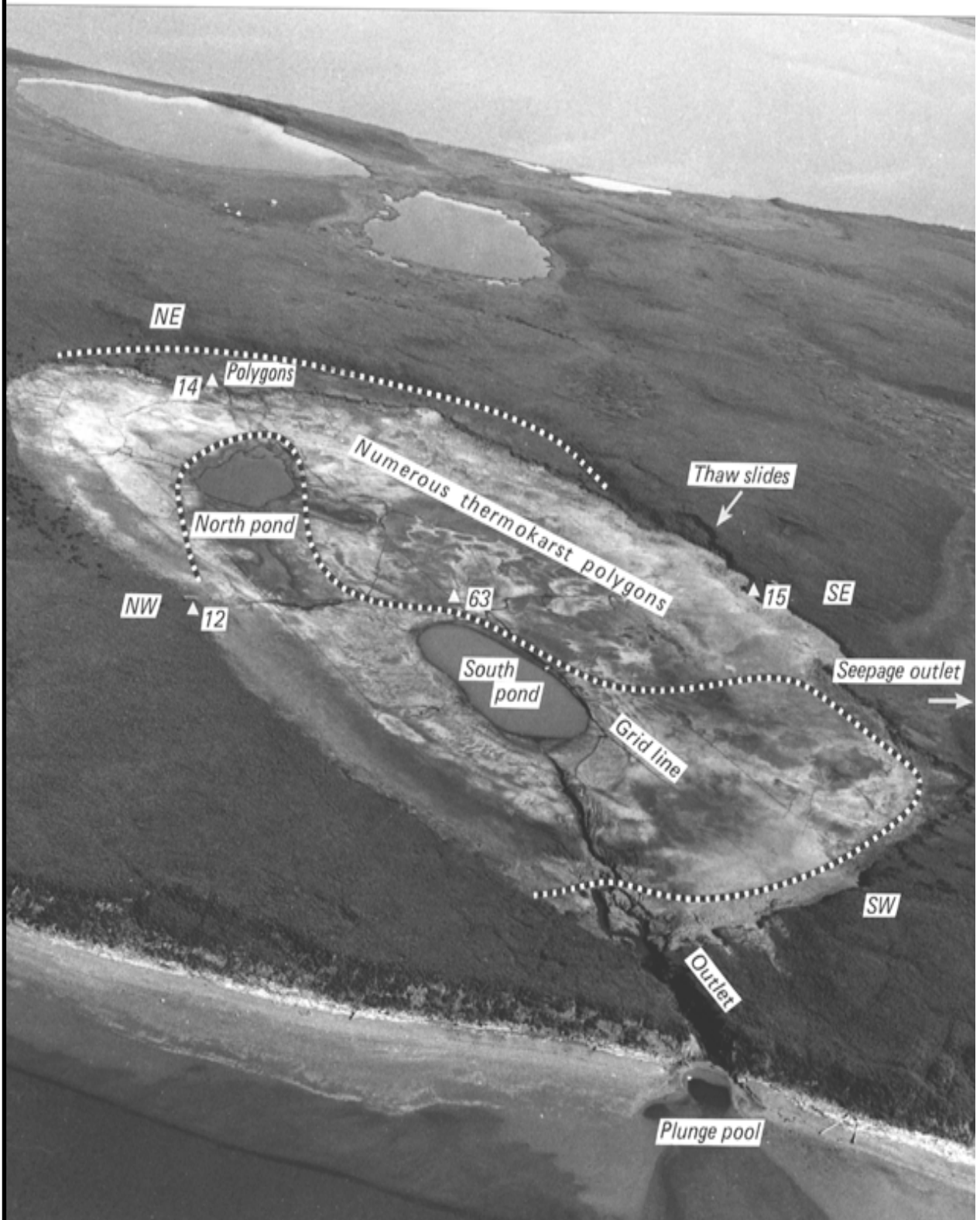


FROZEN GROUND



The News Bulletin of the International Permafrost Association

Number 22, December 1998



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 investigation and engineering work on permafrost. Membership is through adhering national or multi-national organizations or as individuals in countries where no Adhering Body exists. The IPA is governed by its officers and a Council consisting of representatives from 23 Adhering Bodies having interests in some aspect of theoretical, basic and applied frozen ground research, including permafrost, seasonal frost, artificial freezing and periglacial phenomena. Committees, Working Groups, and Task Forces organize and coordinate research activities and special projects. The IPA became an Affiliated Organization of the International Union of Geological Sciences in July 1989. The Association's primary responsibilities are convening International Permafrost Conferences and accomplishing special projects such as preparing maps, bibliographies, and glossaries. The first Conference was held in West Lafayette, Indiana, USA, 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; and the seventh in Yellowknife, Canada, 1998. Plans are being made to hold the eighth in Switzerland in 2003. Field excursions are an integral part of each Conference, and are organized by the host country.

EXECUTIVE COMMITTEE 1998–2003

President

Dr. Hugh M. French, Canada

Vice Presidents

Dr. Feliks E. Are, Russia

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Members

Dr. Jerry Brown, U.S.A.

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Data, Information and Communication

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Global Change and Permafrost

Periglacial Processes and Environments

Permafrost Engineering

Cryosols

Coastal and Offshore Permafrost

Southern Hemisphere Permafrost

and Periglacial Environments

TASK FORCES

Rock Glacier Dynamics

Mapping and Distribution Modeling
of Mountain Permafrost

Isotope/Geochemistry of Permafrost

COUNCIL MEMBERS

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Mongolia

Netherlands

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Russia

Southern Africa

Spain

Sweden

Switzerland

United Kingdom

United States of America

Cover: Lake Illisarvik, Richards Island, western Arctic coast, Canada, site of J. Ross Mackay's long-term field experiment to investigate the growth of permafrost. The lake was drained in 1978. Methods and results through 1995 are discussed in a paper published in the Canadian Journal of Earth Sciences, vol. 34, no. 1, January 1997. This photograph, taken 12 August 1979, appeared on the cover of the journal, and permission was kindly granted by the editor for its use in Frozen Ground. The June 1998 Permafrost Conference field trip to the Mackenzie Delta area organized and led by Chris Burn observed many permafrost features whose genesis is being investigated in this experiment (pages 5–7).

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THE NEWS BULLETIN OF THE
INTERNATIONAL PERMAFROST ASSOCIATION
NUMBER 22 • DECEMBER 1998

Frozen Ground, the News Bulletin of the International Permafrost Association, is currently published annually. The IPA is a non-governmental association of national organizations representing 23 countries or groups of countries. The success of the bulletin depends upon the willingness of IPA participants to supply information for publication. News items from any IPA participant or others are very welcome, as are interesting photographs for the cover (please furnish high quality glossy prints). To submit news items or photos please contact the appropriate individual listed on page 43.

This issue of *Frozen Ground* was compiled by Jerry Brown. 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 K1A 0E8; in Russia from the Consolidated Scientific Council on Earth Cryology, Vavilov Str. 30/6, 117982 Moscow; in the United States from Jerry Brown, P.O. Box 7, Woods Hole, Massachusetts 02543-0007; and elsewhere from Council members.

Editor's Note: The June 1998 issue of *Frozen Ground* was not published. This issue is a combined June/December news bulletin.

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EXECUTIVE COMMITTEE REPORT

Essentially all activities this year focused on preparation for and participation in the Seventh International Conference on Permafrost held in Yellowknife, Canada, 23–27 June 1998. The IPA Council, Executive Committee and Working Groups met during the Conference. As a cost-saving measure, the June 1998 issue of *Frozen Ground* has been consolidated with the December issue. The following reports summarize many of the results of the Yellowknife meetings and activities of the Adhering Bodies for the past year or more.

