Frozen Ground

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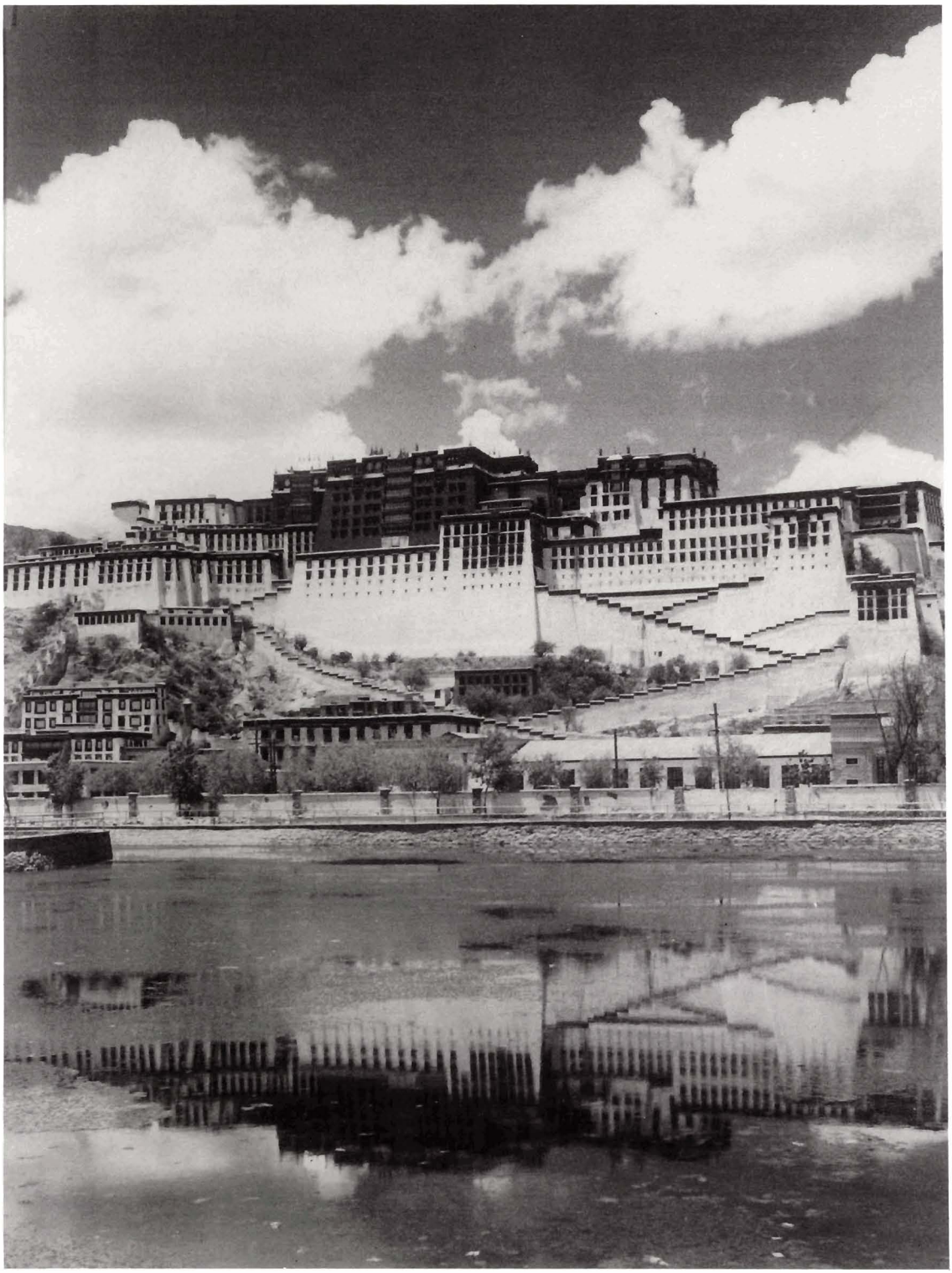


International Permafrost Association

The International Permafrost Association, founded in 1983, 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 or multi-national organizations. The IPA is governed by its officers and a Council consisting of representatives from 20 adhering bodies having interests in some aspects of theoretical, basic and applied frozen ground research (including permafrost, seasonal frost, artificial freezing and periglacial phenomena). Working Groups organize and coordinate research activities. The 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; the fifth in Trondheim, Norway, 1988; the sixth in Beijing, China, 1993. The seventh is planned for Yellowknife, Canada, in 1998. Field excursions are an integral part of each Conference, and are organized by the host country.

Officers of the Association (Executive Committee)

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

Adhering Bodies

Argentina	Denmark	Italy	Poland	Sweden
Belgium	Finland	Japan	Russia	Switzerland
Canada	France	Netherlands	Southern Africa	United Kingdom
China	Germany	Norway	Spain	United States of America

Standing Committees

Finance Committee

Advisory Committee on Working Groups

Editorial Committee

Working Groups

Data and Information
Terminology
Global Change and Permafrost
Mountain Permafrost
Periglacial Processes and Environments
Cryosols
Foundations
Seasonal Freezing and Thawing of Permafrost Areas

Cover: *Potala Palace in Lhasa, capital of Xizang (Tibet) Autonomous Region. The palace was constructed on a Mesozoic limestone knob between the years 600 and 1642. The 1993 post-Conference field trip across the Tibetan Plateau ended in Lhasa (see inside back cover for route map). Photograph by T.L. Péwé, 3 June 1980.*

FROZEN GROUND
The News Bulletin of the International Permafrost Association

Number 14 **December 1993**

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 20 countries or groups of countries. The success of the bulletin is dependent upon the willingness of IPA participants to supply information for publication. Copy date for issue No. 15 is 15 April 1994. Please ensure that working group and member country reports are submitted in good time for publication. News items are also very welcome from any IPA participant or others, as are interesting photographs for the cover (please furnish 8"×10" black and white glossy prints). To submit news items or photos please contact the appropriate individual listed on page 27, or the Secretary General.

Issue No. 14 of *Frozen Ground* was compiled by Jerry Brown with the assistance of Alan Heginbottom of the Editorial Committee. Production is courtesy of the Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire, USA. Copies of *Frozen Ground* are available in Canada from Alan Heginbottom, Geological Survey of Canada, 601 Booth Street, Ottawa, Ontario K1A 0E8, Canada; in Russia from Nikolai Grave, National Permafrost Committee, USSR Academy of Sciences, Fersman Street 11, 117312 Moscow, Russia; in the United States from Jerry Brown, P.O. Box 9200, Arlington, Virginia 22219-0200; and elsewhere from Council members.

EXECUTIVE COMMITTEE REPORT

The Sixth International Conference on Permafrost was successfully held in July, with approximately 300 participants from 22 countries in attendance. Three special sessions were held on climate change, mountain permafrost and foundations. A special workshop on data and information was held and another five-year bibliography published (1988–1992). The Council met twice, approved a new Working Group on cryosols, and approved Spain and a group from Southern Africa as new members. Following the Conference 40 international representatives participated in field trips to Tibet and Tien Shan.

Looking to the future, the Council passed a resolution encouraging IPA to become more involved in global change activities (see p. 8), approved the future activities and membership of its eight Working Groups, allocated $5000 for WG activities in 1994, and selected liaison representatives to some 20 international organizations (p. 8). Formal approval was given to convene the Seventh International Conference in Canada in 1998, and the European countries were encouraged to continue planning for the Eighth Conference in the year 2003.

The activities of the Working Groups are the key to future international permafrost activities and related collaboration. Details of those plans are reported in the following pages. Much attention is now focused on global change programs, both at the intergovernmental and nongovernmental levels, for instance the IPCC and IGBP (see p. 8–9). Many of the Working Groups' activities are directly related to global change, and the Council and Executive Committee urge more direct collaboration. Since Beijing, IPA representatives have been involved in conferences and discussions related to global change, including the GCTE Arctic conference in Norway, the PAGES Scientific Steering Committee meeting in Washington, DC, discussions with IPCC Working Group II on the cryosphere, review of the International Arctic Science Committee report on Arctic global change, and the International Association of Geomorphologists conference in Hamilton, Ontario, Canada, to mention a few.

The IPA permafrost map is nearing completion, and its publication in 1994 will provide the basis for new approaches to climate change assessments. Several international and national organizations are interested in using and/or digitizing the map, including the UNEP–GRID office in Arendal, Norway, and the World Conservation and Monitoring Centre in Cambridge, UK. The annotated bibliography of permafrost prepared by the Working Group on Global Change is soon to be published and will help highlight the significance of permafrost and global change. Future issues of *Frozen Ground* will attempt to keep our readership informed of these and other global change activities.

The new Executive Committee is now in place and we look forward to working with member countries, Working Groups, and the scientific and engineering communities. We thank the previous Executive Committee for its accomplishments.

Participants in the IPA Council Meeting, 5 July 1993. Front row, left to right: *David Gilichinsky, Satoshi Akagawa, Shi Yafeng, Cheng Guodong, Troy Péwé, Ross Mackay, Arvind Phukan, Kevin Hall, Stanislaw Uziak, J. Aguirre-Puente, Jerry Brown, Nikolai Romanovskii, Albert Pissart and Jonas Åkerman.* Back row, left to right: *Alan Heginbottom, Bernard Hallet, Wilfried Haeberli, Mike Clark, J.-P. Lautridou, Francesco Dramis, Charles Harris, Eduard Koster, Robert van Everdingen, Kaare Flaate, Roger Barry, Elisabeth Schmitt, Thorkild Thomsen, Lorenz King, Hugh French, Rostislav Kamensky, Kaare Senneset and George Gryc. (Photograph courtesy of Troy L. Péwé.)*

REPORTS OF THE EIGHTH AND NINTH IPA COUNCIL MEETINGS

Eighth Council Meeting

The eighth IPA Council meeting was held in Beijing, China, on 5 July 1993, from 1930 to 2145. Present were:

Executive Committee

President	Troy Péwé, USA
Vice President	Cheng Guodong, China
Secretary General	J. Ross Mackay, Canada

Council Members

Argentina: Jerry Brown (proxy for Arturo Corte)
Belgium: Albert Pissart
Canada: Hugh French, Alan Heginbottom
China: Zhu Yuanlin, Shi Yafeng
Denmark/Greenland: Thorkild Thomsen (for Henrik Mai)
France: Jaime Aguirre-Puente, Jean Pierre Lautridou
Germany: Lorenz King, Elisabeth Schmitt
Italy: Francesco Dramis
Japan: Satoshi Akagawa (for Masami Fukuda)
Netherlands: Eduard Koster
Norway: Kaare Flaate, Kaare Senneset
Poland: Stanislaw Uziak (for Alfred Jahn)
Russia: Rostislav Kamensky, Nikolai Romanovskii
Sweden: Jonas Åkerman
Switzerland: Wilfried Haeberli
United Kingdom: Michael Clark, Charles Harris
United States: Bernard Hallet

1. Welcome. President Péwé welcomed Council Members, members of Standing Committees and Working Groups, and visitors. He thanked Professor Cheng for having made arrangements for the meeting. All present were then asked by President Péwé to introduce themselves.

2. Approval of Agenda. The agenda was approved.

3. Status of Previous Minutes. The minutes of the seventh Council meeting, held in Washington, DC, in 1992, having been previously circulated, were approved subject to minor changes.

4. Local Arrangements. Professor Cheng discussed the local arrangements for the Council meeting and some arrangements for the Conference.

5. Membership. The Secretary General reviewed recent developments regarding membership and reported that, although contacted, neither Estonia nor Mongolia had applied for membership. The application of the Southern African Permafrost Group (moved by Åkerman; seconded by Hallet) was approved unanimously. L. King reviewed the background of the application by Spain. The application for membership (moved by King; seconded by Haeberli) was approved unanimously. President Péwé welcomed the addition of the two new members, which brought to 20 the total membership of IPA.

6. Short Reports of Members. Following past procedures, representatives of the Members gave short oral reports, and some written reports were submitted for the record [see p. 13]. Professor Cheng, in reporting on the Conference, stated that there were 189 papers in Volume 1 of the *Proceedings*, that Volume 2 would appear at the end of 1993, and that two representatives from Mongolia would be present during the Conference.

7. New Officers. President Péwé reviewed the nomination procedure for IPA and the proposed slate of officers. The voting for President and Vice Presidents was conducted by secret ballot, the tellers being Åkerman (Sweden) and Haeberli (Switzerland). The Secretary General, according to the constitution, was appointed by the Council. The new officers (1993–1998) are:

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

8. Reports of Standing Committees

Advisory Committee on Working Groups. The report was summarized by French in the absence of Lovell, Chairman. French pointed out that some Working Groups have more than six members, the recommended number. As a result of the First International Conference on Cryopedology, held in Pushchino, Russia, 10–14 November 1992, with more than 100 participants from 12 countries, a formal request for IPA to form a Working Group on Cryosols was made. D. Gilichinsky (Russia) and C.L. Ping (USA) reviewed the history of the proposal. The new Working Group was approved unanimously (moved by Brown; seconded by Pissart).

