA activities, particularly the Multilingual Glossary project of the Terminology Working Group, and the Circumarctic Permafrost Map project. Communications issues, both internationally and within Canada, were also discussed. The next meeting of the CNC/IPA will be held in association with the 46th Canadian Geotechnical Conference, in Saskatoon, Saskatchewan, 27–29 September 1993.

The 45th Annual Meeting of the Canadian Geotechnical Society was held in Toronto, 26–28 October 1992.

The Cold Regions Division sponsored a session on Permafrost Engineering, in which eight papers were presented dealing with:

- The distribution of landslides in the Mackenzie Valley
- The engineering geology of Richards Island, Mackenzie Delta
- The strength and time-dependent deformation of frozen saline soils
- Pile load testing of grouted piles in the western Arctic
- The prediction of creep settlements of foundations in permafrost on the basis of *in situ* tests
- Investigation of permafrost in the foundations of dikes at the Gull Generating Station in northern Manitoba
- The occurrence of permafrost in bedrock and its consequences
- Geotechnical investigations of permafrost in Ungava (northern Quebec) using ground-probing radar.

In addition, J.M. Konrad, Laval University, Quebec, gave the Geotechnical Colloquium on the topic of "Frost Heave and Engineering Structures." Several other papers on frost-related topics were also presented in other sessions.

The 46th Canadian Geotechnical Conference will include a session on "Research Needs in Cold Regions Geotechnology." The conference will also include regular sessions for submitted papers. Abstracts of 500 words or less should be submitted by 4 January 1993. Further information can be obtained from Dennis Pufahl, Dept. of Civil Engineering, University of Saskatchewan, Saskatoon, Saskatchewan S7N 0W0.

The 1992 Roger J.E. Brown Award, which was established in 1986 to honor the memory of the renowned Canadian permafrost scientist, was awarded jointly to Pavel Kurfurst and Scott Dallimore of the Geological Society of Canada, for their paper "Engineering Geology of Nearshore Areas off Richards Island, NWT: A Comparison of Stable and Actively Eroding Coast-

lines." in the *Canadian Geotechnical Journal* (vol. 28, no. 2, p. 179–188) and also in recognition of their many years of involvement in studies of the geotechnical properties of permafrost materials in the shore zone of the Beaufort Sea.

Prepared by J.A. Heginbottom
Secretary, CNC/IPA

CHINA

The Lanzhou Institute of Glaciology and Geocryology has finished construction of the State Key Laboratory of Frozen Soil Engineering. The Laboratory is located in a five-floor building with a 3846-m² construction area, including 520 m² of cold rooms. It has various kinds of facilities which can be used to perform almost any type of laboratory testing of frozen soil. Experts and graduate students from all over the world are encouraged (welcomed) to work at this Laboratory; the Laboratory will cover all research and living expenses except international transportation.

The State Key Laboratory has recently completed a 500-km geological survey for a pending highway on a permafrost area in Qinghai Province, mainly through the use of a Radar Detecting System imported from Canada.

Invited by the Transportation Institute of Russia, a five-person expert group, organized by the Railway Ministry of China, performed a 2000-km field expedition for the pending Bei-Ar Railway in Russia in August 1992.

A working group for compiling new "Norms of Construction in Permafrost Areas" organized by the Construction Ministry of China has been working on the Norms for three years. A variety of engineering testing projects and field investigations of completed construction have been accomplished this year.

Prepared by Zhu Yuanlin
Secretary General, Chinese Society of
Glaciology and Geocryology

FRANCE

The Groupe de Recherches Arctiques (GDR 0490) of CNRS was created about 12 years ago to encourage collaboration among specialists from different disciplines. Presently, 12 laboratories are represented by about 20 research workers. The responsible person is Th. Brossard, Laboratoire de Géographie Physique du CNRS, UFR des Lettres et Sciences Humaines, Université de Franche Compté, 30 rue Mégevand, F-25030 Besançon.

The GDR scientific activities arise from the geographical interest in Arctic regions and because the GDR has management responsibility for the French Spitsbergen Station. Researchers in early times came to the GDR to receive technical and logistic help to study aspects of the Arctic. Later, teams of research workers and students, acting every year around this station, found common themes of research. Presently there are two principal directions:

- Evaluation of Arctic geosystems evolution
- Aboriginal point of view of nature and culture

The whole problem and the motivation of these studies is environmental protection.