Approximately 275 attendees from 25 countries participated in the Conference, the pre- and post-Conference field trips to the Mackenzie Valley, northern Quebec, and the BHP diamond mine, and local excursions. Twenty-three paper sessions and two poster sessions resulted in over 150 presentations. A total of 248 abstracts of published papers and posters were published in the program book and can be viewed on the IPA Web site. IPA Working Group and Secretary General reports covering the activities of the past 5 to 10 years were also published in the program book and appear on the site. The final proceedings volume published by Laval University contains 188 papers.

Several other publications were released during the Conference, including the 12-language glossary of permafrost and ground-ice terms and the CD-ROM on the Circumpolar Active-Layer Permafrost System (CAPS). CAPS contained the digital version of the IPA permafrost map (see inside back cover for map unit statistics). Meetings of participants in the Circumpolar Active-Layer Monitoring (CALM) and Permafrost and Climate in Europe (PACE) programs were convened during the Conference.

Major changes to the IPA Constitution were reviewed and approved, including expansion of the Executive Committee from four to six members. A new Executive Committee was elected (see inside front cover) and the position of Secretary General replaced with an international Secretariat. At least 65 individuals attended the Council and Executive Committee meetings.

Recognizing the importance of data and information activities, the existing Working Group was reestablished as a permanent Standing Committee. Two new Working Groups on Coastal and Offshore Permafrost and the Southern Hemisphere were established. Three Task Forces on rock glacier dynamics, mapping mountain permafrost, and isotope geochemistry were established for a period of 2–3 years to assess current status and plan future activities. Rules

governing Working Groups and Task Forces were revised, with WGs no longer limited to eight members.

Two resolutions were passed concerning global monitoring of permafrost and the active layer and their relationship to other international programs, including WMO, WCRP, GCOS and SCAR. Organizations and programs were identified for liaison with IPA Committees, Working Groups and Task Forces.

IPA representatives plan to participate in three forthcoming international conferences: the 25th International Quaternary Association (INQUA) Congress in Durban, South Africa (August 1999); the 31st International Geological Congress in Rio de Janeiro, Brazil (August 2000); and the 3rd International Conference on Cryogenic Soils in Copenhagen, Denmark (August 2001). Our readers are encouraged to participate in these and other related international conferences. Several Working Groups and Task Forces have provisional plans for meetings, including Engineering in Svalbard (2000) and Mountain Permafrost in Mongolia (2001).

The new Executive Committee plans to meet early in 1999 to assist in the implementation of the new Secretariat and to discuss the future publication and distribution plans for *Frozen Ground*. We plan to issue some form of the news bulletin late in 1999; in the interim relevant information will appear periodically on the IPA Web site.



Past and present officers of the IPA at Yellowknife. L-R: Hugh French (past Vice President and current President), J. Ross Mackay (past Secretary General); Troy Péwé (past President), Cheng Guodong (past President), Jerry Brown (past Secretary General and current Member), and Nikolai Romanovskii (past Vice President).

REPORT OF THE SEVENTH INTERNATIONAL CONFERENCE ON PERMAFROST

Hugh M. French, IPA President

The Seventh International Conference on Permafrost was held 23–27 June 1998 in Yellowknife, capital city of the Northwest Territories, Canada. Yellowknife is the largest city in northern Canada, with a population of just over 17,000. Lying on the north shore of Great Slave Lake, at latitude 62°29'N, it is located within the zone of discontinuous permafrost. This has had a significant impact upon the development of the city. Many buildings, roads and other infrastructure needs have been designed in recent years to deal with the occurrence of warm, localized permafrost bodies. Thus, participants at the Conference were able to experience some of the interesting practical problems associated with permafrost. In addition, several pre- and post-Conference scientific excursions to other permafrost regions of Canada, two one-day visits to the BHP diamond mine project at Lac de Gras, and a local half-day walking tour within the City of Yellowknife itself were part of the Conference program.

PARTICIPANTS AND ORGANIZATION

Approximately 275 participants, including accompanying persons and 25 students, representing 25 countries participated in Conference activities. They represented Canada (106), U.S.A. (50), Switzerland (16), Russia, China and Japan (9 each), Germany and U.K. (8 each), Finland (4), Norway (3), Argentina, Austria, Belgium, Denmark, France, and Italy (2 each), and Estonia, Kazakstan, Mongolia, New Zealand, Poland, Romania, Southern Africa, Sweden and The Netherlands (1 each). Ninety-four oral papers and 60 posters were presented in 23 paper sessions and 2 poster sessions.

The official sponsors of the Conference were the National Research Council of Canada, the Geological Survey of Canada, the Cold Regions Division of the Canadian Geotechnical Society, the Aurora Research Institute of the Northwest Territories, and the International Permafrost Association. A National Organizing Committee chaired by Don Hayley, EBA Engineering Consultants Ltd., was assisted by a Local Organizing Committee chaired by Craig D. Entremont, Aurora Research Institute. The Technical Program Committee responsible for both the paper review and program schedule was chaired by Antoni Lewkowicz, University of Ottawa. The review process was facilitated by the assistance of over 30 Associate Editors, mainly from Canada. The

Conference Secretariat services were provided in Ottawa by Alan Heginbottom (GSC) and Dan Desrochers, Environmental Analysis Services, and in Yellowknife by Office Complements Ltd.

PROGRAM AND RELATED ACTIVITIES

The opening ceremony included welcoming statements by Charles Dent, Minister of Education and Tourism, Government of the Northwest Territories; David Lovell, Mayor of Yellowknife; and Jean-Serge Vincent, Director, Terrain Sciences Division, Geological Survey of Canada, on behalf of the Federal Government of Canada. The importance of permafrost research to Canada was emphasized by Dr. Vincent in his opening comments (see Canadian report). Jerry Brown (IPA Secretary General) presented a brief status report with emphasis on the importance of the Working Groups in the activities of the IPA.

The opening plenary session consisted of two presentations. C.R. Burn (Carleton University) reported upon field investigations of permafrost and climate change in north-west North America. J.F. (Derick) Nixon (Nixon Geotech Ltd.) discussed recent applications of geothermal analysis in northern engineering. The closing plenary session consisted of reports by the IPA Working Groups and Task Forces (see Table, page 14). Three concurrent paper sessions over the four days included the following themes:

- Under the general category of permafrost science were sessions on Quaternary evolution of permafrost areas, ground ice, permafrost landscapes and soils, mountain permafrost, rock glaciers, periglacial processes, hydrology of permafrost regions, coastal and offshore permafrost, and the physics and chemistry of frozen ground.
- A second category of papers focused upon the thermal aspects of permafrost, including active layer thickness and temperature, modeling heat transfer in permafrost, and the influence of climate change and climate upon permafrost.
- The wide range of permafrost engineering topics included frost heave, pipelines and geotechnique, foundations, design and construction of roads, airports and waste disposal facilities, field and laboratory studies, and gas hydrates.
- Three paper sessions dealt with the impact of new technology related to information science and permafrost, use of geophysical techniques in permafrost regions, and use of remote sensing and GIS in permafrost regions.

Over 250 persons attended an illustrated public lecture given by Steve Wolfe (Geological Survey of Canada) entitled *Living with Frozen Ground: The Impacts of Permafrost in Yellowknife*. The social activities included an opening reception and ice breaker, an evening barbeque outside the new Legislative Assembly building, and a formal banquet in the Explorer Hotel. At the banquet, attended by over 190 registrants and guests, Troy Péwé, Past President of the IPA, gave an after-dinner talk on his recollections and impressions of the changes in the international permafrost community over the last 50 years. The Roger J.E. Brown Award was presented by the Canadian Geotechnical Society to Michel Allard (Laval University). These presentations were followed by a traditional Indian drum dance.