Editorial Committee. Brown (Chairman) stated that a short report of the Editorial Committee was published

on page 3 of the last issue of *Frozen Ground*, and that in future two issues of *Frozen Ground* would continue to be published annually. Three former members of the present Editorial Committee will retire. Heginbottom (Canada) discussed the status of the IPA-sponsored Circum-Arctic Map of Permafrost and Ground Ice Conditions to be published, with an accompanying text, by the US Geological Survey.

Finance Committee. French (Chairman) reviewed the financial status of IPA as covered in his written report. The report was tabled (moved by French; seconded by Dramis). There was discussion on dues and ways to increase funds. Koster suggested an approach in which the Executive Committee would decide upon the best ways to fund future activities. French requested that page 1 and the first half of page 2 of his report be accepted. The vote in favor of the revised report was unanimous [see p. 7 for summary of report].

9. Reports of Working Groups. Written detailed reports were presented by most Working Groups [the summaries appear on p. 10–12].

Data and Information. Clark (Chairman) summarized the report and called attention to the workshop to be held the next day. He recommended that the new Council appoint Barry (Chairman) and Heginbottom (Secretary). Barry thanked Brown for his assistance in preparation of the permafrost bibliography that will be distributed to conference participants. The report was accepted.

Foundations. The report was presented orally by Flaate in the absence of the Chairman (Academician Melnikov), who had been reported to be in ill health. Flaate thanked the Chairman for coordinating the two previous workshops (at Yamal and Norilsk, Russia). Flaate raised the question of whether the Working Group should continue and, after discussion with others, said he would make suggestions to the new Council. Phukan emphasized the importance of engineering in IPA activities. The report was received.

Mountain Permafrost. Haeberli (Chairman) presented a thorough report. Kamensky recommended that another Russian be added to the group; Haeberli agreed. The report was accepted unanimously (moved by Haeberli; seconded by Åkerman).

Periglacial Environments. Lautridou (Chairman) presented a written report and added that there would be a symposium on monitoring (processes) to be organized by Hallet and held in San Francisco, California, USA, in 1995. The report was accepted unanimously (moved by Lautridou; seconded by Dramis).

Global Change and Permafrost. Koster (Chairman) presented the report and, although he did not recommend continuation of the Working Group, expressed the hope that the work would continue in one form or another. He drew attention to the special issue of *Permafrost and Periglacial Processes* and the draft annotated bibliography on permafrost and global change sponsored by the Working Group. The report was accepted unanimously (moved by Koster; seconded by Lautridou).

Seasonal Freezing and Thawing of Permafrost Areas. Phukan (Chairman) presented a brief report and spoke about the recent international symposium on Frost in Geotechnical Engineering held in Anchorage, Alaska, cosponsored by the Working Group [see report, p. 19]. The report was accepted unanimously (moved by Phukan; seconded by Flaate).

Terminology. Van Everdingen (Chairman) presented a detailed report. He stated that Polish was being added to "terminology" and that a Russian–English dictionary is in preparation. The report was accepted unanimously (moved by van Everdingen; seconded by French).

10. International Affiliations. President Péwé reviewed the relationship between IPA and IUGS (International Union of Geological Sciences) and stated that IUGS was appreciative of our reports. Brown reviewed the status and activities of IASC (International Arctic Science Committee) and urged IPA to cooperate with IASC.

11. News Bulletin. Brown, editor of *Frozen Ground*, stated that the next issue, December 1993, would contain reports presented to the Council. He repeated his past requests for suitable publishable material such as reports from member countries and Working Groups, and permafrost-related cover photos, etc. President Péwé thanked Brown for his tireless efforts to produce two issues of *Frozen Ground* each year, and he also expressed IPA's appreciation of the help provided by CRREL (the Cold Regions Research and Engineering Laboratory).

12. Seventh Permafrost Conference. At the seventh IPA Council meeting, held in Washington, DC, in August 1992, French (Chairman CNC/IPA) stated that Canada was inviting IPA to hold its seventh Conference in Yellowknife, NWT, Canada, in 1998. He reviewed the events leading to Canada's invitation and spoke briefly on the Conference itself. The invitation was accepted unanimously (moved by French; seconded by Haeberli).

13. Next Meetings. A reminder was given of the next meetings of the new Executive Committee and Council during the Beijing Conference.

14. Adjournment. There being no other business, the meeting was adjourned.

Ninth Council Meeting

The ninth IPA Council meeting was held in Beijing, China, on 8 July 1993, from 1930 to 2200. Present were:

Executive Committee

President	Cheng Guodong, China
Vice President	Hugh French, Canada
Vice President	Nikolai Romanovskii, Russia
Secretary General	Jerry Brown, USA

Council Members

Argentina: absent (proxy provided)
Belgium: Albert Pissart
Canada: Alan Heginbottom
China: Zhu Yuanlin
Denmark/Greenland: Thorkild Thomsen (for Henrik Mai)
Finland: absent
France: Jaime Aguirre-Puente, Jean Pierre Lautridou
Germany: Lorenz King, Elisabeth Schmitt
Italy: Francesco Dramis
Japan: Satoshi Akagawa (for Masami Fukuda)
Netherlands: Eduard Koster
Norway: Kaare Flaate
Poland: Stanislaw Uziak (for Alfred Jahn)
Russia: Rostislav Kamensky
Southern Africa: Kevin Hall
Spain: absent
Sweden: Jonas Åkerman
Switzerland: Wilfried Haeberli
United Kingdom: Charles Harris
United States: William Lovell, Bernard Hallet

Observers

Roger Barry, USA, Chair, WG Data and Information
Max Brewer, USA, US Geological Survey
Oscar Ferrians, USA, Chair, Finance Committee
David Gilichinsky, Russia, Chair, WG Cryosols
Aldar Gorbunov, Kazakhstan
Stanislav Grechishchev, Russia, Member, Advisory Committee on Working Groups
George Gryc, USA, CircumPacific Mapping Project
Antoni Lewkowicz, Canada, Chair, WG Periglacial Processes and Environments
Evgeny Melnikov, Russia, IPA Liaison, IUGS WG Geo-indicators
Frederick Nelson, USA, Chair, WG Global Change and Permafrost
Thomas Osterkamp, USA, Member, WG Global Change and Permafrost
Troy Péwé, USA, Past President, IPA
Chien-Lu Ping, USA, Secretary, WG Cryosols
Arvind Phukan, USA, Chair, WG Seasonal Freezing and Thawing of Permafrost Areas
Petru Urdea, Romania
James Rooney, USA, Chair, WG Foundations
Robert van Everdingen, Canada, Chair, WG Terminology
Jesse Walker, USA, IPA Liaison, International Association of Geomorphologists

1. Welcome. The meeting was called to order by President Cheng Guodong. Members and visitors introduced themselves.

2. Approval of Agenda. The draft agenda was reviewed and revised. The Working Group on Periglacial Processes and Environments had been inadvertently left off the list of Working Groups. A presentation on the Seventh International Conference on Permafrost was added to the agenda. The agenda as modified was approved. It was explained that normally the post-Conference Council meeting follows the closing session of the Conference. However, due to scheduling problems on 9 July, the Chinese Organizing Committee requested the Council reschedule its meeting for the evening of 8 July.

3. Status of Previous Minutes. The Secretary General explained that draft minutes of the 5 July 1993 Council meeting were not yet available and that the draft minutes would be circulated in September following Mackay's return from the field.

4. Old Business. Reports and membership of Standing Committees and Working Groups were discussed and approved as follows [see separate news item on p. 10–12 for approved plans and membership of Working Groups].

Advisory Committee on Working Groups. Lovell (Chair) reviewed the Guidelines for Working Groups and proposed the following membership: Lovell (USA, Chair), Haeberli (Switzerland) and Grechishchev (Russia). The report was accepted unanimously (moved by Hallet; seconded by King).

Finance Committee. French (Chair) proposed the following membership: Ferrians (USA, Chair), Pissart (Belgium) and Zhu Yuanlin (China). The report was approved (moved by French; seconded by Lovell; 16 for, 1 abstention).

Editorial Committee. Brown (Chair) proposed the following membership: Schmitt (Germany, Chair), Grave (Russia), Heginbottom (Canada), Xu Xiaozu (China), Hall (Southern Africa). The report was approved (moved by Brown; seconded by Koster; 15 for, 2 abstentions). King (Germany) agreed to retain responsibility as European reporter for *Frozen Ground.*

Mountain Permafrost. Haeberli (Chair) proposed continuation of the WG for the next five years and present-

ed the proposed membership. The report was approved (moved by Haeberli; seconded by Hallet; 16 for, 1 abstention).

Data and Information. On behalf of Clark (Chair), Barry (Secretary) proposed continuation of the WG for the next five years and presented the proposed membership. The report was approved unanimously (moved by Lovell; seconded by Hallet).

Terminology. Van Everdingen (Chair) proposed continuation of the WG for the next five years and presented the proposed membership. The Council reconfirmed its approval to allow this WG to exceed the membership limit of six, since these activities require additional national commitments. The report was approved unanimously (moved by Lovell; seconded by Heginbottom).

Periglacial Processes and Environments. Lautridou (Chair) proposed continuation of the WG for the next five years and continued liaison with the IGU Commission on Frost Action Environments. However, instead of the two groups having the same Chair, it was proposed that they have different Chairs, but the same Secretary. The IPA WG name would be changed to reflect both current and past active layer processes and be called "Periglacial Processes and Environments." The report was approved unanimously (moved by Lautridou; seconded by Koster).

Cryosols. Gilichinsky (Chair) briefly reviewed the history and purpose of this new WG and proposed to work closely with other WGs, particularly Data and Information, Terminology, and Global Change and Permafrost. Membership was approved for five years at the 5 July 1993 Council meeting. The report was approved unanimously (moved by French; seconded by Haeberli).

Foundations. Flaate (Secretary) proposed continuation of the WG for the next five years, reported on a series of discussions that took place during the Conference and which will continue on 9 July, and presented the proposed membership. The Secretary agreed to circulate a document on future activities and procedures. The possibility of developing several subgroups within this WG was mentioned, and Lovell indicated this was a good principle, subject to future approval by the Executive Committee. The report was approved unanimously (moved by Flaate; seconded by Lovell).

Seasonal Freezing and Thawing of Permafrost Areas. Phukan (Chair) proposed continuation of the WG for the next five years, proposed the new membership, and reported on the June 1993 symposium on "Frost in Geotechnical Engineering." The report was approved unanimously (moved by Lovell; seconded by C. Harris).

Global Change and Permafrost. Koster (Chair) summarized the status of activities and suggested changes in future directions. The work of the present membership is completed and new membership and direction are proposed. The assessment of human-induced impacts on permafrost-dominated ecosystems should be considered, and closer interactions should be pursued with IGBP core projects and IPCC. The new Chair, Nelson, will provide a list of final membership to the Executive Committee. The report was approved unanimously (moved by French; seconded by Dramis).

5. New Business

5.1 Liaison with Other Organizations. A list of international organizations with possible interests in IPA was circulated. The Council assigned individuals to represent the IPA and to report back on activities of interest to IPA [see list, p. 8]. In response to Dr. Berger's letter of invitation, Romanovskii nominated E.S. Melnikov to be the official IPA representative to the Coenvironment Working Group on Geo-indicators.

Barry reviewed the structure of the World Data Centers for Glaciology (which do not currently include permafrost and ground ice) and suggested that Russian permafrost specialists seek to identify or establish a subcenter for permafrost and ground ice data in WDC-B. The motion was approved (moved by Lovell; seconded by Pissart; 15 for, 2 abstentions). Barry will send Romanovskii the current Guides to WDCs.

5.2 Budget. French reviewed the budget. At the current rates, the annual income from dues is anticipated to be between $8,000 and $10,000. Of this, $5000 per year could be allocated for WG activities. Guidelines on how WGs could apply for such funds are needed. French will prepare guidelines in consultation with others while in China. [The guidelines are summarized on p. 10.]

5.3 Scheduling. A blank calendar for the next five years was circulated and WG Chairs asked to indicate tentative dates for meetings and deadlines. [A compilation of proposed IPA meetings is found on p. 9.]

5.4 Next Council and Executive Meetings. The Council will plan to meet during INQUA in Berlin in summer 1995 and again in Canada in 1997. The Council will meet at the VII ICOP in Canada in 1998. The Executive Committee will attempt to meet annually, and at a minimum will meet in Berlin and again in December 1995 during the AGU Frozen Ground Workshop. All members of the Executive Committee

will soon be on electronic mail, thus facilitating the conduct of routine business.

6. Seventh International Conference on Permafrost. Heginbottom (Secretary, CNC/IPA) summarized plans for the VII ICOP to be held during the week of 27–31 July 1998, in Yellowknife, Northwest Territories, Canada. Several field trips are proposed to view ground ice conditions in the Mackenzie valley, on the CANOL highway, and possibly in northern Quebec. The Canadian National Committee for IPA meets on 30 September 1993 to develop plans for organizing the Conference [see Canadian report, p. 13].