The French Institute for Polar Research and Technology (IFRTP) was created recently. The Scientific Council will be constituted before the beginning of 1993, but already a first event attached to this Institute is programmed. The colloquy "Arctic and Antarctic Polar Research—2000 Outlook," organized by the French Academy of Sciences and the IFRTP, was scheduled to be held in Paris from 16–18 December 1992. From 8–10 December 1992, an important congress is to be held in Paris which gathers together all the civil engineering specialties—Les Bâtisseurs du Cadre de Vie, Premières Assises du Génie Civil. This conference is organized by several partners: ministries, professional federations, contracting authorities and building companies. The scientific organization is the responsibility of two scientific associations: The National Council of Civil Engineers and Scientists and the Liaison Committee of Civil Engineering Asso-

ciations. J. Aguirre-Puente, President of the French Permafrost Association, is a member of the Scientific Committee and Chairman of one of the scientific sessions, "Arctic Works and Use of Ground Freezing in Civil Engineering." The aim of the session is to treat problems encountered in polar regions and under rigorous winter conditions and the use of artificial soil freezing.

With the help of a research contract from the Ministry of Research and Technology, the group Freezing and

Sublimation of the Laboratoire d'Aérothermique du CNRS is conducting a study to compare results from numerical models and measurements made in northern Quebec, and to consider physical-chemical phenomena of frost heave in fine-textured soils. The comparison of numerical models and field measurements is the object of collaboration between the Freezing and Sublimation Group and the Northern Studies Centre of the Université Laval de Québec.

Prepared by J. Aguirre-Puente

ITALY

The Italian Adhering Body of the IPA is carrying out research on the distribution of permafrost and of periglacial landforms (mostly rock glaciers) in Italy, surveying both the Alps and the Apennines. Italian researchers are involved in studies on periglacial morphology carried out along the Andes (Patagonia)

and in a geomorphological study of a portion of Victoria Land (Antarctica). The Italian translation of the Glossary of Permafrost has been completed and submitted to *Permafrost and Periglacial Processes* within the framework of the IPA Working Group for Terminology.

Prepared by Francesco Dramis

RUSSIA

Climate Change and Permafrost

Permafrost studies in Russia continue within the limits of state scientific-technological programs according to the activity of WMO-UNEP Intergovernmental Panel of Climate Change (see *Frozen Ground*, no. 10, p. 13, 1991). Some preliminary results of 1992 research work can be summarized as follows:

The assessment of changes in climate parameters was continued. These are based on data from meteorological stations and on ground temperature data for the upper layers of permafrost, obtained from permafrost monitoring test sites in the far north of Western Siberia and European Russia. It was found that in the western Siberian tundra contemporary climate warming is not clearly expressed. Modern climate ameliorations and deteriorations observed are within the limits of natural fluctuation. The trend of natural degradation of permafrost is obtained by temperature measurements in boreholes, though the period of observation is too short and could coincide with one of the short-wave climate fluctuations.

A more distinctive degradation of permafrost under different natural conditions has been established in the northern part of the European portion of Russia (Vorkuta region, Ust Perchora, Kozotaicha). Since 1970 the temperature of the upper 20-m layer of frozen ground has been rising, the depth of seasonal thaw increasing, and the permafrost table lowering.

Climatic warming during the last few decades, beginning in the 1950s, is clearly expressed in the continental area of permafrost (Yakutsk). A sign of long-term warming of the permafrost in Yakutsk is the slow thawing of its bottom layers—some millimeters per year.

Experimental studies are in progress of special facilities to protect construction based on frozen ground from destruction due to warming of foundations and thus diminished bearing capacity. The results allow us to recommend the use of artificial cooling of foundations combined with thermoinsulation. It is calculated that in Yakutsk, using such a method, the temperature of a foundation might be lowered from -3°C to -13°C and the construction could be kept from being destroyed during 180 years of climatic warming.

The dynamics of arctic coastal areas are being studied on special test sites, situated in the deltas of the two biggest rivers of Siberia—the Lena and Kolyma rivers. Using benchmarks and airphotos it was found that the rate of shoreline retreat through thermoerosion and abrasion where the ground is very icy varies from year to year. The maximum rate of 36 m/yr was observed in the Kolyma River delta; 15–20 m was observed in the Lena delta. The average velocity of shoreline retreat in the area is 1–4 m/yr.

The research program is being accomplished by Russian Academy institutes, Ministry institutes, and Moscow State University in cooperation with the Institute of Low Temperature Science (Japan) and the Geological Survey of Canada. Detailed results will be published.

In 1991–1992 the Scientific Council on Earth Cryology issued through Nauka (in Russian):

1. *Denudation in the Cryolithozone*, A.J. Popov, ed.
2. *The Upper Horizon of Permafrost*, P.I. Melnikov and Yu.U. Shur, ed.
3. *Engineering Geocryological Problems in the TransBaikal Area*, V.T. Balobaev and M.R. Gavrilova, ed.