In the closing ceremony Wilfried Haeberli announced the acceptance by the IPA Council of the Swiss offer to host the Eighth ICOP in the year 2003. A.L. Washburn read the names of many of the colleagues who had died since the 1993 Conference:

Canada

Robert Leggett–National Research Council
Steve Zoltai–Canadian Forestry Service

Russia

Pavel Ivanovich Melnikov–Russian Academy of Sciences
Lev Semenov–PNIIS
Kartashov Sergey Nikolayevich–Melnikov Permafrost Institute, Yakutsk
Vyalov Sergey Stepanovich, Chistotinov Leonid
Vasilyevich–Igarka Permafrost Station, Yakutsk

United States (many were supporters and friends of permafrost research)

Shunsuke Takagi–CRREL
James Bender–CRREL
Dwight Billings–Duke University
Hank Coulter–U.S. Geological Survey
Lou DeGoes–National Academy of Sciences
Charles Drake–Dartmouth College
Kaye Everett–Ohio State University
Harold Jorgenson–Bureau of Land Management
John Kiely–Bechtel Corporation
Koji Kawasaki–University of Alaska
Melvin G. Marcus–Arizona State University
Ned Ostenso–National Oceanic and Atmospheric Administration
Clyde Wahrhaftig–U.S. Geological Survey

LOCAL EXCURSION AND DIAMOND MINE TOUR

The large majority of Conference delegates participated in the local City of Yellowknife excursion. An illustrated

guidebook, edited by Steve Wolfe, provided a background for the tour. Within the city limits, permafrost is discontinuous in extent and marginal in its thermal state. The guide illustrates the numerous permafrost-related problems which have been encountered in recent years. Thermokarst resulting in surface disturbance, sunken sidewalks, road maintenance localities, frost-heaved utility poles, foundation and basement problems, the use of thermosyphons, and the recent localized growth of permafrost along snowmobile trails all testify to the importance of understanding permafrost conditions.

A second highlight of the field excursion program were two one-day excursions led by Don Hayley to the new BHP-operated Ekati Diamond Mine located north of tree-line at Lac de Gras. A total of 80 persons were transported to the mine site by charter aircraft. The mine, due to commence commercial operations in November 1998, consists of several deep open-pit operations exploiting a number of rich diamond-bearing kimberlite pipes. The mine has a projected 20-year life-span. The operation has necessitated the drainage and/or diversion of several tundra lakes and streams, the construction of several containment ponds for tailings, and the installation of a housing complex equipped with gymnasium and all-weather corridor links between buildings. The tour included a visit to several tailing-containment dams using permafrost cores to prevent seepage, the examination of massive ground ice within glaciofluvial sediments, and a walk over barren-land tundra terrain to view frost-heaved bedrock.

CONFERENCE DOCUMENTS

The program, abstracts and IPA reports are contained in a 327-page volume edited by A.G. Lewkowicz and M. Allard which was included in each registration package. The abstracts and reports are available on the IPA Web site. The Proceedings volume, also edited by Lewkowicz and Allard and available following the Conference, is an impressive hard cover volume published by Laval University that contains the 188 peer-reviewed papers. Another substantive publication is the well-illustrated 71-page report entitled *Living with Frozen Ground: A Field Guide to the Permafrost in Yellowknife, Northwest Territories*, edited by S.A. Wolfe with contributions by S. Smith, T.E. Hoeve, J. Bastedo and P.D. Keddie and published by the Geological Survey of Canada.

Several IPA publications were made available at the Conference. The CD-ROM Circumpolar Active-Layer Permafrost System (CAPS) produced by the National Snow and Ice Data Center (NSIDC) in cooperation with the IPA was demonstrated at the Conference. The digital version of the IPA permafrost map is on CD. A new IPA Glossary of

Permafrost and Related Ground-Ice Terms was prepared by Robert van Everdingen. The 278-page spiral-bound volume lists terms in 12 languages (Chinese, English, French, German, Icelandic, Italian, Norwegian, Polish, Romanian, Russian, Swedish, and Spanish), and it includes illustrations and photographs for a number of selected terms.

In addition to these publications, a 209-page Russian volume entitled *Problems of Geocryology* was published as a contribution to the Conference by the Melnikov Permafrost Institute in Yakutsk. The 27 papers cover a wide range of permafrost science and engineering topics with English language summaries. See *Publications*, page 41.

SPONSORS

In addition to the organizations sponsoring the Conference, the following organizations provided direct or indirect financial support to the organizers or the participants: BHP Diamonds Inc., National Hydrology Research Institute, International Arctic Research Center at the University of Alaska Fairbanks, Royal Canadian Geographical Society, City of Yellowknife, Government of N.W.T., U.S. National Science Foundation, Swiss Academy of Sciences, and Swiss Alpine Club.

REPORT OF FIELD TRIPS

In keeping with prior Conference tradition, summary reports of the pre- and post-Conference field excursions are presented.

Field Excursion 1A: Permafrost in Yukon Territory and Mackenzie Delta, Canada, 10–20 June 1998

Chris Burn (crburn@ccs.carleton.ca)

A 10-day pre-Conference field excursion to the Yukon and Mackenzie delta area, along a transect of the permafrost terrain found in northwest Canada, was led by Chris Burn (Carleton University) and Scott Smith (Agriculture and Agri-food Canada), with assistance in central Yukon from Richard Trimble (EBA Engineering Consultants Ltd.), and along the Dempster Highway from Wayne Pollard (McGill University). A total of 26 individuals from Canada, Germany, Switzerland, the United Kingdom, and the United States participated.

The excursion began in sporadic discontinuous permafrost near Whitehorse, southern Yukon Territory, and progressed to continuous permafrost in the western Arctic. The focus of the excursion was field examination of permafrost terrain at sites of published research. A binder containing several hundred pages of published papers and synopses was presented to each participant. The excursion visited several sites where long-term studies of permafrost terrain have been

completed, particularly in the Takhini River valley near Whitehorse, in the Stewart River valley near Mayo, and in the Mackenzie delta near Inuvik. Engineering aspects of highway and municipal construction were examined along the Klondike and Dempster Highways, and in Mayo, Dawson and Inuvik.

Highlights of the excursion included examination of cryostratigraphy of Klondike “muck” deposits at Last Chance Creek, exposures of frost blisters in North Fork Pass, and the Mayo Permafrost Dinner, sponsored by the Royal Canadian Geographical Society, with guests from the community of Mayo. The excursion shared its last full day (19 June) with 19 additional participants, who had arrived in Inuvik for excursion 1B. Fourteen participants took part in both 1A and 1B.

Leaders: Chris Burn, C.A. Scott Smith, Wayne Pollard and Richard Trimble. Leaders for specific sites: Rick Janowicz (Indian Affairs and Northern Development Canada), Charlotte Mougeot (Mougeot Geoanalysis), Charlie Roots (Geological Survey of Canada), Rick Lindsay (Town of Inuvik), and Erica Kotler (Carleton University).

Assistants: Gary White (G.V. White Resources Ltd.), Anne-Pascale Bartleman (Carleton University/University of Guelph), Les Kutny (Aurora Research Institute), Doug Joe (Inuvik), Alex Elanik (Inuvik), Alan Fehr (Parks Canada), Ross Cooper (Mayo), Art Hutchison (Agriculture Branch, YTG), and Glen Carpenter (Indian Affairs and Northern Development Canada).