7. Other Business. A draft resolution addressing the issue of permafrost and global change was distributed and comments solicited. The resolution follows Council discussions and the recommendation by the WG on Global Change and Permafrost that IPA become more involved in international global change activities. Haeberli requested that high altitude permafrost be included in the statement. Heginbottom suggested the resolution be mentioned at the closing session on 9 July. French moved the revised draft be approved and it was approved unanimously [see p. 8].

Heginbottom suggested the IPA accounts be audited as a procedural matter. Following discussion, it was agreed that the new Chair of the Finance Committee would undertake a review of IPA financial matters.

Haeberli indicated that plans for the VIII ICOP in Europe (2003) were being discussed among the European members. The emphasis would be on Quaternary and mountain processes. Since the European permafrost communities are relatively small, it will be desirable to define each country's responsibilities for the Conference. The new Council repeated its support for holding the VIII ICOP in Europe and encouraged the potential organizers to develop their plans.

8. Statements of Appreciation. On behalf of the IPA, French thanked members and officers of the previous Council for their hard work and accomplishments. Past-President Péwé was invited to make a final statement in which he also expressed appreciation to the Council for its support and gave special recognition to the Chinese Organizing Committee for its work over the past five years in organizing the VI ICOP. Furthermore, a special debt of gratitude is owed to Cheng Guodong for his leadership in organizing the Conference. The Council joined Péwé in thanking Cheng Guodong for the efforts of the Chinese in organizing and sponsoring this successful Conference.

9. Adjournment. The meeting adjourned at about 2200.

Finance Committee Report. The previous report of the Finance Committee was presented to the IPA Council at its last meeting in Washington, DC, in August 1992. As of 30 April 1993, the IPA bank balance was $11,347.70 (Canadian). At the previous Council meeting in Washington, the balance was $16,410.14.

There are a number of encumbrances against the account. The expenses of executive members with regard to the VI ICOP may exceed $5500 (Canadian). An additional $3500 has been budgeted for travel of Working Group Chairs, although all this may not be used. Thus, in 1993 the IPA has no significant reserves in hand and must rely largely upon annual dues over the coming years to replenish its account.

An additional complexity is that the financial support of the IPA Secretariat (J.R. Mackay, Vancouver) by the National Research Council of Canada has now ceased. Since 1984, this has varied between $4000 and $8000 (Canadian) annually. The position of the NRCC is that Canada had a special interest as a founding member to help in the start-up of the IPA, but that the time has now come for IPA to manage with its own resources.

The major source of revenue for IPA is dues. A revised dues structure, put in place following the Quebec City, Canada, Council meeting in 1990, had the aim of making the IPA self-funding by 1993. This has met with only partial success. For example, from 1988–1992, of the "Big Four" (Canada, USA, China, Soviet Union/Russia), only Canada was paying regularly with 12 units ($3000 US). The result has been that there are insufficient funds to support major initiatives. In addition, the costs associated with *Frozen Ground* continue to be provided from within the US permafrost community.

To reflect economic realities, it was agreed at the Washington, DC, Council meeting in 1992 that, unofficially, the dues structure be revised such that Canada and the US would pay with 8 units, and that dues for Russia and China be reduced to appropriate levels on a temporary basis. As of 1 May 1993, 1993 dues have been received as follows:

Finland	($250 US)	UK	($500 US)
Norway	($250 US)	Canada	($2000 US)
Japan	($250 US)	USA	($500 US)
Germany	($500 US)		

Thus, cash-in-hand from dues is $4250 US (approximately $5000 Canadian) to give a running balance of approximately $7000. [Based on report submitted by H.M. French.]

RESOLUTION: GLOBAL CHANGE AND PERMAFROST

Approved 8 July 1993 at the IPA Council Meeting, Beijing, China

WHEREAS the importance of permafrost is reflected in both international governmental and non-governmental reports and science plans (Intergovernmental Panel on Climate Change (IPCC); IGBP core projects: International Global Atmospheric Chemistry Project (IGAC); Land–Ocean Interactions in the Coastal Zone Project (LOICZ); Biospheric Aspects of the Hydrological Cycle Project (BAHC); and Global Change and Terrestrial Ecosystems Project (GCTE));

WHEREAS the distribution and properties of permafrost are of increasing interest to those concerned with assessing the influence of global climate change on high latitudes and high altitudes;

WHEREAS permafrost is sensitive to climate and contains a memory of past climate changes;

WHEREAS the IPA is concerned with the advancement of knowledge on the formation and degradation of permafrost at regional and global scales;

Be it RESOLVED that the IPA, consisting of 20 adhering national bodies, representing many earth science and engineering disciplines, seek a more active role in the IGBP core projects by communicating IPA interests and activities to relevant IGBP programs, IPCC assessments, and other programs;

FURTHERMORE the IPA notify other national and international scientific and engineering organizations of its present working groups' plans and activities including the availability in early 1994 of the IPA 1:10,000,000 map of permafrost and ground ice of the Northern Hemisphere;

Finally, be it RESOLVED that relevant IPA working groups give particular attention to global climate change and prepare status and trend reports for the Seventh International Conference on Permafrost, to be held in Canada in August 1998.

Proposed IPA Liaisons with other International Organizations

The following nominations were approved at the IPA Council meeting, 8 July 1993, Beijing, China.

International Union of Geological Sciences (IUGS)
- International Geological Correlation Programme IGCP/UNESCO Project 297: Geocryology of the Americas; Arturo Corte, Argentina
- INQUA Commission on Global Continental Paleohydrology (GLOCOPH); Mike Clark, UK
- Coenvironment Working Group on Geo-indicators, UNESCO Program on Earth Processes in Global Change; Evgeny Melnikov, Russia

International Association of Hydrological Sciences (IAHS), International Commission on Snow and Ice / Division of Ice as a Material (ICSI); Wilfried Haeberli, Switzerland, IPA WG Mountain Permafrost

International Geographical Union (IGU), Commission on Frost Action Environments; Jean Pierre Lautridou, France, IPA WG Periglacial Processes and Environments

International Society for Soil Mechanics and Foundation Engineering (ISSMFE); Arvind Phukan, USA, IPA WG Seasonal Freezing and Thawing

International Society of Soil Science; Charles Tarnocai, Canada, IPA WG Cryosols

International Association of Geomorphologists; Jesse Walker, USA

International Symposium on Ground Freezing; Masami Fukuda, Japan, IPA WG Seasonal Freezing and Thawing

International Road Federation; David Esch, USA

International Arctic Science Committee (IASC); Hugh French, Canada, IPA Vice President

WMO/UNEP—Intergovernmental Panel on Climate Change (IPCC); Jerry Brown, USA, IPA Secretary General

Polar Libraries Colloquy; Alan Heginbottom, Canada, IPA Editorial Committee

Northern Sciences Network/Man and the Biosphere (NSN/MAB) and International Tundra Experiment (ITEX), Danish Polar Center; Jerry Brown, IPA Secretary General

World Data Centers for Glaciology; Roger Barry, IPA WG Data and Information

World Glacier Monitoring Service (WGMS); Wilfried Haeberli, Switzerland, IPA WG Mountain Permafrost

International Glaciological Society; Bernard Hallet, USA, IPA WG Periglacial Processes and Environments

UNESCO Northern Research Basins; Thorkild Thomsen, Denmark

Scientific Committee for Antarctic Research (SCAR); Kevin Hall, Southern Africa
International Institute of Refrigeration; Jaime Aguirre-Puente, France
International Geosphere Biosphere Program Core Programs (IGBP); to be named:
- International Global Atmospheric Chemistry Project (IGAC)
- Land–Ocean Interactions in the Coastal Zone Project (LOICZ)
- Biospheric Aspects of the Hydrological Cycle Project (BAHC)
- Global Change and Terrestrial Ecosystems Project (GCTE)
- Past Global Changes (PAGES) Project

Provisional Schedule of Major IPA Meetings and Activities (1994–1998)

A number of meetings are planned and under discussion by the Working Groups. In order to avoid overlaps and competition among Working Groups, a calendar of meetings is maintained. Working Groups are encouraged by the IPA Council and Executive Committee to schedule meetings with other professional organizations in order to increase interactions and economize on travel costs. The following is a provisional list of meetings for the period 1994–1998. All Working Groups and Committees will meet at the Seventh International Conference on Permafrost in August 1998 in Canada, and report there on recent accomplishments.

IPA Council
- August 1995: Berlin, Germany (INQUA)
- 1997: Canada (provisional)
- July 1998: Yellowknife, Canada (VII ICOP)

IPA Executive Committee
- Summer 1995: Berlin, Germany (INQUA)
- December 1995: San Francisco, USA (AGU Frozen Ground Workshop)
- 1997: Canada (provisional)
- August 1998: Yellowknife, Canada (VII ICOP)

Mountain Permafrost
- December 1995: San Francisco, USA (AGU Frozen Ground Workshop)
- 1997: Seminar on compilation of modeling and mapping experiments

Terminology
- June 1994: Utrecht, Netherlands

Global Change and Permafrost
- December 1995: San Francisco, USA (AGU Frozen Ground Workshop)
- Workshops to be scheduled

Data and Information
- 3–8 July 1994: Cambridge, UK (Polar Libraries Colloquy)
- 1994: European Data Workshop

Periglacial Processes and Environments
- 4–9 September 1994: Reims, France (Symposium and Field Trip on Periglacial Slope Processes)
- December 1995: San Francisco, USA (AGU Frozen Ground Workshop)
- July 1996: Ellesmere Island field trip

Cryosols
- 26 July–8 August 1994: Kolyma field trip
- 13–18 November 1994: Seattle, Washington, Cryosol Symposium at the Annual Meeting, Agronomy Society of America
- 1994: Mexico City, Mexico (ISSS)
- 1996: Syktyvkar, Russia (Second International Conference on Cryopedology)

Foundations
- No specific dates

Seasonal Freezing and Thawing
- March 1997: Luleä, Sweden (Symposium on Frost in Geotechnical Engineering)

Other directly related meetings
- 7–9 March 1994: Edmonton, Canada (7th Cold Regions Specialty Conference)
- 5–9 September 1994: Magadan, Russia, International Conference on Arctic Margins: Sessions on Engineering Geology and Permafrost Mapping
- 24–28 October 1994: France (7th International Symposium on Ground Freezing)
- August 1995: Berlin, Germany (INQUA)
- August 1996: Fairbanks, Alaska (8th Cold Regions Specialty Conference)
- 1997: Italy, 4th International Conference IAG/AIG

REPORTS OF WORKING GROUPS

Activities and Significance of Working Groups

Activities of the IPA Working Groups for the next five years were approved by the IPA Council at its meeting on 8 July 1993 in Beijing. Working Groups are expected to report on progress at Council meetings and regularly in *Frozen Ground*. Working Group membership is limited to a Chair, a Secretary, and six full members; exceptions to this limit are made by the Council. Ex-Officio members of the IPA Executive Committee and Working Group Chairs may be represented on other Working Groups. There may be an unlimited number of corresponding members on Working Groups, and interested individuals need simply apply to the Working Group Chair.

The IPA Council agreed to make available at least $5000 per year of its annual income to support activities of Working Groups. Disbursement of these IPA-derived funds will be based on letter proposals submitted annually by the Working Group Chairs, and can cover costs of travel to and attendance at meetings, office expenses, preparation and publication of reports, manuals and other documentation, or other Working Group activities. Proposals are encouraged that demonstrate cooperation with other IPA and international activities and have prospects for additional sources of independent funding. The proposals will be reviewed by members of the Executive Committee in consultation with Working Group members and IPA participants.

The following reports outline the purpose, proposed activities, anticipated results and advances, and membership of each Working Group for the period 1993–1998.

Data and Information

Purpose: to improve and standardize the collection, archiving, documentation and dissemination of permafrost and ground ice data.

Activities over the next five years include a proposed workshop on data prioritization in 1994, continued efforts to assemble and publish permafrost and ground ice data under the auspices of WDC-A (Boulder), development of a carto-bibliographic data base, preparation of regional bibliographies, and revisions to existing permafrost bibliographies. The Working Group will collaborate with the WGs on Terminology and Global Change and Permafrost, and other national and international committees and agencies concerned with data retrieval, storage and dissemination. In the United States, this includes close cooperation with the Arctic Environmental Data Directory (AEDD).

These activities are expected to make a significant contribution to global change researchers and modelers as national and international data sets are organized and made available for assessment, model validation, and other uses. A paper by Barry and Brennan in the Proceedings of the Sixth Permafrost Conference summarizes the status of the current data and bibliographic activities and the contributions the National Snow and Ice Data Center in Boulder is making to the permafrost communities.

Members: R.G. Barry, Chair (USA); J.A. Heginbottom, Secretary (Canada); J. Åkerman (Sweden); M.J. Clark (United Kingdom); Zhang Xian-Chen (China); E.S. Melnikov (Russia). Ex-Officio: F.E. Nelson, WG Global Change and Permafrost; R.O. van Everdingen, WG Terminology.