Prepared by N.A. Grave

Global Ecological Monitoring Project

The International Workshop, Global Ecological Monitoring Project was held 8–12 August 1992 in Dubna, Russia, organized by The Ecological Station of Environmental Control (ESCOS), World Laboratory Branch, Russia, and the Lawrence Livermore National Laboratory, California, USA. About 200 representatives of governmental and non-governmental agencies, scientists and managers of defense-related industries from the United States, Russia, Ukraine, Kazakhstan, Lithuania, Italy and China participated.

The participants in the workshop reviewed evidence that there is danger to human life and welfare in major regions of our planet associated with extreme ecological damage, especially in areas of republics in the ter-

ritory of the former Soviet Union, including some regions of the Arctic.

An appeal of the participants in the workshop "To the Governments of the USA, Russia, Ukraine, Kazakhstan, Lithuania and the People's Republic of China" signed by Edward Teller (USA), Yevgeniy Velikhov (Russia) and Antonino Zichichi, President of the World Laboratory (Italy) stressed that an essential condition for diminishing the hazards to human welfare of these damaged ecosystems is monitoring major changes in the native biota and the overall health of the resident people, along with measurement of ongoing anthropogenic changes in environmental quality indices. An important step in addressing these problems would be the creation of an integrated ecological monitoring system that should include space-, air- and land-based measurements.

Contamination of the Arctic environment from both existing and potential sources located within the former Soviet Union's territory, as well as transport processes, i.e. movements of pollutants toward the neighboring countries, and the present state of the Russian Arctic environment were discussed in a paper presented by V.E. Roujansky, ESCOS. It pointed out that the geocological mapping of the permafrost zone is essential to the understanding of the accumulation and release of pollutants in the active layer and in perennially frozen ground and migration of pollutants in permafrost.

Submitted by V.E. Roujansky
ESCOS World Laboratory Branch

UNITED KINGDOM

The British Groundfreezing Society edits and distributes a short newsletter to members of the Society. The *Low-Temperature News* of the British Cryogenic Council reports on the activities of the Council, including a diary or calendar of events. For further infor-

mation on both newsletters contact J.S. Harris, 5 Foxhill Road, Burton Joyce, Nottingham NG145DB, United Kingdom.

Prepared by J.S. Harris

UNITED STATES

A joint US–Russian seminar on cryosols and global change was held in Pushchino, Russia, 15–16 November 1992, following the First International Conference on Cryopedology (see *Miscellaneous*). The seminar was sponsored by the National Science Foundation under the leadership of Chien Lu Ping, University of Alaska. A total of 18 US scientists attended, including representatives of the Soil Conservation Service and

its Soil Survey Division and the US Geological Survey. Other international attendees from the conference also participated. Seven topics were addressed, including soil mapping, gas exchange, soil climate, soil organic matter, microbial activity, geochemical cycling, and agriculture and land use. A workshop report will be available.

The International Conference on Arctic Margins was held in Anchorage, Alaska, 2-4 September 1992. Sessions and papers dealt with permafrost, environmental geology, continental shelf processes and paleoclimates. Further information on the ICAM publication can be obtained from coorganizers Dennis Thurston or David Steffy at the Alaska Geological Society, PO Box 101288, Anchorage, Alaska 99510.

The Center for Microbial Ecology at Michigan State University has established research agreements with two institutes of the Russian Academy of Sciences; both are located in Pushchino, a bioscience city near Moscow. The first project, studying ancient bacteria

preserved in permafrost soil, is led by David Gilichinsky, Head of the Laboratory of Soil Cryology of the Institute of Soil Science and Photosynthesis, and the Center for Microbial Ecology at Michigan State University. The second project is in collaboration with Alexander Boronin, Director of the Institute of Physiology and Biochemistry of Microorganisms, to study the molecular biology and enzymology of dechlorinase enzymes from unique bacteria isolated in Russia. The principal US collaborators are John McGrath, a cryobiologist and engineer, and James Tiedge, Director of the Center for Microbial Ecology.

Prepared by Jerry Brown

OTHER COUNTRIES

Spain

Spain is not yet a member of the International Permafrost Association. However, efforts are being made by a group of Spanish scientists to form a National Body in order to apply for membership in IPA. Spanish scientists are conducting permafrost studies in several Spanish mountain ranges, including the Pyrenees, Cordillera Cantabrica, Sistema Central, Sierra Nevada and Teydo Volcano. Some Spanish teams are working abroad on this topic, specifically in the Mexican stratovolcanoes, the Andes and the Antarctic continent. Special attention is paid to the role of frost

processes, periglacial slope processes and, in general, frozen ground activity at high altitude.