Participants: Steve Blasco (Geological Survey of Canada), Reynald Delaloye (University of Fribourg), Diane Emond and Mark Langdon (Indian Affairs and Northern Development Canada), Wilfried Haeberli, Martin Hoelzle, and Andi Käab (University of Zurich), Christoph Kneisel (University of Trier), Hans Keinholtz and Bernhard Krummenacher (University of Berne), Toni Lewkowicz (University of Ottawa), Christine Marion (Applied Ecosystem Management), Ted Osmund-Jones (Yukon College), Rorik Petersen (University of Colorado), Nancy Steffen (Whitehorse), John Storer (Beringia Interpretive Centre, YTG), Dani Vonder Mühl and Matthias Wegmann (ETH Zurich), Colin Whiteman (University of Brighton), and Peter Worsley (University of Reading).

Itinerary:

10 June: Participants arrived in Whitehorse. Introductory overview of field excursion region.

11 June: Visit to Wolf Creek Experimental Watershed near Whitehorse. Transfer to Takhini River valley for examination of thermokarst development following cultivation; permafrost–climate relations in discontinuous permafrost; permafrost degradation induced by forest fire. Evening reception at Beringia Interpretive Centre.



Field excursion 1A at the Arctic Circle crossing, Dempster highway, northern Yukon Territory, Canada, 18 June 1998. Front row (l to r): Martin Hoelzle, Matthias Wegmann, Wayne Pollard, Rorik Petersen, Christine Marion, Dani Vonder Mühl, Erica Kotler, Anne-Pascale Bartleman, Toni Lewkowicz, Diane Emond and Simba. Standing (l to r): Nancy Steffen, Peter Worsley, Ted Osmund-Jones, John Storer, Wilfried Haerberli, Andi Käab, Colin Whiteman, C.A. Scott Smith, Hans Keinholz, Christof Kneisel, Steve Blasco, Reynald Delaloye, Bernhard Kruppenacher, Mark Langdon, and Chris Burn.

12 June. Travel on Klondike Highway, Whitehorse to Mayo. Visiting palsas and permafrost mounds at Fox Lake; Tatchun Creek Highway alignment; Midway forest fire site; 11% Hill Highway alignment.

13 June. Holocene soil development in Stewart River valley; Mayo permafrost research sites; permafrost and climate change; development of retrogressive thaw slumps; slope movement in ice-rich permafrost; aggradation of permafrost on point bars; development of thermokarst lakes; origin of aggradational ice. Evening community reception by Village of Mayo.

14 June. Development of the “drunken” forest; development of cryosols; regional alpine permafrost; patterned ground and cryoplanation terraces on Keno Hill; Taylor’s Placer Mine. Evening dinner at Silver Trail Inn.

15 June. Travel on Klondike Highway, Mayo to Dawson. Sand wedges developed in pre-Wisconsinan drift. Permafrost and municipal construction in Dawson City.

16 June. Klondike overview from the Midnight Dome; soil temperatures and permafrost degradation following cultivation at Haydorff’s farm; Bear Creek pingo; cryostratigraphy of Wisconsinan deposits on Last Chance Creek; gold panning.

17 June. Travel on Dempster Highway, Dawson to Eagle Plains. Seasonal frost mounds at North Fork Pass; icings of the Blackstone River; Ogilvie River canyon; fractured bedrock; cryosol and hummock development at Eagle Plains.

18 June. Travel on Dempster Highway, Eagle Plains to

Inuvik. Arctic Circle Crossing; solifluction and hillslope movement in Richardson Mountains; highway construction and culvert design in Richardson Mountains; ice-rich ground of Peel Plateau. Evening presentation of offshore permafrost conditions and environments by Steve Blasco at Inuvik Research Centre.

19 June. Inuvik and Mackenzie delta. Mud hummocks and circles at Navy Road site; building design and construction in continuous permafrost at new Inuvik arena; soil deformation around ice wedges and tilting of trees; airport ice-wedge site; overview boat trip on Mackenzie River; permafrost aggradation along point bars at Don Gill’s research camp. Evening presentation by local people on life in the Mackenzie delta area hosted by Aurora Research Institute.

20 June. End of Excursion 1A.

Field Excursion 1B: Permafrost in the Mackenzie Delta Area, 18–22 June 1998

Chris Burn (crburn@ccs.carleton.ca)

Participants arrived in Inuvik on 18 June, either independently or as part of Excursion 1A. The two groups spent a day in the Inuvik area, with the morning on the ground, and then departed by boat for Gill’s research camp site where seminal research was conducted in the late 1960s by Don Gill and Mike Smith. The excursion was joined for 20–21 June by J.Ross Mackay (University of British Columbia), who guided participants over his long-term study sites

of ice wedges at Garry Island, and pingos near Tuktoyaktuk. The Geological Survey of Canada's valuable, continuing research in the region was illustrated by Larry Dyke's presentation at an abandoned well site, Mark Nixon's presentation of long-term monitoring of ground ice creep, and Steve Solomon's presentation of shore-line erosion at Tuktoyaktuk. The trip was rounded off with examination of massive ground ice in the Peninsula Point slump and, close-up, in the Tuktoyaktuk community ice cellar. Transportation during the excursion utilized motor vehicle, boat, helicopter and Twin Otter aircraft.

Leaders: Chris Burn, Wayne Pollard, J. Ross Mackay, Steve Solomon, Larry Dyke, Mark Nixon, and Rick Lindsay (Town of Inuvik).

Assistants: Scott Smith, Les Kutny, Alan Fehr, Alex Elanik, and Doug Joe.

Participants: Jerry and Celia Brown (IPA), Bruce Dupuis (Foothills Pipelines), Regula Frauenfelder (University of Zurich), Jean-Michel Gardaz (University of Fribourg), Steve Gurney (University of Reading), Drew Hyatt (Valdosta State University), Felix Keller (Academia Engiadina), Hansrudolf Keusen (Geotest, Switzerland), Olli Okko (Technical Research Centre of Finland), Sam Outcalt (U.S.A.), Kumiko Takata (NIES, Japan) and Rein Vaikmäe (Tallinn Technical University) joined the Excursion 1A participants.

Itinerary:

18 June: Orientation evening in Inuvik Research Centre, with presentation on permafrost and offshore environments of the near-shore Beaufort Sea by Steve Blasco.

19 June: Same as 1A.

20 June: Flight by Twin Otter to Garry Island. Ice-wedge development on Garry Island; industrial waste disposal in a sump surrounded by permafrost, Mackenzie delta; Holocene cryostratigraphy on Pelly Island.

21 June: Flight by Twin Otter to Tuktoyaktuk. Ground ice creep at Involved Hill; growth of pingos, Tuktoyaktuk Peninsula; development of massive ground ice at Peninsula Point; coastal erosion at Tuktoyaktuk village; visit to the community ice cellar in massive ice; cultural aspects of Inuvialuit life.

22 June: End of excursion 1B; flight to Yellowknife.

Field Excursion 4: Subarctic Quebec, 29 June–6 July 1998

Michel Allard (m.allard@cen.ulaval.ca)

The post-conference excursion took the 11 participants to the east coast of Hudson bay, northern Québec. The theme of the excursion was Permafrost in Subarctic Wetlands. Several palsa bogs were visited and the participants had opportunities to observe vast tracts of non-peat-covered permafrost mounds. Travel by float plane and helicopter

allowed the group to view a variety of periglacial phenomena such as frost blisters, bedrock heaved features, mudboils, tundra polygons and, particularly, an array of landforms related to palsa growth and decay. Field discussions included topics associated with aggrading features on recently drained lake beds, recent palsa-like mounds along the sea shore, mature landforms, degrading palsas, and rimmed palsa scars. The geophysical characteristics of the permafrost were reviewed. A strong emphasis was put on the sensitivity of permafrost to even subtle climatic and ecological changes. The last day of the excursion was devoted to a small symposium at the Whapmagoostui-Kuujuaraapik field station. The main topics discussed concerned the paleoclimatic significance of fossil landforms in Europe in comparison with present-day subarctic geomorphology and climate, the new techniques required for acquiring new information through deeper drilling and improved geophysics, the value of mathematical modeling for a better understanding of processes, and the terminological problems that arise from the regional variability in palsa morphology and stratigraphy in different parts of the world. Laval students who were already involved in field research participated and assisted with the field trip and symposium.