Terminology

Purpose: to develop a set of internationally accepted permafrost terms for engineering and scientific use, with language equivalents.

Over the next five years the WG plans to complete development of the multi-language (eight) glossary with the addition of definitions, complete the English–Russian dictionary of over 2000 terms, and incorporate the new Chinese–Russian–English glossary into a unified glossary. The Working Group will disseminate and encourage use of such terminology.

These activities, particularly as applied to the Russian language, serve all scientific, engineering and communication disciplines and will reduce terminological confusion in both spoken and written communications.

Members: R.O. van Everdingen, Chair (Canada); V. Konishchev, Secretary (Russia); J. Åkerman (Sweden); A. Corte (Argentina); F. Dramis (Italy); O.J. Ferrians, Jr. (USA); J. Karte (Germany); O. Gregersen (Norway); J.P. Lautridou (France); Qiu Guoqing (China). Ex-Officio: N.N. Romanovskii, IPA Executive Committee.

Global Change and Permafrost

Purpose: to identify the effects of global changes in temperature and related phenomena upon the nature of permafrost and its distribution.

An annotated bibliography of permafrost and climate change was prepared and will be published in *Glaciological Data.* A special issue of *Permafrost and Periglacial Processes* containing papers on permafrost and global change was published and distributed at the Beijing conference in July 1993. Activities over the next five years include preparation of an inventory of existing and planned ground temperature sites, standardization of data collection and archiving in cooperation with the WG on Data and Information, more direct involvement with global modeling activities, and convening of workshops on related problems. The Working Group is encouraged to interact with other national and international project groups concerned with global change (e.g. IGBP core projects, IPCC).

The results of these activities will provide the basis for the earth sciences and engineering disciplines to further develop and validate more precise understanding of climate–permafrost interactions and resulting consequences of environmental degradation and restoration. This includes utilizing and revising the new IPA permafrost and ground ice map of the Northern Hemisphere for regional and global scenarios.

Members: F.E. Nelson, Chair (USA); A.E. Taylor, Secretary (Canada); O.A. Anisimov (Russia); M.K. Gavrilova (Russia); T.E. Osterkamp (USA). Ex-Officio: Cheng Guodong, IPA Executive Committee; R.G. Barry, WG Data and Information; W. Haeberli, WG Mountain Permafrost; additional members to be added.

Mountain Permafrost

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

Activities of the WG over the next five years will: 1) promote application of computer models to predict permafrost occurrence; 2) organize comparisons of results from modeling and field mapping; 3) coordinate strategies and plans for long-term monitoring with regard to ongoing and potential future warming trends; 4) encourage investigations of energy exchange processes in the active layer; and 5) improve understanding of permafrost creep and rock-glacier formation in high mountainous areas.

Results of these activities will serve to advance both theoretical and methodological advances in mountain geomorphology and climate–permafrost dynamics, and assist in foundation design in mountainous areas undergoing human development.

Members: W. Haeberli, Chair (Switzerland); F. Dramis, Secretary (Italy); S. Harris (Canada); A. Gorbunov (Kazakhstan); M.M. Koreisha (Russia). Ex-Officio: Cheng Guodong, IPA Executive Committee.

Periglacial Processes and Environments

Purpose: 1) to investigate the frequency and magnitude of periglacial processes, especially those occurring within the active layer, 2) to evaluate different methodologies and techniques for process measurements, and 3) to predict the effects of potential climate change on periglacial environments using contemporary data and the stratigraphic record.

Over the next five years the WG will conduct several working meetings and field trips, and prepare a handbook on recommended techniques for investigating periglacial processes. An AGU special session and related workshop are being planned for the December 1995 meetings in San Francisco under the title "Monitoring Frozen Ground: Implications for Studies of Periglacial Processes, Climate Change, and Engineering Structures." The WG operates jointly with the IGU Commission on Frost Action Environments and issues a joint news circular.

Activities of this Working Group focus on field and laboratory processes under past- and present-day climate regimes, and thus provide the quantitative understanding and data to assess future changes. Results are applicable to essentially all surficial earth and environmental sciences concerned with cold regions.

Members: A.G. Lewkowicz, Chair (Canada); C. Harris, Secretary (United Kingdom); J. Åkerman (Sweden); Cui Zhijiu (China); B. Hallet (USA); A. Pissart (Belgium); V. Solomatin (Russia); J. Vandenberghe (The Netherlands). Ex Officio: J.P. Lautridou (France), IGU Commission on Frost Action Environments.

Cryosols

Purpose: to develop and maintain close working relations between soil and permafrost scientists throughout the bipolar regions, and to develop projects to correlate and/or consolidate the vast amounts of information, maps, and data on soils that are of interest to IPA.

Activities over the next five years include characterization of soil climates; mapping of the relationship of permafrost and cryosol distribution and organization of an international field excursion for soil correlation to the Kolyma region, Russia, in summer 1994; representing the IPA at the International Soil Science Society (ISSS) Subcommission on Frozen Soils, 1994; cosponsoring the Cryosol Symposium at the Annual Meeting of the American Society of Agronomy (November 1994) and organizing the Second International Conference on Cryopedology in Syktyvkar, Russia, in 1996. Coordination and liaison will be provided with the ISSS and other organizations having common interests.

The Working Group will initiate the integration of scientific studies of cold soils and permafrost and data collection, as well as bring together diverse nomenclature, classification and mapping schemes, particularly between and within the Russian, Canadian, and U.S. soils and permafrost communities.

Members: D. Gilichinsky, Chair (Russia); C.L. Ping, Secretary (USA); J. Bockheim (USA); G. Broll (Germany); Wang Haoqing (China); B. Jakobsen (Denmark); G. Mazhitova (Russia); C. Tarnocai (Canada). Ex-Officio: J. Brown, IPA Executive Committee.

Foundations

Purpose: to collect information on the practice of foundation engineering in various permafrost regions of the world and to synthesize guidelines for effective engineering practice.

Activities over the next five years include preparing concise state-of-the-art reports on such topics as pile foundations and foundation research and conducting seminars and workshops on related topics, including a special seminar on foundation failures. The WG encourages monitoring and reporting on the performance of foundations in permafrost and works closely with the WG on Seasonal Freezing and Thawing and national and international engineering and geotechnical organizations and societies, including the Canadian Geotechnical Society and the American Society of Civil Engineers.

These activities and the ones proposed by the WG on Seasonal Freezing and Thawing of Permafrost Areas (below) provide the engineering communities with direct access to the many international permafrost endeavors, and in turn provide the many scientific disciplines with a better understanding of engineering applications in their field and laboratory investigations. This synergism will help advance both basic and applied permafrost research at national and international levels.

Members: J.W. Rooney, Chair (USA); K. Flaate, Secretary (Norway); R. M. Kamensky (Russia); L. Krustalev (Russia); P.J. Kurfurst (Canada); R.G. Tart, Jr. (USA); Zhu Yuanlin (China). Ex-Officio: A. Phukan, WG Seasonal Freezing and Thawing of Permafrost Areas.

Seasonal Freezing and Thawing of Permafrost Areas

Purpose: to improve the exchange of information on, describe the state of knowledge about, and stimulate research activities concerning frost action in soils and measures to protect against its harmful effects in permafrost areas.

The WG will assist in organizing the next symposium on Frost in Geotechnical Engineering in Lulea, Sweden, in March 1997. It will work closely on problems of common interest with the WG Foundations, other IPA WGs, and other national and international organizations, including: the International Society of Soil Mechanics and Foundation Engineering (ISSMFE) and its Technical Committee on Frost (TC 8); the American Society of Civil Engineers (ASCE) and its Technical Council on Cold Regions Engineering (TCCRE); the International Symposium for Ground Freezing; and the International Road Federation.

Members: A. Phukan, Chair (USA); B. Ladanyi, Secretary (Canada); M. Fukuda (Japan); H.L. Jessberger (Germany); S. Knutsson (Sweden); G.Z. Perlstein (Russia); K. Senneset (Norway); E. Slunga (Finland). Ex-Officio: J.W. Rooney, WG Foundations.

NEWS FROM MEMBER COUNTRIES

The following is based on reports or information provided at the 3 July 1993 Council meeting in Beijing, China. Some additional information has been added since that time.

Canada

Canada to Host 1998 International Permafrost Conference. As expected, Canada's invitation to the IPA to hold the Seventh International Conference on Permafrost in Yellowknife, NWT, Canada, in 1998 was accepted by the IPA Council. This decision was publicly announced at the closing ceremony of the Sixth International Conference in Beijing on 9 July. The invitation, from Pierre Peron, President of the National Research Council of Canada, was issued in January 1992, and had received unanimous acceptance in principle from the IPA Council at its meeting in Washington, DC, in August 1992. The invitation was accepted unanimously at the Council meeting of 5 July 1993. Support for the conference will come from the Geological Survey of Canada, the National Research Council of Canada, the Science Institute of the Northwest Territories, and the Cold Regions Division of the Canadian Geotechnical Society.

Canadian National Committee for the IPA. Natural Resources Canada (formerly Energy, Mines and Resources Canada), through the Geological Survey of Canada (GSC), has entered into a partnership with the National Research Council of Canada (NRCC) for the support of the Canadian National Committee for the International Permafrost Association (CNC/IPA). NRCC will continue to be responsible for paying the annual dues for Canada. GSC, which has supported the CNC/IPA secretariat since its inception in 1985, henceforth will also be responsible for the operating costs of the CNC/IPA.

The CNC/IPA held its annual meeting in Saskatoon, Saskatchewan, 30 September 1993, directly following the Canadian Geotechnical Conference. As may be expected, the main item of business was the development of a structure of committees and individuals to organize the 1998 International Conference on Permafrost. The first meeting of the National Organizing Committee is being planned for April 1994. Alan Heginbottom, of the Terrain Sciences Division, GSC, and secretary of the CNC/IPA, was appointed as Secretary General for the conference and chairman of the National Organizing Committee. The conference will be held during the week of 27–31 July 1998, with field trips before and/or after the formal sessions.

In other business, the committee elected Don Hayley to be the new Chairman, CNC/IPA, effective 1 January 1994; this appointment awaits ratification by the GSC. Mr. Hayley has been a member of the CNC since 1988. Before then, he served as Chairman of the Permafrost Subcommittee of the NRCC Associate Committee on Geotechnical Research, and was also the founding Chairman of the Cold Regions Geotechnology Division of the Geotechnical Society of Canada. He is vice-president of EBA Engineering Consultants Ltd., in Edmonton, and a geotechnical engineer who has been involved in cold regions engineering research and practice for over 20 years. He has worked in many areas of the Canadian Arctic and Subarctic, in the Beaufort Sea, Alaska, and, most recently, the Russian Arctic.

In addition, the Committee heard reports from 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 reports of progress were presented on IPA activities, particularly the Multilingual Glossary project of the Terminology Working Group, and the Circum-Arctic Permafrost Map project. Communications issues, both international and within Canada, were also discussed. The next meeting of the CNC/IPA will be held in association with the 47th Canadian Geotechnical Conference in Halifax, Nova Scotia, in September 1994.

Cold Regions Division, Canadian Geotechnical Society. The 46th Annual Meeting of the Canadian Geotechnical Society was held in Saskatoon, 27–29 September 1993. The Cold Regions Division sponsored a session on permafrost engineering, in which six papers were presented. The papers dealt with freeze–thaw treatment of oil sands tailings, creep of frozen soil, strength of silty permafrost, testing of frozen sand, and segregation potential. The 1993 *Roger J.E. Brown Award*, which was established in 1986 to honor the memory of the renowned Canadian permafrost scientist, was awarded to Branko Ladanyi, Département de génie civile, École Polytechnique, Université de Montréal, for "services to permafrost studies in Canada." Don Hayley was also given a special award for "service to the Geotechnical Society," in recognition of his initiative and efforts in founding the Cold Regions Division of the Society.

The 47th Canadian Geotechnical Conference, to be held in Halifax, Nova Scotia, 21–23 September 1994, will include a session on "Piles in Permafrost." The conference will also include regular sessions for submitted papers. Abstracts of 500 words or fewer should be submitted by 30 November 1993 (see calendar).

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

China

The main activities taking place in China were obviously the organization and conduct of the Sixth International Conference on Permafrost. Approximately 300 people from 22 countries participated in the Conference. Details of the Conference are contained elsewhere in this issue. The post-Conference volume of the proceedings is nearing completion and will be sent to all participants in early 1994. Copies of both volumes of the proceedings are available from the Lanzhou Institute of Glaciology and Geocryology. Two issues of the *Journal of Glaciology and Geocryology* contain special collections of Chinese papers accepted for the Conference (see p. 23).

The Chinese Organizing Committee thanked foreign participants for attending the Conference and excursions and hoped they enjoyed the meeting and visits.