Prepared by David Palacios

Mongolia

Professor Jigi, Institute of Geography, recently visited Germany and indicated the strong interest of Mongolia to join the IPA. This will be discussed in July at the Beijing Council meeting and conference.

Reported by Lorenz King

PERMAFROST AND PERIGLACIAL PROCESSES

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AIMS AND SCOPE

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MISCELLANEOUS

Nansen Drilling Program (NAD) is designed to understand the environmental change in the Arctic and the history of its geological evolution in order to better predict the future of the Arctic Basin and its effect on global processes. The NAD program is developing plans for acquiring long, high-resolution sediment cores and deep basement cores, which are needed to understand the Cenozoic and Mesozoic paleoceanography, paleobiology and structural history of the Arctic. This ambitious program commemorates the pioneering work of Arctic explorer Fridtjof Nansen during the FRAM expedition, 1893–1896. NAD is led by an executive committee composed of senior scientists from institutions actively involved in Arctic research. Working with the executive committee is a science committee of senior level scientists and a technical

committee of scientific engineers with Arctic expertise. These committees were inaugurated during the summer of 1989, and NAD now includes representatives from Canada, France, Germany, Japan, The Netherlands, Norway, Sweden, UK, USA and Russia. Denmark has participated as an observer. Acquisition of a continuous core is planned for the Canadian Beaufort Shelf and includes in its upper section the perennially frozen sediments. For additional information on the drilling contact K.S. Manchester or Steve Blasco, The Atlantic Geoscience Centre, Bedford Institute of Oceanography, Box 1006, Dartmouth, Nova Scotia B2Y 4A2 Canada. To receive copies of the NAD Science Plan and related NAD newsletters contact: Joint Oceanographic Institutions, Inc., 1755 Massachusetts Ave. NW, Suite 800, Washington, D.C. 20036-2102.

IGCP Project 253: Changes in Permafrost Conditions, 8–13 June 1992, Tallinn, Estonia

The Working Group meeting, hosted by the Institute of Geology, Estonian Academy of Sciences, was attended by 16 participants from Canada, Estonia, Finland, Germany, Lithuania, Norway and Russia. There were two main topics of the meeting:

- Buried glacier ice and permafrost in glaciated areas
- Termination of Pleistocene in permafrost areas

The first day was dedicated to paper presentations:

1. *Introduction to the Glacial Geology of Estonia*, R. Karukäpp, Tallinn.
2. *Biota and Climate in Arctic Northeast Siberia During the Pleistocene/Holocene Transition*, A. Sher, Moscow.
3. *Contradictions of Modern Paleoclimatic and Paleoglaciological Models of Late Pleistocene in the Light of Permafrost Data*, Yu. Vassilchuk, Moscow.
4. *Late Glacial Moraines on Mount Kenya and the Termination of Pleistocene: Correlation with Other Middle Latitude Alpine Areas*, W.C. Mahaney, North York.
5. *Isotope Records of Late Quaternary Glacial and Climatic Variations in Marginal Queen Maud Land (East Antarctica) from Ice-Cored Moraines*, W.D. Hermichen, H.W. Hubeerten, Potsdam; N. Scheele, Bremerhaven; R. Vaikmäe, Tallinn.

6. *About the Origin of Some Massive Ground Ice in the North of West Siberia*, R. Vaikmäe, Tallinn.

7. *The Relationship Between Massive Ground Ice and the Late Pleistocene History of the Bovanenka area, Yamal Peninsula, North of West Siberia*, F.A. Michel, Ottawa; W.C. Mahaney, North York.

8. *Characteristics of the Clasts in Buried Ice of the Ledenaya Gora Outcrop (Lower Reaches of the Yenisei River, Siberia) as Evidence of Glacial Origin*, A. Gaigalas, Vilnius.

Outside the scope of the meeting's main program, F.A. Michel reported about the distribution of massive ground ice in the Mackenzie Delta region and N. Rutter introduced the new subproject "Problematic Ice Sheets." There appeared to be much interest of both Working Groups, particularly as far as the deglaciation history in the north of West Siberia was concerned. Those common interests will be taken into account while planning further activities.

In the course of two days, the participants were offered an opportunity to study late glacial stagnant ice features in North, Central and South Estonia.

The further trends of the working group activities were discussed during the General Discussion at the end of the meeting. The range of subjects is much wider than reflected in the program of the meeting. The participants agreed that attention should be focused on elaborating a detailed time scale for the termination of the Pleistocene in permafrost conditions. For that

purpose all the dating methods available should be used. Valuable information can be derived from changes of biota. Besides research in the modern permafrost regions, much attention should also be paid to geomorphological studies in periglacial areas.