Leaders: Michel Allard, Serge Payette, and Richard Fortier (Centre d'études nordiques, Université Laval).

Participants: William Krantz (University of Colorado), Albert Pissart and Irénée Heyse (Université de Liège), Anne-Marie Cames (Laboratoire Central des Ponts et Chaussées), Bernard Bourguet (Bureau de recherches géologiques et minières), Pirita Oksanen (University of Lapland), Georg Delisle (Bundesanstalt für Geowissenschaften und Rohstoffe), Angélique Prick, Stuart Harris and Peter Kershaw (University of Calgary).

Itinerary:

29 June: Air travel from Montréal to Kuujuaraapik. Tour of the village and surroundings.

30 June: Helicopter flights with three stops along Manitounuk Sound, 60 km from the field station, to observe permafrost plateau, field of bedrock heaved landforms, and frost blisters.

July 1: Flight to field camp at Rivière Boniface at the treeline 300 km north of Kuujuaraapik. Enroute observed palsa bogs, permafrost plateaus, and tundra polygons.

July 2–4: Zodiak travel on Rivière Boniface to visit peat plateaus, paleosols, patterned ground, and degrading palsas and palsa scars.

July 4–5: Return to Kuujuaraapik field station and symposium.

July 6: Local visits and return to Montréal.

REPORTS OF THE EXECUTIVE COMMITTEE AND TWELFTH AND THIRTEENTH IPA COUNCIL MEETINGS

The Executive Committee Meeting and Twelfth and Thirteenth IPA Council Meetings were held at the Explorer Hotel, Yellowknife, Canada. Present were:

EXECUTIVE COMMITTEE, COUNCIL MEMBERS AND REPRESENTATIVES

Argentina: Dario Trombotto
Austria: Gerhard Lieb
Belgium: Irene Heyse
Canada: Margo Burgess, Hugh French (EC), Don Hayley
China: Cheng Guodong (EC), Jin Huijun
Denmark: Hanne H. Christiansen
Finland: Seppo Saarelainen
France: François Costard
Germany: Hans Hubberten, Lorenz King
Italy: Francesco Dramis
Japan: Norikazu Matsuoka, Kenji Yoshikawa
Kazakhstan: Sergei Marchenko
Mongolia: Natsdagdor Sharkhuu
Netherlands: Jef Vandenberghe
Norway: Arne Instanes, Truls Molmann (EC)
Poland: Woiciech Dobinski
Russia: Feliks Are (EC), Nikolai Romanovskii (EC)
Southern Africa: Jan Boelhouwers
Spain: Proxy Lorenz King
Sweden: Jonas Åkerman
Switzerland: Christian Hauck, Wilfried Haerberli (EC),
Dani Vonder Mühl
U.K.: Mike Clark, Charles Harris
U.S.A.: Bernard Hallet, Rupert Tart, Jerry Brown (EC)

COMMITTEE, WORKING GROUP AND TASK FORCE CHAIRS (NON COUNCIL REPRESENTATIVES)

Canada: Michel Allard, Kevin Hall, Branko Ladanyi, Toni Lewkowicz, Charles Tarnocai, Steve Solomon, Al Taylor, Robert van Everdingen
Denmark: Ole Humlum
Russia: David Gilichinsky, Lev Khroustalev
U.S.A.: Roger Barry, Oscar Ferrians, Frederick Nelson

OBSERVERS

Canada: Keith Mercredi, Scott Smith
Estonia: Rein Vaikmäe
France: AnneMarie Cames-Pintaux
Germany: Julia Boike
Italy: Mauro Guglielmin
New Zealand: Iain Campbell
Romania: Petru Urdea

Russia: Gueorgui Perlshtein
Switzerland: Bernhard Krummenacher
U.K.: Steve Gurney, Colin Whiteman
U.S.A.: Max Brewer, Troy Péwé, Vlad Romanovsky,
Yuri Shur, Ron Sletten, Ted Vinson, Jess Walker

EXECUTIVE COMMITTEE, 22 JUNE 1998

President Cheng Guodong chaired the meeting, with Vice Presidents Hugh French and Nikolai Romanovskii and Secretary General Jerry Brown present. The main purpose of the meeting was to discuss and solicit additional comments from members on the items to be voted on at the subsequent Council meetings.

1. FINANCE

On behalf of the Finance Committee, the Secretary General reported on the current budget and the proposed five-year plan (1999–2003). The major 1998 expense (approximately US\$16,000 from the three-year reserve) was support of travel to Yellowknife. At least US\$6000 and as much as US\$10,000 may be carried over into budget year 1999. Assuming that annual contributions continue at the present level, approximately US\$15,000 will be available annually for Working Parties, the Executive Committee, and partial support of *Frozen Ground*. The Finance Committee recommended that it be disbanded and its responsibilities assigned to the proposed expanded Executive Committee and Secretariat. A consensus was reached to disband the Committee.

2. CONSTITUTION

Vice President French led the discussion and provided background for the proposed changes, including discussion of the Executive Committee meeting in Bologna on 31 August 1997. The proposed changes were circulated in late 1997 and were to be voted upon at the first Council meeting. If approved, the expanded Executive Committee would be elected at the second Council meeting in Yellowknife. With the increased number of members (currently 22 vs. the original 4), there is a need to have broader representation on the EC, including regional and disciplinary coverage. An increase to six members plus a Secretariat is proposed. Each member of the EC would have at least one specific or shared responsibility, such as international programs, Working Parties coordination, engineering, next Conference,



Participants in the IPA Council meetings, Yellowknife, Canada, 26 June 1998. (Photograph by T.L. Péwé.)

financial matters, etc. The role of the Secretary General can thus be redefined to that of a Secretariat. The location of the Secretariat has still to be decided. The Members present agreed with the proposed changes, including more visibility in the Constitution and Bylaws for the Working Parties.

3. ADVISORY COMMITTEE ON WORKING GROUPS

The Secretary General submitted the report on behalf of Acting Chair Haerberli. The report included a historical overview of Committee activities, an organizational structure for IPA activities, and draft rules and funding guidance for Working Parties. As required by rules governing the Working Groups, after 10 years of very productive activity, the Terminology and Mountain Permafrost Working Groups will be discontinued. It was recommended that the Data and Information WG become a Standing Committee and that the two engineering WGs be merged into a single Permafrost Engineering WG. Additional proposals included establishing two new WGs on offshore permafrost and the Southern Hemisphere, and four Task Forces on isotope geochemistry, rock glaciers, mapping and modeling, and monitoring. Task Forces are intended to be short-term activities (1–3 years) that will make assessments and recommendations. Their work can be performed in conjunction with other international organizations. Changes in rules for WGs would permit open membership and two co-chairs.

4. EDITORIAL COMMITTEE

The Secretary General indicated that no report was available and that the Committee has not been active. In future the expanded Executive Committee, Secretariat or others could perform the editorial functions. Therefore, a recommendation to disband the Committee would be made to the Council.

5. WORKING GROUPS

Short reports were presented for existing Working Groups and the proposed new Southern Hemisphere WG. Detailed reports including future directions are presented for existing WGs in the Conference program and abstract volume (pages 213–281); they are also available on the IPA Web site.