Denmark/Greenland

The Adhering Body is the Danish Society of Arctic Technology and its sister organization, the Greenland Technological Society. The Adhering Body acts as a source of information concerning International Permafrost Association activities for Danish and Greenlandic members of the societies. The societies' membership includes about 300 individuals and 40 companies and institutions. Within this framework the societies organize meetings and establish links with other organizations and companies concerned with cold climate regions. Besides the societies' initiatives in both countries, with meetings and the like, work is also carried out in consulting engineering companies, universities, and governmental institutions.

In January 1993 a group of consulting engineering companies in Denmark and Sweden prepared the first draft of a book entitled *Permafrost Studies for Hydro-Power*. The work, sponsored by the Nordic Industrial Foundation, covers the relationship of permafrost to: 1) hydraulic structures in general, 2) lakes, and 3) dams and embankments.

Long-term temperature data for rock in Greenland are still being collected at some stations. The data are kept in the Greenland Home Rule hydrological/climatological database, where considerable time series are now available. From this database and synoptic temperature data from Denmark's Meteorological Institute a new map has been drawn of discontinuous and continuous permafrost distribution in Greenland. The map was shown at the poster session at the Beijing Conference, together with a display copy of the first draft of the book *Permafrost Studies for Hydro-Power*.

Submitted by Thorkild Thomsen

Germany

Many scientists of the German Permafrost Community are still absorbed in evaluation of the data from the German Geoscientific Spitzbergen Expeditions that took place between 1990 and 1992 with more than 45 participants. Two preliminary volumes containing results appeared in 1992 (Stuttgart) and 1993 (Basel). Several papers with detailed results and large-scale color maps have been finished recently and are being prepared for printing in spring 1994 in a volume of *Zeitschrift für Geomorphologie (Supplementband)*.

German permafrost studies are continuing mainly in the Alps (Germany, Switzerland) and in the Andes (Argentina). In addition, several German permafrost scientists have been active at international conferences and seminars, and some joined the post-conference excursions to the Qinghai–Tibet Plateau and to Urumqi–Xinjiang. At the "Joint Russian–American Seminar on Cryopedology and Global Change" in Pushchino in November 1992, several German papers presented results of microbiological, geochemical, pedological and paleopedological studies in Siberia and Antarctica. At the Sixth International Permafrost Conference in Beijing, German contributions mainly presented results of the Svalbard expeditions.

On the engineering side, and with respect to seasonal frost effects, German research is related to the frost susceptibility of mineral sealing layers for landfill lining systems. This problem is only relevant during the construction period. The 5th International Symposium on Ground Freezing will be held in Nancy, France, in October 1994. For further information please contact Prof. Michel Frémond, Chef du Service, Laboratoire Central des Ponts et Chaussées, Scé. de Mathématiques, 58, Blvd. Lefèvre, 75732 Paris, Cedex 15, France.

Prepared by Lorenz King
and H.J.L. Jessberger

Italy

The Italian Adhering Body of the International Permafrost Association is completing an inventory of rock glaciers both in the Alps and in the north central Apennines. The results of these studies are also an Italian contribution to the IPA permafrost map of the Northern Hemisphere. Large-scale geomorphological mapping is in progress in selected mountain areas (central and western Alps and Apennines) which have proved to be affected by permafrost. Very detailed studies have also been carried out for more than 40 rock glaciers, including ^{14}C datings, BTS measurements, geoelectrical soundings and remote sensing.

Research continued at two stations installed in the Valtellina area (central Alps) some five years ago to monitor creep phenomena in rock glaciers. A new research station has been established on an active rock glacier in the upper Valtellina catchment. In this area, located at about 2700 m a.s.l., meteorological instruments and more than 15 thermistors measuring ground temperature at different depths have been installed.

Research on permafrost and periglacial geomorphology is also in progress for the area surrounding the Italian research station in Antarctica (Terra Victoria). Finally, the ultimate Italian version of the permafrost glossary has been submitted to the IPA Working Group on Terminology for inclusion in the multilingual glossary.

Prepared by Francesco Dramis

Netherlands

Within the framework of regular Quaternary geological mapping and investigations the study of periglacial (and permafrost-related) phenomena in Weichselian sediments continues. These studies are pursued in particular by the Institute of Earth Sciences of the Free University (Amsterdam) and to some extent by the Geological Survey of The Netherlands and the Departments of Physical Geography of the Universities of Utrecht and Amsterdam.

A recent topic of interest is "cryogenic microfabrics and macrostructures and their palaeoenvironmental significance" (see A.S. Huyzer, 1993, Free University of Amsterdam, Thesis, 245 p.).

A major activity in (sub)Arctic regions has been the Greenland Ice Margin Experiment (GIMEX). These studies are carried out in the Søndre Strømfjord area in western Greenland. This multidisciplinary programme is on:

- the mass balance of the (west) Greenland ice sheet and its sensitivity to climate change
- the meteorology of the ablation zone of the ice sheet and the adjacent tundra area
- the Holocene deglaciation history
- the palaeoecology of the tundra margin
- the sediment balance in the fjord region

The study of periglacial phenomena and permafrost temperature profiles forms an integral part of this research programme. In the summer of 1993 another expedition (about 15 participants) to the Søndre Strømfjord region will take place.

Prepared by Eduard A. Koster

Norway

Current activities in permafrost research relate to technical developments and are scaled to the size of the country and the actual problems. Some 30 people are involved to varying degrees.

Research on permafrost and periglacial processes takes place at the Polar Research Institute and in university departments. The level of activity is about the same as before and the work involves close cooperation with foreign colleagues. Construction activities at Svalbard have been reduced in recent years. Greater involvement of Norwegian-based oil companies is, however, foreseen for the Barents Sea region. It is important to be prepared for this development. As part of this, the Norwegian Institute of Technology is offering education and research opportunities in permafrost technology. This is made possible through close cooperation with Canadian and Russian colleagues.

Norway has terminated publication of the journal *Frost Action in Soils*. Membership in IPA has thus become even more important to us, and we appreciate the information we receive through IPA in general and *Frozen Ground* in particular.

Prepared by Kaare Flaate

Russia

The annual meeting of the Council on Cryology was held in Pushchino, near Moscow, 20–24 April 1993 at the Institute of Soil and Photosynthesis of the Russian Academy of Sciences. At the plenary session eight papers were presented:

- Development of the coastal area of the Arctic seas
- Thermoabrasion of Arctic shores and decomposition of gas hydrates
- Engineering–geocryological research in the central area of the Yamal Peninsula

- Formation of the tundra soil cover in northeast Russia
- Permafrost research in the Arctic territories to develop recommendations for survey and construction
- Changes in the rate of thermoabrasion and thermodenudation in the coastal area of the Laptev Sea
- Permafrost evolution and its monitoring by the contemporary global climate change
- The dynamics of frozen shores in the shoal coastal area of the East Siberian Sea
- International Circumpolar Permafrost Map (Russian part)

At the special sessions, about 70 papers on general and engineering geocryology (physics and chemistry of frozen soil, hydrology, linear construction, underground water, ecology, and environmental protection) were discussed.

An international seminar on "Protection of Construction Against Frost Heaving" was held in Chita, Siberia, 27–29 September 1993 at the Chita Department of the Permafrost Institute.

Prepared by Nikolai Grave

Southern Africa

The Adhering Body is small, but active. Work has been undertaken in the Antarctic, the Drakensberg Mountains, and the mountains of the Western Cape. The first meeting of the "Southern African Permafrost Group" (SAPG) was held in April 1993 at the University of the Western Cape, and a field session was held in the mountains of that area. A *Bibliography of Research on Periglacial Geomorphology in Southern Africa* was compiled by Jan Boelhouwers. Papers on related topics were presented at the International Permafrost Conference in Beijing, the International Association of Geomorphologists meeting in Hamilton, and the local SASQUA meeting in Kimberley. Cooperative work with colleagues in Caen, France, was initiated. An attempt is being made to interest the world community in the cryogenic questions of the Southern Hemisphere and to broaden the local membership of the SAPG, which includes: President: Kevin Hall (University of Natal); Secretary: Patricia Hanvey (University of Witwatersrand); President-Elect: Jan Boelhouwers (University of the Western Cape).

Prepared by Kevin Hall

Spain

At the Council meeting in 1993 in Beijing, China, the Spanish National Permafrost Committee became an official member of the International Permafrost Association. The committee currently consists of 28 scientists that are representative of Spanish research in the field of permafrost and geocryology. The members are from different universities and research institutes in Spain, e.g. Madrid, Barcelona, Zaragoza, Santander, Sevilla, La Laguna (Tenerife), Alcalá, Jaca Huesca. The committee elected Professor David Palacios, Universidad Computense, Madrid, as its chairman. The IPA Committee plans to meet in June 1994 to establish its organization and plans.

Committee members are conducting permafrost studies in several Spanish mountain ranges (Pyrenees, Cordillera Cantabrica, Sistema Central, Sierra Nevada and Teide Volcano). Some Spanish teams are also working abroad, e.g. in the Mexican stratovolcanoes, the South American Andes, and Antarctica.

Prepared by Lorenz King
Regional Reporter, Europe

Switzerland

On 25 November 1992 about 30 scientists and members of the Swiss Coordinating Group on Permafrost of the Swiss Academy of Sciences met at the Laboratory of Hydraulics, Hydrology and Glaciology (VAW) of the Swiss Federal Institute of Technology, Zurich (ETHZ). Short reports were given on current permafrost research in polar and alpine areas.

M. Hoelzle (VAW) summarized results of D.C. resistivity soundings carried out on rock glaciers and ice-cored moraines of northwest Svalbard in cooperation with the Geographical Institute of the University of Oslo. K. Dettwiler and N. Ritter from the Geographical Institute, University of Basel, gave an outline of ongoing climatological and geoecological permafrost investigations in Svalbard as part of the German/Norwegian/Swiss Liefdefjorden Expeditions 1990, 1991 and 1992. Concerning the Alps, O. Antonson (Paul Scherrer Institute, Villigen) discussed gas analyses on core samples from the Murtèl drilling, D. Vonder Mühll (VAW) described gravimetric measurements on the Murtèl rock glacier, and W. Haeberli (VAW) presented time series of borehole temperatures from the same place.

Borehole deformation measurements in the permafrost of Pontresina-Schafberg were analyzed by S. Wagner (VAW), and F. Keller (VAW) illustrated snow–permafrost interactions from extensive field experiments in the Upper Engadin. The distribution pattern of permafrost in selected areas of the Western Alps is being investigated by a research group of the Geographical Institute of the University of Lausanne

(P. Schoeneich). Attempts are being made to numerically model the influence of Ice Age glaciers and permafrost on ground temperatures and groundwater conditions in the Swiss Plateau (C. Speck, VAW). Hazards from debris flows starting in steeply inclined permafrost terrain above Randa, Valais, are being dealt with by M. Zimmermann (Geo 7, Bern).

Preliminary pollen analysis by botanists from the University of Basel of organic matter found in the uppermost part of the Murtèl permafrost core appears to confirm that the ground ice within the active rock glacier indeed dates from the earlier part of the Holocene, as estimated earlier on the basis of thermal and flow considerations. Permafrost in starting zones of snow avalanches and corresponding problems relating to avalanche protection are being investigated by VAW and the Swiss Federal Institute for Snow and Avalanche Research, Weissfluhjoch/Davos, in cooperation with federal and cantonal authorities. Attempts continue to build a network for monitoring the long-term evolution of permafrost in the Swiss Alps. Warming of Alpine permafrost since the late 1980s is observed in the Murtèl borehole and appears to have accelerated by a factor of about 5 to 10 as compared with reconstructed secular permafrost warming (about 1°C/century).

Thawing of frozen ground as inferred from high-precision rock glacier photogrammetry seems to have markedly accelerated also, in 1980–1990, as compared with 1970–1980. Computer simulations of changing permafrost distribution patterns and ground temperatures are developed at VAW within the framework of the Swiss National Research Program on Climate Change and Natural Catastrophes. Geographical Information Systems have found wide application for estimating permafrost occurrence on the basis of digital terrain information. Corresponding algorithms are presently being improved by using the growing data base from field evidence in combination with energy balance considerations.

Prepared by Wilfried Haeberli

United Kingdom

The British Adhering Body is organized through a committee comprising Charles Harris, Cardiff, Geology (Chairman); Michael Clark, Southampton, Geodata (Secretary); Edward Derbyshire, Royal Holloway, London, Geography; Peter Worsley, Reading, Sedimentology; Ronald Jones, Nottingham, Engineering; and Tony Mayer, NERC, Polar Sciences. The committee has continued in its function as a source of information concerning IPA activities and a means of distributing newsletters and circulars to British scientists. IPA dues are paid by the British Royal Society on behalf of the British Adhering Body of the IPA. A Geocryology Workshop is planned for 1994.

Prepared by Charles Harris

United States

The United States is represented in the IPA by its US Committee for IPA under the National Research Council. Current membership includes C.W. Lovell (Chair), Bernard Hallet (Vice Chair), and members Roger Barry, George Gryc, Lewis Link, Rupert Tart, and John Zarling. Support for IPA annual dues is provided directly to the Secretary General by the Association of American Geographers, American Society of Civil Engineers, American Society of Mechanical Engineers, and individuals and private companies. The June 1993 issue of *Frozen Ground* reported on many government and professional organizations' activities. The following supplements that report.