The next Working Group meeting will be held during the VI International Conference on Permafrost, 5–9 July 1993, Beijing, China.

Prepared by R. Vaikmäe

Postcongress Field Excursion C.20c of the 27th International Geographical Congress was entitled "Central Appalachian Periglacial Geomorphology," and consisted of a field trip and a scientific paper session held from 14–18 August 1992. These events were conducted under the auspices of the 27th IGC Commission on Frost Action Environments, the Working Groups on Mountain Permafrost and Periglacial Environments of the IPA, and Project Number 297 of the International Geological Correlation Programme (IGCP 297).

This excursion comprised the first intensive effort to focus solely on the periglacial geomorphology of the Central Appalachian Highlands in the vicinity of, and south of, the Quaternary glacial borders. The trip route encompassed areas in the Piedmont Ridge and Valley, Appalachian Plateaus and Blue Ridge provinces, in order to provide the best diversity of lithology, structure, and landforms possible during the time available. Participating scientists came from Australia, Canada, France, Germany, Japan, Sweden, United Kingdom, and the USA. All agreed that study of periglacial forms and materials in the Appalachians has historically lagged behind research in most other middle latitude regions on other continents, but that modern progress is being made in several different problem areas.

During the field study, examples of both surface- and subsurface-manifested periglacial features were seen and discussed. Surface forms and materials include: tors; block fields and block streams; sorted patterned ground; pingo- or minerogenic palsa-like ground ice scars; large oriented and asymmetric topographic welts; loess, sand dunes, and sand mantles; and diamictons of probable periglacial origins. Larger landscape features include: high topographic flats and terraces that truncate lithology and structure and that are of possible cryoplanation origin; laterally extensive diamicton sheets and aprons on mountain sideslopes; fan-like diamicton lobes at the mouths of small water gaps; and river terraces. Features that could only be seen in excavation included: stratified slope deposits; examples of non-sorted patterned ground that could only be seen by soil removal; and sediment-filled wedges in both shale bedrock and in stratified slope deposits.

Participants remarked on the wide variety and great complexity of forms and materials observed during the field trip. Major overall tasks of periglacial research in this part of the Appalachians will include:

- Determination of the process mechanisms responsible for the landforms and their underlying earth materials
- Determination of the ground frost environments



First row: D.D. Braun, Mrs. Aarii, T. Aarii, E.J. Ciolkosz, S.D. Gurney, O.B. Eckoff, R. Braun and G. Hyman. Second row: W.L. Blewett, J.P. Lautridou, Mrs. Lautridou, C.E. Thorn, W.C. Mahaney, N. Potter, Jr., P. Schlyter, C. Klinger, J. Ridge, R.W. Galloway, N.C. Thurman, J. Hagedorn, G.M. Clark and G.R. Whittecar.

- under which these forms and materials originated,
- Acquisition of sufficient subsurface stratigraphic data and numerical age dates so that the periglacial components of the geomorphic history of the region can be deciphered.

Both the guidebook and the abstracts volume are

available for purchase as separate publications of the Agronomy Series from the Agronomy Department, The Pennsylvania State University, University Park, Pennsylvania 16802, USA.

Submitted by excursion organizer
G. M. Clark, University of Tennessee

IV Meeting of the IGCP Project 297, "Geocryology of the Americas," will be held together with the IPA VI International Conference on Permafrost, 5–9 July 1993, in Beijing, China. It will also join another IPA Working Group on Periglacial Environments, chaired by J.P. Lautridou. Those interested in presenting papers should send them to Cui Zhi Jiu, Department of Geography, University of Peking, Beijing, China, before 30 April 1993. Publication of

results will be presented to *Permafrost and Periglacial Processes (PPP)*. For more information contact Arturo E. Corte, P.O. Box 330, Mendoza, Argentina. Telex: 5543B CYTMEAR, Fax: 0011-54-061-380370, or Jean-Pierre Lautridou, Géomorphologie, CNRS, Rue des Tilleuls, 1400, Caen, France.

Submitted by A.E. Corte
Leader, Project 297

First International Conference on Cryopedology was held in Pushchino, Russia, 10–14 November 1992. The conference, with over 100 participants, was organized by David Gilichinsky of the Institute of Soil Science and Photosynthesis.

A proceedings volume is available from Alaska–Yukon Society of Professional Soil Scientists (AYSPSS),

Attn: Joe White, P.O. Box 202761, Anchorage, Alaska 99520 at a cost of \$20 (US), postage included; make check or money order payable to ASPSS.

Future conferences will be held on a four-year sequence, with the next one possibly being held again in Russia at Syklykar.