6. INTERNATIONAL ACTIVITIES

Roger Barry presented a summary of recent meetings related to global observations and research programs under the World Climate Research Programme (WCRP), namely the Global Climate Observing System (GCOS) and the Global Terrestrial Observing System (GTOS) (see *Frozen Ground* No. 21 for background). The Terrestrial Observation Panel for Climate (TOPC) of the GCOS had met in Corvallis, Oregon, in May 1998. Barry had presented a proposal for the Circumpolar Active-Layer Monitoring (CALM) network to be designated as a GCOS implementation component. The panel welcomed the proposal and provided a list of actions required of the IPA in order to formalize CALM and PACE activities within the GCOS Global Hierarchical Observing Strategy (GHOST). A draft resolution for IPA support of the WCRP/GCOS/GTOS permafrost network has been circulated for Council discussion and approval.

7. HERITAGE SITES

Al Taylor raised interest in nominating unique and representative permafrost features and sites as part of an international heritage program. The IPA parent organization, the IUGS, has a Working Group on Global Geosites, and Taylor volunteered to contact it for guidelines for nominations. This topic might be appropriate for a presentation at the International Geological Congress in Brazil in 2000.

The meeting adjourned about 5:30 PM.

TWELFTH COUNCIL MEETING, 23 JUNE 1998

The meeting convened at 5:15 p.m.

1. WELCOME

President Cheng Guodong opened the meeting, with Vice Presidents Hugh French and Nikolai Romanovskii and Secretary General Jerry Brown present. Twenty Members were present; Marchenko from Kazakstan was temporarily absent and Germany acted as a proxy for Spain.

2. APPROVAL OF AGENDA

The agenda was approved as proposed.

3. STATUS OF PREVIOUS MINUTES

The minutes were reviewed and approved unanimously with no changes (moved by Hallet and seconded by King).

4. NEW MEMBERS

Daniel Vonder Mühll (Switzerland) made a motion nominating Austria for membership. Austria has three institutes actively involved in mountain research. The Austrian Geographical Society will be the Adhering Body, with H. Fischer (head of the Commission of Geomorphology) as the official representative. Information on the membership and national activities is to be provided by Gerhard Karl Lieb, Institute of Geography, University of Graz. Dramis seconded the nomination. The vote was unanimous. Gerhard Lieb represented Austria at the Council meeting as the twenty-third Adhering Body.

5. SECRETARY GENERAL'S REPORT

Jerry Brown reported that the Conference abstract and program volume and Web site contained a detailed five-year report. Australia and New Zealand have been approached concerning membership in IPA. Gonçalo Teles Vieira of Portugal has been designated an Individual Member. The SG stressed the need for the proposed changes in the Constitution, thus providing broader representation and involvement of Members on the Executive Committee, and establishment of a Secretariat in lieu of the SG. In anticipation of these changes, the SG stated his willingness to continue to work on unfinished business through the end of 1998. This would include preparation of *Frozen Ground*, meeting minutes, the IUGS annual report, and a financial report.

6. FINANCE COMMITTEE

Chair Ferrians presented the report on behalf of Committee members Pissart and Zhu Yuanlin. The Committee recommended that its activities be transferred to the new

Executive Committee and Secretariat. The SG explained details of the past, present and five-year budgets (see 22 June meeting). Acceptance of the Committee report and disbanding of the Committee was moved by Hayley and seconded by Hallet. The vote was unanimous.

7. ADVISORY COMMITTEE ON WORKING GROUPS

Acting Chair Haeberli presented a detailed written report, including the history of the Committee, the Working Groups' activities over the past five years (see Conference abstract and program volume and the Web site for full reports), proposed new activities, revised rules for Working Groups and Task Forces and funding of activities, and an organizational chart prepared by Mike Clark in consultation with Barry and Brown. The 10-year activities of the WGs on data, mountain permafrost and terminology are completed. Barry and Clark recommended that the Data and Information WG become a Standing Committee (see Recommendation). New WGs on the Southern Hemisphere and coastal permafrost and Task Forces on permafrost creep, mapping mountain permafrost, and isotope geochemistry are proposed.

The report was discussed in some detail; individual items were to be approved at the 26 June Council meeting. Significant changes to the rules for WGs would create two co-chairs in place of a chair and secretary, with membership open to any active worker. Membership should not reflect individual national interests. The need for a Standing Committee on Data, Information and Communication (SCDIC) was agreed upon. The question of a separate monitoring committee was raised, and referred to the Executive Committee for further study and in response to GCOS/GTOS network requirements.

8. EDITORIAL COMMITTEE

The SG reported on behalf of Chair Schmitt that the Committee had not been active and that its function should be distributed elsewhere, including the expanded Executive Committee and SCDIC. Acceptance of the Committee report was moved by Dramis and seconded by King. The vote was unanimous.

9. STATUS REPORT

Conference Chair Don Hayley presented a brief update on the Conference. There are approximately 250 participants, including 25 students. As reported elsewhere, 188 papers will be published in the Proceedings. Field trips are being well attended. Outside contributions amounted to CAS60,000 and there may be a small surplus. The Canadian Organizing Committee report will include recommenda-

tions on future Conferences, such as the need for guidelines on paper submission and review, and organization of special sessions by WGs and professional organizations, particularly for engineering topics.

10. EXECUTIVE COMMITTEE ELECTION

The report of the Nomination Committee (Pissart, Hallet, Konishchev) was presented by the Secretary General. Hugh French (Canada) was nominated for President and Feliks Are (Russia) and Wilfried Haerberli (Switzerland) for Vice President (two positions). No other nominations were received. As required by the Constitution the election for President was conducted by secret ballot; of the 22 eligible ballots, 21 were cast for Hugh French. The election of the two Vice Presidents was unanimous. The results are effective at the 26 June Council meeting. As agreed earlier, the retiring SG would continue to provide support to the Council and the EC until the end of 1998.

11. CONSTITUTION

President Cheng Guodong asked Vice President French to present each change and its rationale (see final text, pages 21–24). Changing the objective of IPA to include the word “environments” after permafrost was discussed and voted upon; Hayley moved and Hallet seconded. The vote was unanimous. Many of the other changes were procedural, recognizing the shift to an expanded EC and creation of a Secretariat. The three new Ordinary Members of the EC would be responsible for at least engineering interests, coordination of Working Parties (including Task Forces), and regional activities in Asia. Provisions for mail balloting were added. To accommodate the nomination and election of the three additional members of the EC, the requirement for a nomination report one year in advance was dropped, with the understanding it would be reinstated following the 26 June election. Procedures for nominating and appointing the Secretariat were discussed and voted upon. The provision to establish an International Conference Advisory Committee for future Conferences was agreed to. Dramis moved the above changes and Vonder Mühl seconded. The vote was unanimous.

12. APPOINTMENT OF INTERIM NOMINATING COMMITTEE

Since three Ordinary Members would be elected at the 26 June Council meeting, the President, with Council approval, appointed a three-person interim Nominating Committee. The Committee, composed of Hallet (U.S.A.), Dramis (Italy) and Perlstein (Russia), was asked to consult with Council Members and to present a slate of candidates consistent with the expanded functions of the EC.

13. ADJOURNMENT

The meeting adjourned at 8:15 p.m.

THIRTEENTH COUNCIL MEETING, 26 JUNE 1998

The meeting convened at 1:40 p.m.

President French chaired the meeting; Vice Presidents Are and Haerberli were present. Kevin Hall (Canada) was asked to record informal minutes to be transcribed officially by Jerry Brown. Twenty-one Members were initially represented, with Trombotto from Argentina temporarily absent and Germany acting as a proxy for Spain.