Keith Kvenvolden of the USGS in Menlo Park reports on recent results coming from the study of permafrost and gas hydrate as possible sources of methane. Permafrost has been suggested to be a high-latitude source of methane (a greenhouse gas) during global warming. To assess the magnitude of this source, an examination was conducted of the methane content of shallow cores (maximum depth 9.5 m) drilled in 1991 and 1992 at four sites near Fairbanks, Alaska, where discontinuous permafrost is common. The cores were composed mainly of frozen or thawed loess and peat, with some ice present in the frozen ground. Methane contents of frozen and thawed ground were compared. At all sites methane contents decrease toward the surface. Maximum methane contents at the sites were variable, ranging from 22.2 to 0.03 mg/kg. Results suggest that both frozen and thawed ground in permafrost regions can be a source of methane.

The idea that gas hydrate associated with relict permafrost of the Beaufort Sea continental shelf is a source of methane was tested. It was discovered that methane concentrations in water under the winter sea ice cover were 3 to 28 times greater than they are in late summer when ice is absent. These observations suggest that methane concentrates under the sea ice during winter and ventilates rapidly in late summer as the ice melts and retreats. The Arctic Ocean margin may be a seasonal, high-latitude, marine source of about 0.1 Tg/yr atmospheric methane. New field work is designed to expand these kinds of observations and to determine the sources of methane.

Submitted by Jerry Brown

MISCELLANEOUS

International Association of Geomorphologists Meets

The Third International Conference of the International Association of Geomorphologists/l'Association international des géomorphologues (IAG/AIG) was held in August 1993 at McMaster University in Hamilton, Ontario, Canada. The Conference Organizing Committee, chaired by Derek Ford and Brian McCann, arranged a very diverse program that included field excursions, film and video sessions, and social activities as well as the usual paper sessions.

The technical sessions were divided into the traditional geomorphologic categories, such as fluvial, coastal, tectonic, eolian, weathering, and karst geomorphology. Of special interest to the IPA were sessions devoted to periglacial, Quaternary, and glacial morphology; about one-tenth of the 776 abstracts were devoted to those three topics. In addition, plenary lectures were presented by Ross Mackay (detailing his field experiment on the growth of permafrost), Anders Rapp (on alpine glaciation landforms), and Dietrich Barsch (on periglacial geomorphology in the 20th century).

The first two volumes of a new series sponsored by the IAG/AIG were issued at the conference, namely: *The Evolution of Geomorphology: A Nation-by-Nation Summary of Development* (H.J. Walker and W.E. Grabau, Ed.), John Wiley and Sons, 539 p.; and *Geomorphology: The Research Frontier and Beyond* (J.D. Vitek and J.R. Giardino, Ed.), Elsevier, 265 p. Arrangements have been made to publish the papers of the conference in six volumes along with the proceedings.

The IAG/AIG is affiliated with both the International Geographical Union (IGU) and the International Union of Geological Sciences (IUGS), and through them with the International Council of Scientific Unions (ICSU). As of 31 July 1993, IAG/AIG consisted of 58 adhering national bodies, 11 of which had associate status. During the meetings in August eight additional members were added. All of the national members of the IPA are also members of IAG/AIG.

The new officers of the association, elected by its council, are:

D. Barsch, President	Germany
O. Slaymaker, Vice President	Canada
R. Allison, Secretary	United Kingdom
V. Baker, Treasurer	USA
A. Gupta, Publications Secretary	Singapore
M. Andre, Committee Member	France
T. Suzuki, Committee Member	Japan

The council plans to have regional meetings in both Hungary and Singapore during the next three years and to hold the Fourth International Conference in Italy in 1997.

Prepared by Jesse Walker, Liaison, IPA/IAG
Louisiana State University

Meeting on Permafrost-Affected Soils

The International Correlation Meeting on Permafrost-Affected Soils was held 18–30 July 1993 in Yukon and Northwest Territories, Canada, and Alaska, USA. The meeting was organized by the Alaska/Yukon Society of Professional Soil Scientists (AYSPSS) in collaboration with USDA–Soil Conservation Service (SCS), Agriculture Canada–Centre for Land and Biological Resources Research (CLBRR), and University of Alaska–Fairbanks (UAF). Fifty pedologists, geologists, botanists, climatologists, and agricultural and climate change program managers from Canada, China, Croatia, Finland, Germany, Hungary, Russia and the US participated.

The meeting consisted of a two-day plenary session for technical papers and 11 days of field trips. The meeting/field trip started at Inuvik and Mackenzie Delta, followed along the Dempster Highway to Dawson City, Yukon Territory, then followed the Top of the World Highway to the Tanana Valley in Alaska, and finished at Fairbanks.

Richard Asselin, Director of CLBRR, Agriculture Canada; Richard Arnold, Director of Soil Survey Section, USDA–SCS; Gary White, Director, Science Institute of NWT; and Joe White, President of AYSPSS, addressed the group on the opening day to welcome the participants and set the stage for the meeting. A total of 15 papers and 16 posters were presented on the morphology, genesis, mapping and classification of permafrost soils. The participants also examined 20 soil pits and discussed their genesis, classification and land management with regard to climate change. Paul Reichardt, the Interim Provost, UAF; Steve Probst, Alaska State Conservationist of USDA–SCS; and James Drew, Dean of the School of Agriculture and Land Resources Management, UAF, addressed the group at the closing ceremony in Fairbanks. Proceedings of this meeting will be published by the USDA–SCS National Soil Survey Center. Contact John Kimble, Editor, for copies (tel. 402-437-5363).

As a result of the meeting, a Gelisol order was proposed as the 11th order of the US Soil Taxonomy to classify permafrost-affected soils. James Bockheim of the University of Wisconsin was elected to be the chairman of the International Committee on Gelisols.

To field-test the Gelisol proposal, a permafrost soils correlating meeting/field trip is being organized by the Working Group on Cryosols of the International Permafrost Association, 26 July–8 August 1994, in Cherskiy, Kolyma Lowland, northeast Russia. The estimated cost is $2500, excluding transport to and from Cherskiy. For details contact David Gilichinsky, Institute of Soil Science and Photosynthesis, Russian Academy of Sciences, Pushchino, Moscow Region, Russia, or C.L. Ping (tel. 907-746-9462 or E-mail: pfclp@acad2.alaska.edu).

Prepared by C.L. Ping

Second International Symposium on Frost in Geotechnical Engineering

The Second International Symposium on Frost in Geotechnical Engineering was held in Anchorage, 28 June–1 July 1993. Seventy engineers from ten countries (Belgium, Canada, Denmark, Finland, Japan, Poland, Sweden, Switzerland, Russia and the USA) participated in the symposium, which was organized into three main sessions: theory pertaining to prediction of frost penetration and thermal degradation of frozen layer; application related to design and construction of various structures against frost; and case histories illustrating experiences in projects where frost action caused significant damages and application of remedial measures against frost action.

Twenty-one papers presented at the symposium appear in a book edited by A. Phukan and published by A.A. Balkema. The proceedings are available from Dr. Arvind Phukan, Professor of Civil Engineering, University of Alaska, 3211 Providence Drive, Anchorage, Alaska 99508 for $45.00 (US). The School of Engineering, University of Alaska Anchorage, in association with the IPA Working Group on Seasonal Freezing and Thawing of Permafrost Areas, the International Society for Soil Mechanics and Foundation Engineering Technical Committee on Frost (TC 8), and the American Society of Civil Engineers Technical Council on Cold Regions Engineering hosted the symposium.

Special Russian Sessions on Permafrost

Two conferences are scheduled in Russia in 1994 having themes or special sessions on permafrost:

International Conference on Arctic Town and Environment, Vorkuta, 15–18 June 1994. Excursions to see foundation and dam construction on permafrost.

International Conference on Arctic Margins, Magadan, 5–9 September 1994. Special session on engineering geology and permafrost with emphasis on mapping

Related permafrost papers are invited for both conferences. See the IPA calendar for contacts or contact Jerry Brown for more information.

ISSMFE TC 8

The president of the International Society of Soil Mechanics and Foundation Engineering, Professor N.R. Morgenstern, established the Technical Committee on Frost, TC 8, at the proposal of the Finnish Geotechnical Society, in 1989. The members of the committee have been:

E. Slunga, Finland (chairman)
M. Dysli, Switzerland
R. Frank, France
L.E. Goodrich, Canada (–1992)
R.H. Jones, United Kingdom
J-M. Konrad, Canada (1992–)
S. Knutsson, Sweden
H. Kobo, Japan
A. Phukan, USA
G. Refsdal, Norway
S. Saarelainen, Finland (secretary)
A. Sadovski, Russia
K. Skarzynska, Poland
J.F. Thimus, Belgium
T.R. Vinson, USA

During the first working period (1985–1989), TC 8 prepared recommendations for "Definitions, terminology and symbols pertaining to seasonal frost," and for "Reference frost-susceptibility criteria" (International Symposium, Saariselkä, Finland, 13–15 March 1989: *Frost in Geotechnical Engineering,* vol. 1). The frost-susceptibility criteria concerned the prediction of frost heaving.

The tasks for the second period (1990–1993) were defined as:

1 To promote cooperation and exchange of information on frost in geotechnical engineering
2 To establish liaison with the International Permafrost Association and the International Symposium on Ground Freezing
3 To continue the unfinished work of the past committee
4 To arrange the 2nd International Symposium on Frost in Geotechnical Engineering in four to five years' time

The results of the work are presented in the proceedings of the Second International Symposium on Frost in Geotechnical Engineering in Anchorage, Alaska, USA, June 1993.

The main emphasis in this work has been on the thaw weakening of frozen soil in connection with seasonal frost. Because of different practices in different countries, the work is being done on a rather general level. The report includes recommendations for reference test procedures to be used when evaluating the thaw weakening of a soil. The subjects are treated through correspondence, in personal discussions and in two committee meetings, which were held in Florence, Italy, in May 1991 and Nottingham, UK, in August 1992.

Besides the chairman and secretary of the committee, the following persons have served as members of the Finnish working group for the preparation of material: Esko Kankare, Kauko Kujala, Harri Mäkelä, Pertti Nieminen and Reijo Orama.

Summary of report by Eero Slunga in
Frost in Geotechnical Engineering

Thermal Engineering and Science for Cold Regions

The Fourth International Symposium on Thermal Engineering and Science for Cold Regions was held 28 September to 1 October 1993. Approximately 50 people from 10 countries attended the conference, held at the Cold Regions Research and Engineering Laboratory in Hanover, New Hampshire, USA. The meeting was sponsored by CRREL, the Institute of Northern Engineering of the University of Alaska Fairbanks, and two ASME divisions—Heat Transfer and Offshore Mechanics & Arctic Engineering. Forty-two papers and three special lectures were presented in the following general subject areas: convection with freeze in conduits, cold climate systems and structures, permafrost heat transfer, phase change and soil systems, thermosyphons and latent heat storage, and ice–water systems.

PUBLICATIONS

1989 International Symposium on Geocryological Studies in Arctic Regions

The Proceedings of the 1989 International Symposium on Geocryological Studies in Arctic Regions are now available. The symposium, held in Yamburg, West Siberia, in August 1989, was reported upon in *Frozen Ground* Number 6 (November 1989). It was the first opportunity for many western scientists and engineers to visit the West Siberian gas and oil areas. The proceedings are contained in five small volumes:

1 Plenary papers
2 The modern Arctic cryolithozone structure: Its evolution and stability during Pleistocene–Holocene
3 Man, cryosphere and nature protection in the Arctic: Studies on the stability of processes occurring in frozen soils in the presence or absence of man-made disturbances
4 The permafrost zone interaction with oil and gas facilities and pipelines
5 Poster reports

Copies are available from Dr. Vladimir Tsibulsky, Director, Institute of Northern Development, P.O. Box 2774, 625003 Tyumen 3, Russia. Tel.: 3 452 21 34 41; E-mail: root@ipos.tyumen.su

American Society of Civil Engineers Titles on Cold Regions

Arctic Coastal Processes and Slope Protection Design (#639, $18.00)
Civil Engineering in the Arctic Offshore (#441, $81.00)
Cold Regions Engineering, 5th Edition (#680, $30.00)
Cold Regions Engineering, 6th Edition #798, $52.50)
Cold Regions Hydrology and Hydraulics (#773, $54.00)
Design for Ice Forces (#356, $17.25)
Freezing and Thawing of Soil–Water Systems (#506, $11.25)
Frost Action and Its Control (#395, $15.00)
Research on Transportation Facilities in Cold Regions (#558, $12.00)

Contact American Society of Civil Engineers, Book Orders, P.O. Box 831, Somerset, New Jersey 08875-0831. Telephone orders: 1-800-548-ASCE.