Symposium on the Impacts of Climatic Change/Global Warming on Hydrology and Water Resources in Mountainous Regions and Cold Regions will be held mid-July 1993 in Lhasa, Tibet, China. The themes are proposed to deal with hydrological responses to climate in mountainous regions and cold regions:

- Hydrological regime and water balance
- Regional hydrological response

- Ecosystem changes
- Glacier accumulation and glacier recession, glacio-isostasy and snowline
- Lake water level variations
- Environment and socio-economic systems in relation to regional water resource changes
- Methodologies

See *Calendar* for contacts.

PUBLICATIONS

Map of Natural Complexes of Northern West Siberia. This new map of West Siberia (scale 1:1,000,000) was prepared by the All-Russian Scientific-Research Institute of Hydrogeology and Engineering Geology (VSEINGEEO) using satellite imagery and multiyear surface field studies (for geocryological prognosis and planning of environment protection measures under large-scale construction). The landscape units of the map combine the major geocryological characteristics, including perennially frozen ground, its composition and thickness, ice content, presence of massive ground ices, peculiarities of temperature regime and a complex of exogenic geological processes. Technogenic disturbances of the region are depicted and prognostic estimation of permafrost's stability to the technogenic disturbances is given. The map of natural complexes is accompanied by a series

of small sketch maps where the spatial distribution of major landscape features and geocryological conditions is reflected and their stability to technogenic disturbances characterized. These include landscape zones, lake distribution, ground ice occurrence, stability of permafrost to technogenic disturbances of surficial cover, restoration of vegetation cover after disturbances, and recommended types of recultivation. The map is supplemented with an explanatory text describing the mapping procedure, taxonomic units of the map, and regularities of geocryological condition. The map is available in Russia from the Institute VSEINGEEO, Zeleny Village District, Noginsk District, Moscow Region, 14252. Available elsewhere from R.A. Kreig Associates, 201 Barrow Street, Suite no. 1, Anchorage, Alaska 99501-2429 (\$40 per set including explanatory text and legends [in English]).

Oxygen Isotope Composition of Ground Ice Application to Paleogeocryological Reconstructions. This book represents a synthesis of northern Eurasia cryolithozone Quaternary geology. It is in Russian but adapted for the English reader; the contents, captions and summary are translated into English. Considerable information has become available on about 50 sequences of Late Quaternary sediments from Yamal and Gydan Peninsulas, North and Central Yakutia, Chukotka, Magadan Region, and Zabaikal'e. This information allows interregional correlations and reconstructions. Chronologic dating is accomplished with hundreds of radiocarbon dates. Winter temperature reconstruction is based on ^{18}O content changes in syngenetic ice wedges. Summer temperatures are reconstructed by interpretations of palynologic data. The

book contains numerous diagrams, tables of ^{14}C , ^{18}O , pollen and hydrochemical data. A catalogue of dated mammoth remains is also presented. Virtually all known determinations of ^{18}O in permafrost and other isotope-containing media are collated. Included also are paleoclimatic and paleogeocryologic maps for winter and summer separately for key periods of the last 40 Kyr. The monograph will be useful for scientists specializing in paleoclimatology, Quaternary geology and geocryology, and for students of geography, ecology, biology and geology. Available in two volumes: Vol. 1—422 p., Vol. 2—265 p. \$60 for institutions, \$50 for individuals (both volumes in soft cover and prices include postage). Send order to Marketing Department of Nuclid Co. Ltd., Prosp Andropova d.21. k.78. Moscow 115470, Russia. Phone: (7 095) 1144518.

Canada-Russia Geotechnical Studies of Permafrost, Bovanenkovo Test Site, Yamal Peninsula, Western Siberia. Contribution to Theme I: Geoscience and Arctic Petroleum of the Program of Scientific and Technical Cooperation between the USSR and Canada in Arctic and Northern Research

for 1990-1992, and Future Directions (P.J. Kurfurst, Ed.), Geological Survey of Canada, Open File Report 2546, 405 p. Available from Ashley Reproductions, Attn: Gil Coutier, 232 Bank Street, Ottawa, Ontario, Canada K2P 1X1, \$63.00

Permafrost and Ground Ice Conditions of Northwestern Canada, J.A. Heginbottom and L.K. Radburn (Ed.), Geological Survey of Canada Map

1691A, scale 1:1,000,000, two sheets (map and legend). Available from Geological Survey of Canada, K1A 0E8, \$7.50 (Can.), \$9.00 other countries.

West Siberian North: Environment Disturbance and Management. Information Bulletin edited by G.E. Vilchuk, 87 p. plus regional maps.