Agenda: A revised agenda was presented by the President as reflected in the minutes. Barry requested that resolutions be added. French agreed that they would be included under 8. New Working Groups and Task Forces. The new agenda was approved.

1. CONSTITUTION

The revised Constitution as approved was distributed. The phrase “one year before the Conference” under the By-law dealing with the nomination was proposed for reinsertion. Hayley proposed and Akerman seconded. The vote was unanimous.

The President informed the Council that Denmark is being considered as the location of the Secretariat. Partial support may come from the Commission for Scientific Research in Greenland. The IPA recommends that Hanne H. Christiansen operate the Secretariat for the next five years.

2. REPORT OF INTERIM NOMINATING COMMITTEE

Hallet presented the report, emphasizing the need for regional balance, representation of the engineering communities, and coordination of Working Parties' activities. The nominees are Zhu Yuanlin (China) as regional representative for Asia, as well as engineering; Jerry Brown (U.S.A.) for coordination of Working Parties; and Truls Molmann (Norway/Svalbard) for engineering. Both Brown and Molmann agreed to serve. Zhu Yuanlin was not present, but past President Cheng Guodong concurred on his behalf. Brown emphasized his role would be primarily coordination within IPA, and that Working Parties and others need to perform international liaison. The report was accepted by the President. The representative from Norway, Arnes Instanes, placed in nomination Seppo Sarrelainen (Finland) to represent engineering. Åkerman seconded the nomination.

3. ELECTION OF THREE ORDINARY MEMBERS

The President proposed a formal voting procedure whereby each Member would submit on a written ballot the names of three of the four nominees. Oscar Ferrians and Iain Campbell were appointed the official ballot tellers. Since Saarelainen was the Finnish representative, Vaikmäe voted as proxy for Finland. Argentina was not present for the vote. The final ballot count was: Brown 22; Zhu Yuanlin 14; Molmann 18; and Saarelainen 12. Brown and Molmann joined the meeting as Ordinary Members of the Executive Committee, and Zhu Yuanlin will be notified of his election and responsibilities. Agenda items 6 and 7 were discussed during the ballot count.

4. APPROVAL OF ADVISORY COMMITTEE ON WORKING GROUPS

The report of the Advisory Committee on Working Groups as discussed at the 23 June meeting was presented by Haerberli for a vote moved by Harris and seconded by King. The vote was unanimous. The chart on page 17 shows the IPA organizational components.

5. APPROVAL OF NEW GUIDELINES ON WORKING GROUPS AND TASK FORCES

Based on the 23 June discussions, improved guidelines were distributed and reviewed (see p. 13). The discussion on Working Groups centered on their role in future Conferences, with Hayley recommending that the WGs organize special sessions and workshops and be more involved in Conference planning. It was agreed to add this point to rule 10. Haerberli reminded the Council that a WG's activities must cease after two 5-year terms. New activities and a new title should be proposed if appropriate. Romanovskii asked if additional co-chairs could be added. Brown replied that it would be better to be consistent, with all WGs having two co-chairs, but that subgroups within a WG could be established with a separate chair or co-chairs. Guidelines for funding were briefly discussed. It was recognized that the limit of US\$2000 per activity was a very modest amount. A motion to approve the rules and guidelines for Working Parties and funding was made by Jin Huijun and seconded by Dramis. The vote was unanimous.

6. APPROVAL OF STANDING COMMITTEE ON DATA, INFORMATION AND COMMUNICATION

Barry presented the recommendation that the Data and Information WG should be reestablished as a Standing Committee on Data, Information and Communication and that Mike Clark (U.K.) and he co-chair the new Committee.



Newly elected members of IPA Executive Committee. L-R: Truls Molmann (Member, Norway); Jerry Brown (Member, U.S.A.); Feliks Are (Vice President, Russia); Hugh French (President, Canada); and Wilfried Haerberli (Vice President, Switzerland). Not present: Zhu Yuanlin (Member, China). (Photograph by T.L. Péwé.)

The rationale for this change reflects past accomplishments of the Working Group and the continuing commitment of IPA to dissemination of information on all aspects of frozen ground. Proposed activities include overseeing the IPA Web page, assisting the EC in development of the IPA Permafrost Monitoring Network, the next version of the CAPS CD-ROM, and coordinating with GCOS/GTOS. Revising the permafrost glossary and assisting with future issues of *Frozen Ground* are other possible functions. Vonder Mühl proposed and Christiansen seconded. The vote was unanimous.

Recommendation: Standing Committee for Data, Information and Communication

Recognizing the important strides that have been made in documenting, archiving and distributing permafrost data and information since 1988, that the tasks undertaken by the Working Group on Data and Information during 1988–98 have assumed a strong routine element, thus making their continuance through the temporary structure of a Working Group inappropriate, and that there is a need for further innovation in preparing and disseminating information about permafrost, it is recommended that a Standing Committee be established to ensure the continuity and expansion of those activities in the future.

The functions of the Standing Committee would be:

- to ensure the continued collection, archiving, documentation and dissemination of permafrost/frozen ground data;
- to address the improved standardization of frozen ground data collection and documentation;
- to maximize the dissemination of information and value-added products about frozen ground research to inter-

GUIDELINES FOR WORKING GROUPS, STANDING COMMITTEES AND TASK FORCES

Working Groups and Standing Committees

1. Working Groups and Standing Committees will be approved by the IPA Council.
2. A Working Group or Standing Committee must have a formalized statement of purpose.
3. Each Working Group and Standing Committee will consist of two Co-Chairs and Members. Membership will be based on an individual's interest in contributing to the activity and not limited by numbers or national representation. Any interested individuals may request appointment by the Co-Chairs of the Working Group
4. The Co-Chairs shall not be from the same IPA Adhering Bodies.
5. The Co-Chairs shall be appointed by the IPA Council. Members shall be appointed by the Co-Chairs with the approval of the IPA Executive Committee.
6. The life span of a Working Group will be an interconference period (5 years), renewable once (i.e. a maximum of 10 years). A Standing Committee's activities will be reviewed every 10 years.
7. No person may occupy the position of Co-Chair of more than one Working Group or Standing Committee at any one period of time.
8. Each Working Group and Standing Committee should submit an annual progress report for *Frozen Ground* and the IPA Web page and a summary report at least 3 months prior to the forthcoming international Conference. Working Groups and Standing Committees are encouraged to publish the results of their activities in more detail in an appropriate technical form.
9. Activities of Working Groups and Standing Committees may include the holding of meetings and field excursions, and the publication of books, maps and other documents. They are expected to establish and maintain liaison with other international organizations, provide input to the Global Geocryological Database (GGD), and participate in monitoring activities as appropriate (see Table, p. 15).
10. Each Working Group and Standing Committee will hold a business meeting at the International Conference, and provide input to the Conference program.
11. Working Groups and Standing Committees should be financially self-supporting. However, they can apply to the Executive Committee for funding of specific activities.

Task Forces

1. Task Forces will be approved by the IPA Council.
2. A Task Force must have a formalized statement of purpose.
3. A Task Force will consist of a Chair and Members. Membership will be based on an individual's interest in contributing to the activity. Any interested individual may participate in the Task Force.
4. The Chair shall be appointed by the IPA Council. The Members shall be appointed by the Chair with the approval of the IPA Executive Committee.
5. The life span of a Task Force will be a maximum of three years. It can be extended as an Interim Working Group by the Executive Committee until the next Conference or Council meeting.
6. Each Task Force should submit an annual progress report for *Frozen Ground* and the IPA Web page and a summary report at least 3 months prior to the forthcoming International Conference.
7. Task Forces should be financially self-supporting. However, they can apply to the Executive Committee for funding of specific activities.