First International Conference on Cryopedology

Post-Conference Proceedings, First International Conference on Cryopedology, Pushchino, Russia, 1992, Chief Editor David Gilichinsky. Contact: Joe White, AYSPSS, P.O. Box 202761, Anchorage, Alaska 99520 for availability of both pre- and post-conference volumes (supply limited).

Thermal Engineering & Science for Cold Regions

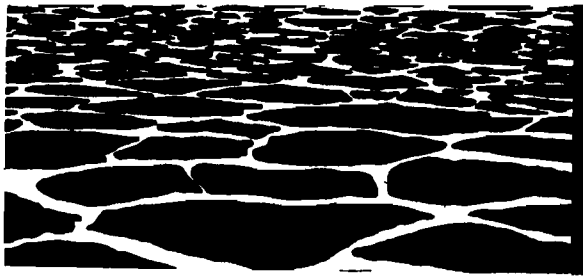
Proceedings, Fourth International Symposium on Thermal Engineering & Science for Cold Regions, 28 September–1 October 1993, V.J. Lunardini and S.L. Bowen, Ed. Contact Virgil Lunardini, USA Cold Regions Research and Engineering Laboratory, 72 Lyme Road, Hanover, New Hampshire 03755-1290.

Available Immediately— VI ICOP Proceedings

Proceedings, Sixth International Conference on Permafrost, July 5–9, 1993, Beijing, China. Volume 1, 179 papers, 964 pages.

The price of $100.00 (US) plus $20.00 handling and mailing includes the second (post-conference) volume, to be available in early 1994.

Order from: Zhu Yuanlin, VI ICOP Secretary General, Lanzhou Institute of Glaciology and Geocryology, Chinese Academy of Sciences, Lanzhou, Ganzu 730000, China. Fax: 86 931 485241.



PERMAFROST AND PERIGLACIAL PROCESSES

Volume 4, Issue No. 2 (April–June 1993)

Introduction—Present Global Change and Permafrost, Within the Framework of the International Geosphere–Biosphere Programme, E.A. Koster

Climate and Permafrost, M.K. Gavrilova

Changes in the Extent of Permafrost During the Late Quaternary Period in the Territory of the Former Soviet Union, K.A. Kondratjeva, S.F. Khrutzky and N.N. Romanovskii

Permafrost Changes in Europe During the Last Glacial, J. Vandenberghe and A. Pissart

Permafrost Zonation in Russia under Anthropogenic Climate Change, F.E. Nelson and O.A. Anisimov

Climate Warming and the Carbon Cycle in the Permafrost Zone of the Former Soviet Union, T.P. Kolchugina and T.S. Vinson

Mountain Permafrost and Climatic Change, W. Haeberli, C. Guodong, A.P. Gorbunov and S.A. Harris

Volume 4, Issue No. 3 (July–September 1993)

Données Nouvelles sur la Présence d'un Pergélisol en Aquitaine au Cours des Dernières Glaciations, J.P. Texier and P. Bertran

Talus Movement in the High Equatorial Andes: A Synthesis of Ten Years of Data, F.L. Pérez

Thermokarst Involutions, Summer Island, Pleistocene Mackenzie Delta, Western Canadian Arctic, J.B. Murton and H.M. French

Description and Origin of Some Talus-Foot Debris Accumulations, Aghla Mountains, Co. Donegal, Ireland, P. Wilson

Rock Moisture Data from Livingstone Island (Maritime Antarctic) and Implications for Weathering Processes, K. Hall

Short Communications

Coastal Dune Development in a Thermokarst Environment: Some Implications for Environmental Reconstruction, Tuktoyaktuk Peninsula, N.W.T., M.-H. Ruz

Hydrogen and Oxygen Isotopes and the Origin of the Ice in Peat Plateaus: Discussion, C.R. Burn

Hydrogen and Oxygen Isotopes and the Origin of the Ice in Peat Plateaus: Reply, S.A. Harris, N.M. Waters and H.R. Krouse

冰川冻土

Journal of Glaciology and Geocryology

Selected Frozen Ground Titles

Volume 14, No. 4 (December 1992)

Experimental Study on Processes of Heat–Mass Transfer and Deformation in System of Frozen Kaolin and Salt Solution, Xu Xiaozu, IU.P. Lebedenko, E.M. Chuvilin et al.

Geological Processes and Geocryogenic Effects in the Central Andes, Santiago A. Grosso and Arturo E. Corte

Quaternary Glacial and Environmental Changes in the Region of Hoh Xil, Qinghai Province, Li Shijie and Li Shude

Holocene Periglacial Processes and Environmental Changes in the Daqingshan Mountains, Inner Mongolia, China, Cui Zhijiu and Song Changqing

The Denudation Rate of Gelifraction and Its Influential Factors in the Periglacial Environment of Tian Shan Mountains (in China), Liu Gengnian and Xiong Heigang

Quaternary Glaciations in the Halasi River Catchment and Its Surroundings in the Altai Mountains in Xing-jiang, China, Cui Zhijiu, Yi Chaolu and Yan Jinfu

Late Quaternary Glacial Sequence on the South Slope of the Lenglongling, Qilian Mountains, Kang Jiancheng, Zhu Junjie and Chen Hongkai

An Analysis of the Sediment Formation of the Quaternary Mudstone in the Mount Huangshan, Zhou Binggen, Li Gang and Wang Jiegui et al.

Volume 15, No. 1 (March 1993)

A Special Collection of Partial Chinese Papers Accepted by the Sixth International Conference on Permafrost

Permafrost Around CGWS, Antarctica, Chen Xiaobo

Profiles of Freezing Points and Unfrozen Water Content Around CGWS, Antarctica, Wang Yaqing and Chen Xiaobo

Effects of Forest Fire on Hydro-thermal Regime of Frozen Ground, the Northern Part of Da Hinggan Ling, Zhou Youwu, Liang Linheng and Gu Zhongwei et al.

Application of Remote Sensing Images to the Investigations of the Changes of Permafrost Environment in Burned Forest Regions, Da Hinggan Ling, Liang Fengxian and Gu Zhongwei

Permafrost Features and Their Changes in Amur Area, Da Hinggan Ling Prefecture, Gu Zhongwei, Zhou Youwu and Liang Fengxian et al.

Ice Wedges in Northeastern China, Tong Boliang

The Effects of Gold Mining on Permafrost Environment Wuma Mingling Area, Inner Mongolia of China, Wang Yinxue

The Desertification in the Permafrost Region of Qinghai-Xizang Plateau and Its Influence on Environment, Huang Yizhi, Guo Dongxin and Zhao Xiufeng

A Preliminary Research of Solifluction Terraces in Fenghuoshan Pass Basin on Qinghai-Xizang Plateau, Guo Dongxin, Huang Yizhi and Zhao Xiufeng

The Loess and Its Climate Records in Kunlunshan Region Since the Late Pleistocene, Zhao Xiufeng, Guo Dongxin and Huang Yizhi et al.

The Radar Detecting on Permafrost Distribution Under the Asphalt Road of Qinghai-Xizang Highway, Zeng Zhonggong, Huang Yizhi and Xia Zhiying et al.

Permafrost and Periglacial Landforms in Kekexili Area of Qinghai Province, Li Shude and Li Shijie

Regional Features of Permafrost in Mahan Mountain and Their Relationship to the Environment, Li Zuofu, Li Shude and Wang Yinxue

The Problem Between Frozen Ground and Engineering in Western Line Engineering of Trans-Water from South to North, China, Zhang Changqing, Zhu Linnan, Zhang Jianming et al.

Development Condition of Alpine Permafrost in the Tian Shan, China, Qiu Guoqing

The Climate Fluctuation and the Permafrost Formation Since the Last Glaciation, Tian Shan, China, Zhao Lin, Qiu Guoqing and Jin Huijun

Thermal Regime of Alpine Permafrost in the Upper Reach of Urumqi River, Tian Shan, Jin Huijun, Qiu Guoqing and Zhao Lin et al.

A Composite Model of Multiple Actions for Forming Patterned Ground, Li Guangpan and Gao Min

Experimental Research on Deformation in Model of Artificially Frozen Wall, Wu Ziwang, Ma Wei and Zhang Chanqing et al.

Uniaxial Stress Relaxation of Frozen Loess, Wu Ziwang, Ma Wei, Chang Xiaoxiao et al.

Strength and Yield Criteria of Frozen Soil, Ma Wei, Wu Ziwang and Zhang Changqing

A Numerical Technique for Solving Temperature Field of Frozen Wall, Gao Xingwang

A Model of Migration Potential for Moisture Migration During Soil Freezing, Sheng Yu, Ma Wei and Hou Zhongjie

A Primary Study on Composition of Methane Hydrate, Deng Yousheng, Xu Xiaozu and Zhang Lixing

Unfrozen Water Content in Multi-Crystal Ice, Xu Xiaozu, Zhang Lixin and Deng Yousheng et al.

Primary Study on Interface Conditions of Ice-Saturated Clay, Xu Xiaozu, Wang Jiacheng and E.M. Chuvilin et al.

A Method Determining the Thermal Conductivity of Frozen Soil with the Heat Flow Meter, Tao Zhaoxiang, Zhang Lixin and Hou Zhongjie

Pressure Influence of Pore Characteristics of Frozen Soils, Wang Jiachang, Xu Xiaozu and Deng Yousheng et al.

Similitude Analysis of Modeling Test for Changeless Pressure in the Freezing–Thawing Process of Soil, Zhu Linnan, Li Dongqing and Guo Xingmin

Dynamic Elastic Modulus and Dynamic Strength of Saturated Frozen Silt, He Ping, Zhu Yuanlin and Zhang Jiayi et al.

Mechanism of the Attenuation of Strength for Loess-Cement Under Cyclical Freezing and Thawing, Zhang Huyuan, Feng Ke and Zhang Lixin et al.

Influence of Porous Characteristic of Material on Displacement During Freezing, Wang Jiacheng and Cheng Guodong

Experimental Study of the Effects of Impurities on Ice Creep at –1 °C, Huang Maohuan, Li Gang and Miao Lina et al.

Applications of Data Base Technology in Frozen Soil Researches, Xia Zhiying

The Introduction of Applying Method for CT in Frozen Soil Experiment Research, Pu Yibin

Volume 15, No. 2 (June 1993)
A Special Collection of Partial Chinese Papers Accepted by the Sixth International Conference on Permafrost

Observation on Periglacial Mass Movement in the Head Area of Urumqi River and Laerdong Pass, Tianshan Mountains, Cui Zhijiu, Xiong Heigang, Liu Gengnian

On Development Model of Periglacial Land Form on Slope Land, Zhu Cheng

The Geographic Boundary of Permafrost in the Northeast of China, Lu Guowei, Weng Binglin, Guo Dongxin

Fossil Periglacial Landforms in the Shennongjia Mountains, China, Zhou Zhongmin

The Formation Characteristics of Frozen-Area Bogs in China, Zhang Zeyou

Cause and Treatment of the Icing in Gulian Area, Luo Minru, Zou Xinqing, Na Yunlong

Permafrost Hydrological Processes in Binggou Basin of Qilian Mountains, Yang Zhenniang, Yang Zhihuai, Liang Fengxian et al.

Permafrost Characteristic and the Exploitation and Utilization of Ground Water in Hanjiayuan Area, Da Hinggan Ling, Yuan Haiyi, Liu Xuekui

Study of the Law of the Distribution of Permafrost and Vegetation in Da Hinggan Ling, Liu Qingren, Sun Zhenkun, Cui Yongsheng et al.

Correlation of Freeze–Thaw Action to the Formation and Exploration of Quaternary Gold Placers, Wang Chunhe, Zhang Aixin, Li Fenghua et al.

Instantaneous-State Deformation and Strength Behavior of Frozen Soil, Yu Qun, Zhang Zhaoxiang, Shen Zhenya et al.