Available from ORBIS'91, PO Box 25, Moscow 117071, Russia. Phone: 7-095-137-88-77. \$140 (US).

Calendar of Recent and Forthcoming Meetings

1993

Greenhouse Gas Emissions and Carbon Sequestration International Symposium on Soil Processes and Management Systems

**5–9 April 1993, The Ohio State University, Columbus,
Ohio**

Contact: Carol Whitman, USDA Global Change Program
Office, 1621 North Kent St., Rm. 60 LL, Arlington,
Virginia 22209
Fax: 703-235-9046

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

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

IGCP 253: Termination of the Pleistocene

26–28 June 1993, Manitoba, Canada

**(followed by field trip across the glaciated and
flood-scoured Canadian Prairies/Rockies**

Contact: James T. Teller, Department of Geological
Sciences, University of Manitoba, Winnipeg, Manitoba,
R3T 2N2 Canada.

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

Frost '93: International Symposium on Frost in Geotechnical Engineering

28 June–1 July 1993, Anchorage, Alaska

Contact: Arvind Phukan, School of Engineering, Univer-
sity of Alaska, 3211 Providence Drive, Anchorage, Alas-
ka 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 (during Sixth Conference)

Contact: Arturo E. Corte, P.O. Box 330, 5500 Mendoza,
Argentina
Fax: 54-61 380370; Telex: 55438 CYTME AR

National Conference on Environmental Engineering

12–14 July 1993, Montreal, Quebec, Canada

Contact: Raymond N. Young, Conference Chair, Geotech-
nical Research Centre, McGill University, 817 Sherbrooke
St. West, Montreal, Quebec, Canada H3A 2K6
Phone: (514) 398-06672
Fax: (514) 398-7361

Symposium on the Impacts of Climatic Change/Global Warming on Hydrology and Water Resources in Mountainous Regions and Cold Regions

Mid-July 1993, Lhasa, Tibet, China

Contact: Chairman, Organizing Committee, Ming-Ko Woo,
Department of Geography, McMaster University, Hamil-
ton, Ontario L8S 4K1, Canada or Liu Changmin/Guobin
Fu, Secretariat of Symposium, Department of Hydrology,
Institute of Geography, CAS, Building 917, Datun Road,
Beijing 100101, China
Phone: (861) 4231539
Fax: (861) 4231551
Telex: 222483 CAAMS

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, USA
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, Carleton
University, Ottawa, Ontario K1S 5B6, Canada

**Global Change and Terrestrial Arctic Ecosystems:
An International Conference**

23–27 August 1993, Oppdal, Norway

Contact: Jarle Holten, NINA, Tungasletta 2, N-7005,
Trondheim, Norway

Third International Conference on Geomorphology

(including the Binghamton Symposium—25 August and
IGU/IPA business meeting of Working Groups on Peri-
glacial Environments and Frost Action Environments)

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

**Fourth International Symposium on Thermal
Engineering and Science for Cold Regions**

28 Sept–1 Oct 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

**The Second International Design for Extreme
Environments Assembly: Growth and**

Environment—Challenging Extreme Frontiers

23–28 October 1993, Montreal, Quebec, Canada

Contact: Centre for Northern Studies and Research, Burn-
side Hall, Suite 270, McGill University, 805 Sherbrooke
St. West, Montreal, Quebec H3A 2K6, Canada

Phone: (514) 398-6052

Fax: (514) 398-8364

Telex: 05-268510

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

1994

**Seventh International Specialty Conference on Cold
Regions Engineering**

7–9 March 1994, Edmonton, Alberta, Canada

Contact: Centre for Frontier Engineering Research, 200
Karl Clark Road, Edmonton, Alberta, Canada T6N 1E1

Phone: (403) 450-3300

Fax: (403) 450-3700

Polar Tech '94

22–25 March 1994, Luleå, Sweden

Contact: CENTEX, Lena Allheim Karbin, Luleå Univer-
sity 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

**Symposium on Periglacial Slope Processes
(will include IGU/IPA full meeting and a field trip
to southwest France, Champaign and Lorraine)**

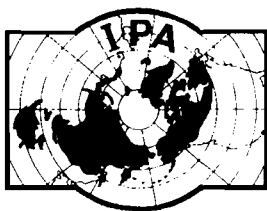
1–6 September 1994, France

Contact: Jean-Pierre Lautridou, Centre de Geomorpholo-
gie du CNRS, Rue des Tilleuls, 14000 Caen, France

**International Conference on Offshore Mechanics and
Arctic Engineering**

Fall 1994, Houston, Texas

**International Symposium on Ground Freezing
1994, France**



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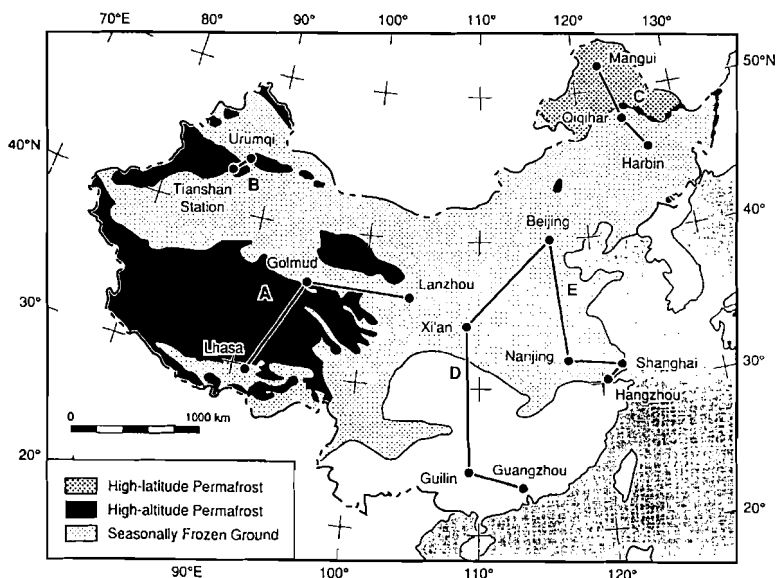
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Tel: 7 095-292-6511



Additional Information for the Sixth International Conference on Permafrost 5-9 July 1993, Beijing, China



Three special sessions will be convened with invited speakers and panels:

- Global Climate Change and Permafrost
- Mountain Permafrost and Periglacial Processes
- Linear Construction in Cold Regions (Roads, Pipelines, Canals, etc.)

A special workshop on data and information is being organized by Roger Barry. There will be three proceedings volumes. Two volumes consisting of contributed papers will be available at the Conference. The third, post-conference, volume will contain symposium papers, poster abstracts, and other information. The publisher will be Science Press, Beijing.

Hotel accommodations in Beijing

- Continental Grand Hotel:
 - Standard room (two beds) \$45/room*
 - Double room (two beds) \$40/room
 - Luxury suite (two beds) \$70/room
- Apartments in Beijing Int'l Convention Center:
 - 8 persons/3 rooms, kitchen and bath—\$25-\$35/person.

IMPORTANT DATES

1 March 1993

Deadline for posters; 500-word abstract to be published in post-Conference volume. Send abstract to Chinese Organizing Committee.

	Before 1 April 1993	After 1 April 1993
Attendee	\$320*	\$360
Accompanying person	\$180	\$200
Student	\$140	\$160
Banquet	\$40 additional per person	

* All prices are in U.S. dollars. The tour prices are based on groups of 10 or more; for smaller groups the prices will be somewhat higher. Payments: Registration form to the Secretariat. Payment made payable to ARITFM. Telegraphic transfer should be sent to the Center for International Scientific Exchange, CAS; Account Number: 71404876, Bank of China, Beijing, China.

† Pre- and post-conference tours arranged by the Center for International Scientific Exchange, CAS.

For further information contact Cheng Guodong, Secretariat for the Sixth International Conference on Permafrost, Lanzhou Institute of Glaciology and Geocryology, Chinese Academy of Sciences, Lanzhou 73000, China. Telex: 72008 IGGAS CN. Fax: 86-931-485241.

PROGRAM AND TECHNICAL EXCURSIONS

4 July 1993

Registration for Council Meeting, Poster Sessions & Reception

5-9 July 1993

Conference, International Convention Center

7 July 1993

Evening banquet

9 July 1993

Closing sessions and Council Meeting

10-17 July 1993

Excursion to Tianshan Mountains

\$720* plus estimated \$200 air fare

10-20 July 1993

Excursion to Northeast China

\$1000 plus estimated \$100 transportation

10-24 July 1993

Excursion to Qinghai-Xizang (Tibet) Plateau and Lhasa

\$1560 plus estimated \$200 air fare

PRE- AND POST-CONFERENCE SIGHTSEEING TOURS†

30 June-5 July 1993

Guangzhou-Guilin-Xian-Beijing or

10-15 July 1993

Beijing-Xian-Guilin-Guangzhou (exit Hong Kong)

\$790* double occupancy, \$880 single occupancy

30 June-5 July 1993

Shanghai-Suzhou-Wuxi-Nanjing-Beijing or

10-15 July 1993

Beijing-Nanjing-Wuxi-Suzhou-Shanghai (exit)

\$690 double occupancy, \$773 single occupancy