Regularity of Frost Heave of the Seasonally Frozen Soil in Hetao Irrigation Area, Inner Mongolia, Zhou Deyuan

Research of Frost Heave Property of Soil in Daqing Region, Jiang Hongju, Cheng Enyuan

Calculation of Frost Heave Stress Acting on the Foundation Bottom, Tang Shuchun

Long-Term Shear Strength of Frost-Thaw Transition Zone, Ding Jingkang, Xu Xueyan, Lou Anjin

Discussion on the Distribution of Tangential Frost Heaving Forces Along the Lateral Surface of Pile, Liu Hongxu

Practice of Reinforced Concrete Strip Foundation in Permafrost Region, Men Zhaohe

The Shallow Cover Design and Construction Technology of Building Foundation in Daqin Region, Jiang Hongju, Cheng Enyuan

A Solution for the Icing Heave of the Foundation in Permafrost Region by Lowering Ground Water Table, Liu Shifeng, Zou Xinqing

Three-Dimensional Finite Element Analysis of Stress and Deformation of Frozen Wall in Deep Thick Clay Layer, Wang Jianping, Wang Zhengting, Wu Qijian

Preliminary Study on Freezing Point in Soil, Cui Guangxin, Li Yi

Depth Consolidation of Frozen Soils in Triaxial Tests, Li Kun, Wang Changsheng, Chen Xiangsheng

Destruction and Rehabilitation of Shaft Lining in Frozen Shaft, Wang Changsheng, Liu Rihui

Numerical Analysis of Temperature and Stress on the Canal Subsoil During Freezing, Zhang Zhao, Wu Ziwang

Frost Heave Prevention Design for the Rigid Canal Linings, Zhu Qiang

The Freezing and Frost Heaving Regularities of Base Soil for Arbitrary Slope Direction and Gradient, Guo Dianxiang, Wei Zhenfeng, Ma Yijun

A Study of Preventing Frost Heave with Shaft Construction for Dissipating Water Energy, Wang Shirong

Administer Countermeasure on Thaw Settlement of Permafrost Embankment Along Qinghai-Xizang Highway, Cui Jianheng, Xu Dongzhou, Cheng Hongzhe

Culvert Engineering in the Permafrost Region of Qinghai-Xizang Plateau, Zhang Jinzhao, Yao Cuiqin

Calculation of Maximum Thawed Depth of Permafrost Under the Black Colour Pavement Based on Geothermal Gradient, Cui Jianheng, Yao Cuiqin

Frost Heave Susceptibility of Highway Bridge Foundation Soil in Seasonal Frost Region, Dai Huimin, Wang Xinglong

Road Design and Renovation Disease of North Slopes in Da Hinggan Ling, Luo Weiquan

Frost-Action Design and Applications of Enlarged Type Pile Foundation Bridge in Waterlogged Area of Songyong, Huang Junheng, Xu Zhenghai, Ge Huanyou et al.

The Research of Slab Structure on Preventing, Zhu Yunbin, Guo Zuxin

The Prevention and Treatment of Heave Damages in Buildings and Water Pipelines in Permafrost Areas, Jiao Tianbao

Protein Changes and Functions of Winter Wheat During Cold Acclimation, Zhao Yutian, Zhao Jun

Crop Cold-Resistant Appraisal Principles and Appraisal Technology System Research, Zhao Yutian, Liang Bowen

Drilling Characteristics of Engineering Geology of Permafrost in Da Hinggan Ling Region, Qiou Xinqing

RECENT AND FORTHCOMING MEETINGS

1994

Seventh International Specialty Conference: Cold Regions Engineering—A Global Perspective
7–9 March 1994, Edmonton, Alberta, Canada
Contact: Daniel Smith, Department of Civil Engineering, University of Alberta, Edmonton, Alberta, Canada T6G 2G7

FINVAC—Cold Climate HVAC '94
15–18 March 1994, Rovaniemi, Finland
Contact: FINVAC/Cold Climate HVAC '94, Ilpo Nousianinen, Sitratori 5, SF-00420 Helsinki, Finland
Phone: 358 0 563 3600; Fax: 358 0 566 5093

ICETECH '94—State-of-the-Art in Arctic Engineering
16–18 March 1994, Calgary, Alberta, Canada
Contact: Wim Jolles, Symposium Chairman, Canadian Petroleum Association, Canadian Marine Drilling, Bow Valley Square 4, 250 6th Avenue SW, P.O. Box 200, Calgary, Alberta, Canada T2P 2H8
Phone: (403) 298-2810; Fax: (403) 298-3532

Polar Tech '94
22–25 March 1994, Luleå, Sweden
Contact: CENTEX, Lena Allheim Karbin, Luleå University of Technology, S-95187, Luleå, Sweden

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

The Third Circumpolar Symposium on Remote Sensing of Arctic Environments
16–20 May 1994, Fairbanks, Alaska
Contact: Kenneson Dean (Chair) or Cindy Wilson (Coordinator), Geophysical Institute, University of Alaska, Fairbanks, Alaska 99775-0800
Phone: (907) 474-7364 or 474-7954; Fax: (907) 474-7290
E-mail: c.wilson@omnet

5th International Conference on Ground Penetrating Radar (GPR)
12–16 June 1994, Kitchener, Ontario, Canada
Contact: GPR '94, Waterloo Centre for Groundwater Research, University of Waterloo, Waterloo, Ontario N2L 3G1, Canada
Phone: (519) 885-1211, ext. 1892; Fax: (519) 725-8720

International Conference on Future Groundwater Resources at Risk
13–16 June 1994, Helsinki, Finland
Contact: Ms. Tuulikki Suokko, FGR 94, National Board of Waters and the Environment, P.O. Box 250, SF-00100 Helsinki, Finland
Phone: 358 0 402 8345; Telex: 90 402 81
Fax: 358 0 402 8345

ISCORD 1994—International Symposium on Cold Region Development
13–16 June 1994, Espoo, Finland
Contact: ISCORD '94 Symposium Secretariat, c/o Association of Finnish Civil Engineers RIL, Meritullinkatu 16 A 5, SF-00170 Helsinki, Finland
Phone: 358 0 135 6300; Fax: 358 0 135 7670

ATE '94—Arctic Town and Environment
15–18 June 1994, Vorkuta, Russia
Contact: A. Tashaev, Institute of Biology, Konii Scientific Centre, Syktyvkar 167610 Russia
Phone: 7 821 22 25213; Fax: 7 821 22 20163

AMQUA—Data and Models in Quaternary Research 13th Biennial Meeting
19–22 June 1994, Minneapolis, Minnesota
Contact: Lori Graven–AMQUA, Professional Development and Conference Services, 216 Nolte Center, University of Minnesota, 315 Pillsbury Drive SE, Minneapolis, Minnesota 55455-0139
Phone: (612) 625-9023; Fax: (612) 626-1632
E-mail: igraven@pdcs.cee.umn.edu

Bipolar Information Initiatives: The Needs of Polar Research—15th Polar Libraries Colloquy
3–8 July 1994, Cambridge, United Kingdom
Contact: William Mills, Scott Polar Research Institute, Cambridge CB2 1ER, U.K.
Phone: 0223-336557; Fax: 0223-336549
E-Mail: wjm13@uk.ac.cam.phx

4th International Conference on the Bearing Capacity of Roads and Airfields
17–21 July 1994, Minneapolis, Minnesota
Contact: Lori Graven, BCRA '94, Professional Development and Conference Services, 216 Nolte Center, University of Minnesota, 315 Pillsbury Drive SE, Minneapolis, Minnesota 55455-0139
Phone: (612) 625-9023; Fax: (612) 626-1632
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International Symposium on the Role of the Cryosphere in Global Change
7–12 August 1994, Columbus, Ohio
Contact: Secretary General, International Glaciological Society, Lensfield Road, Cambridge CB2 1ER, United Kingdom

International Conference on the Arctic and North Pacific: Bridges of Science Between North America and the Russian Far East
25 August–2 September 1994, Anchorage, Alaska and Vladivostok, Russia
Contact: Dr. Gunter Weller, Geophysical Institute, University of Alaska, Fairbanks, Alaska 99775-0800
Fax: (907) 474-7290
E-Mail: gunter@dino.gi.alaska.edu

10th International Symposium and Workshop Northern Research Basins
28 August–3 September 1994, Svalbard, Norway
Contact: Knut Sand, SINTEF, Norwegian Hydrotechnical Laboratory, N-7034, Trondheim, Norway
Phone: 47 7 592300; Fax: 47 7 592376

International Conference on Arctic Margins (ICAM)
5–9 September 1994, Magadan, Russia
Contact: Dennis Thurston, Minerals Management Service, 949 E 36th Avenue, Anchorage, Alaska 99508-4302
Phone: (907) 271-6545; Fax: (907) 271-6565
E-mail: ahdt1@acad2.alaska.edu

Symposium on Periglacial Slope Processes
Will include IPA and IGU working groups meeting and a field trip to southwest France, Champaign and Lorraine
4–9 September 1994, France
Contact: Jean-Pierre Lautridou, Centre de Géomorphologie du CNRS, Rue des Tilleuls, 14000 Caen, France

47th Canadian Geotechnical Conference
21–23 September 1994, Nova Scotia, Canada
Contact: L.D. Baike, Department of Civil Engineering, Technical University of Nova Scotia, Halifax, Nova Scotia B3J 2X4, Canada

International Conference on Offshore Mechanics and Arctic Engineering
Fall 1994, Houston, Texas

7th International Symposium on Ground Freezing
24–28 October 1994, Nancy, France
Contact: ISGF '94, LCPC,CNRS/UMR 1113, Cité Descartes 2 Allée Képler, 77420 Champs sur Marme, France
Phone: 33 1 40 43 54 40
Fax: 33 1 43 54 50

Cryosol Symposium of the American Society of Agronomy Annual Meeting
13–15 November 1994, Seattle, Washington

1995

19th International Congress of International Institute of Refrigeration (IIR) and Institut International Froid (IIF)
20–26 August 1994, The Hague, Netherlands
Contact: PR Group 19th Congress IIR/IIF 1995, c/o Den Daas/CM, P.O. Box 747, 3700 AS Zeist, The Netherlands

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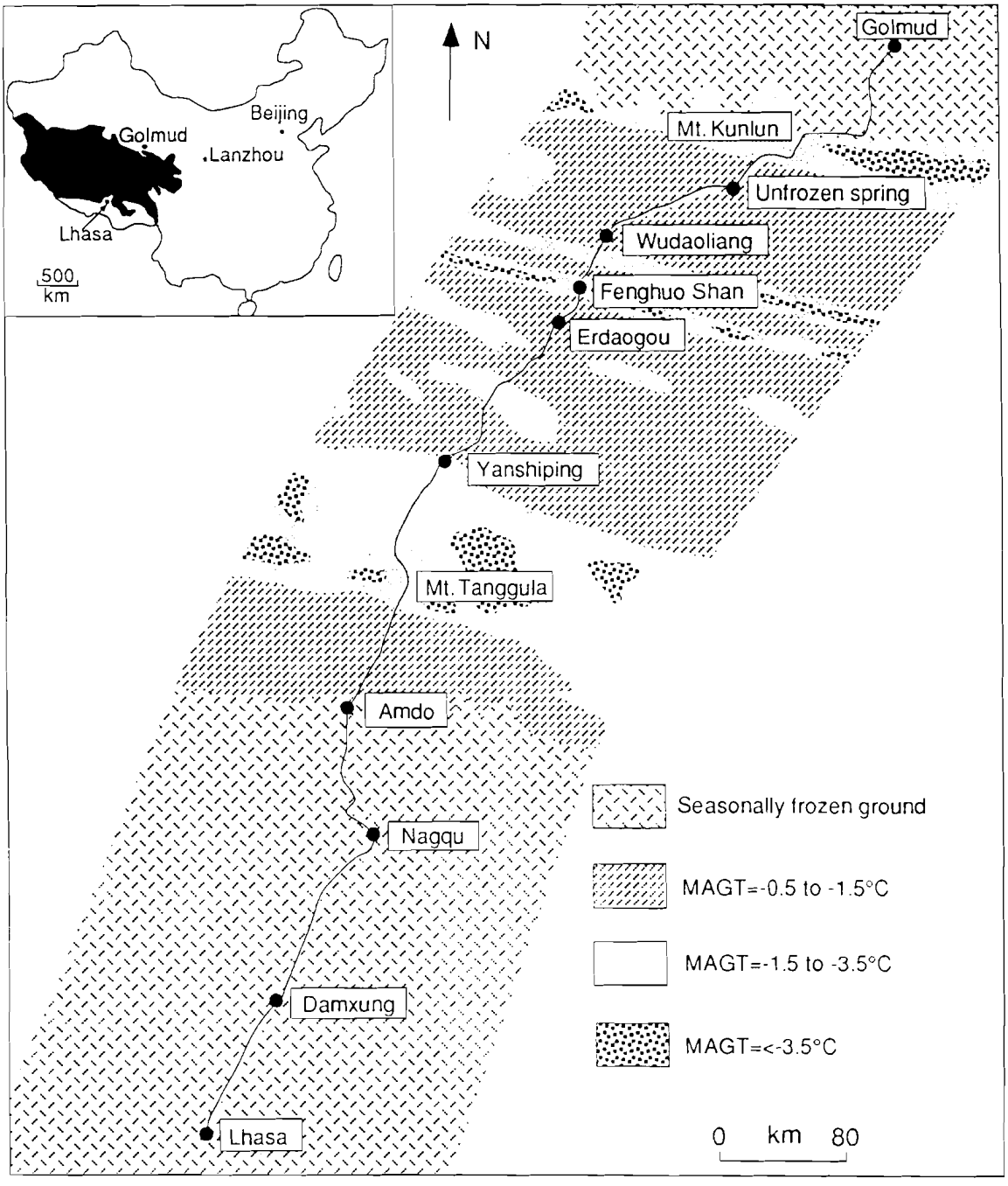

Route map of post-Conference Tibet Plateau field excursion. Group photograph of participants at Tangula Pass, elevation 5231 m, highest point along highway. Map courtesy of Baolai Wang; photo by Jerry Brown.