Funding Support

1. Funds are limited to US\$2000/year for each activity.
2. Working Groups, Standing Committees and Task Forces should not apply for funding each year, but rather on a "need" basis.
3. Availability of funds and the merit of the proposal based on tangible benefits and/or products will be the criteria for support.
4. Proposals involving collaboration among Working Groups, Standing Committees, Task Forces and international organizations, and where additional support is being sought elsewhere, are encouraged.
5. Funds can be requested for basic support of Working Group, Standing Committee, and Task Force activities (e.g. mailings, organizing expenses etc.).
6. Deadline for receipt of proposals is December of each year, for disbursement of funds in the following year. Proposals should be submitted to the IPA Secretariat for Executive Committee decision.

national and national agencies and organizations, including the international Arctic Data Directory (ADD), and to the permafrost community through reports in *Frozen Ground*,

- to assist the Executive Committee with the developing responsibilities for permafrost monitoring;
- to report to the GCOS/GTOS component of the World Climate Research Programme (WCRP) on the status of permafrost monitoring, and to identify permafrost research issues for the task group of the WCRP on Climate and the Cryosphere (CLIC);
- to provide liaison with cognate data collection and monitoring programs, especially CALM and the EU PACE project, and to invite such organizations to nominate a representative to the IPA Committee; and
- to oversee the contents and ensure the continuity of the IPA Web site.

7. INVITATION TO EIGHTH CONFERENCE

Haeberli presented the official offer from the Swiss Academy of Sciences (President Hauck) and the Swiss Glaciological Commission (President Gaeggeler) to host the Eighth ICOP in the year 2003. Haeberli and Sarah Springmann from the Geotechnical Institute of the Swiss Federal Institute of Technology will work in close cooperation in organizing the Conference. The motion to accept the invitation was made by Dramis and seconded by Hallet. The vote was unanimous.

The meeting recessed at 2:55 p.m. and reconvened at 5:10 p.m. following the closing session of the Conference.

8. WORKING PARTIES AND RESOLUTIONS

Brown presented the revised list of Working Parties, their co-chairs, purpose statements and proposed international

STANDING COMMITTEE, WORKING GROUP AND TASK FORCE ORGANIZATION 1998–2003

*IPA Liaison:
Organizations
and Programs*

<i>IPA Working Parties</i>	<i>Chairs</i>	<i>Objectives</i>	<i>IPA Liaison: Organizations and Programs</i>
STANDING COMMITTEE			
Data, Information and Communication	Roger Barry (U.S.A.) rbarry@kryos.colorado.edu Mike Clark (U.K.) mjc@soton.ac.uk	To initiate and implement IPA strategies for data , archiving, information product development, and communication within and beyond the permafrost community	GGD, ADD, AMD IASC, WDCs GTOS/WCRP/CLIC PLC, CALM, PACE
EXISTING WORKING GROUPS			
Global Change and Permafrost	Oleg Anisimov (Russia) oleg@ans.usr.shi.spb.ru Frederick Nelson (U.S.A.) fnelson@udel.edu	To facilitate analysis of changes in permafrost and its distribution induced by climatic change, and to promote knowledge about the impact of these changes on natural systems and human activities. Subgroup to coordinate CALM network.	IPCC, IGU, PACE WCRP/CLIC, GGD ITEX/CALM, AMAP EWN, NES
Periglacial Processes and Environments	Ole Humlum (Denmark) oh@geogr.ku.dk Norikazu Matsuoka (Japan) matsuoka@atm.geo.tsukuba.ac.jp	To evaluate different methodologies and techniques for monitoring periglacial processes, and to publish a manual of recommended techniques.	IGU, IAG, GGD CALM, PACE COGEOENVIRONMENT DOMODIS
Permafrost Engineering	Lev Khroustalev (Russia) geocryol@artifact.geol.msu.ru Branko Ladanyi (Canada) bladanyi@mail.polymtl.ca	To collect information on the practices and procedures of permafrost engineering in various regions of the world, and to facilitate communication with permafrost scientists.	ISSMFE, ASCE CSCE, CGS ASTM, ISGF, GGD COGEOENVIRONMENT
Cryosols	Sergey Goryachkin (Russia) goryach@geosoil.msk.ru Charles Tarnocai (Canada) tarnocai@em.agr.ca	To establish interactions between geocryology and soil science, prepare a cryosol monograph and global cryosol classification and map, and organize the Third International Cryopedology Conference in Denmark in 2001.	ISSS, GGD, GRID
NEW WORKING GROUPS			
Coastal and Offshore Permafrost	Hans Hubberten (Germany) hubbert@awi-potsdam.de Nikolai Romanovskii (Russia) nromanovsky@glas.apc.org	To encourage the interaction of investigations on the subjects of onshore, transitional and offshore permafrost and hydrates. Subgroup on coastal erosion, Chair S. Solomon (Canada).	LOIRA, QUEEN RAISE, GRAND CAPE, LOICZ, IGU OIC/IASC, APARD
Southern Hemisphere Permafrost and Periglacial Environments	Jan Boelhouwers (South Africa), janboel@uwc.ac.za Kevin Hall (Canada) hall@unbc.ca	To create a scientific platform to stimulate interaction between permafrost and periglacial researchers in the Southern Hemisphere, and to synthesize permafrost and periglacial data and information, including existing IPA initiatives in the region.	SCAR, INQUA GGD, SITEX CALM, PACE AMD
TASK FORCES (1–3 years duration)			
Rock Glacier Dynamics	Wilfried Haeblerli (Switzerland) haeblerli@geo.unizh.ch	To establish the basis for and initiate numerical modeling concerning flow of ice/rock mixtures on slopes.	ICSI, PACE COGEOENVIRONMENT DOMODIS
Mapping and Distribution Modeling of Mountain Permafrost	Bernd Etzelmüller (Norway) bernd.etzelmuller@geografi.uio.no	To discuss and develop systematic strategies for mapping and distribution modeling of mountain permafrost at different scales.	PACE, GGD, GRID COGEOENVIRONMENT DOMODIS
Isotope/Geochemistry of Permafrost	Rein Vaikmäe (Estonia) vaikmae@gi.ee	To promote application of isotope geochemical methods in permafrost research, to identify the main gaps in knowledge for successful application of isotopic methods in permafrost studies, and to develop an internationally accepted protocol for a WG.	IGCP 415 GRAND, GGD

IPA LIAISON: ORGANIZATIONS AND PROGRAMS

ADD	Arctic Data Directory	IGBP	International Geosphere–Biosphere Programme
AMAP	Arctic Monitoring and Assessment Programme	INQU	International Quaternary Association
AMD	Antarctic Master Directory	IOC	International Oceanographic Commission
APARD	Arctic Paleo-River Discharge (AOSB)	IPCC	Intergovernmental Panel on Climate Change
ASCE	American Society of Civil Engineers	ISSMFE	International Society of Soil Mechanics and Foundation Engineering
ASTM	American Society for Testing and Materials	ISGF	International Symposium on Ground Freezing
CALM	Circumpolar Active Layer Monitoring	ISSS	International Society of Soil Science
CAPE	Circumpolar Arctic PaleoEnvironments	ITEX	International Tundra Experiment
CLIC	Climate and Cryosphere (WCRP)	IUGS	International Union of Geological Sciences (ICSU)
CGS	Canadian Geotechnical Society	LOICZ	Land-Ocean Interactions in the Coastal Zone (IGBP)
CSCE	Canadian Society of Civil Engineers	LOIRA	Land-Ocean Interactions in Russian Arctic (IASC)
COGEOENVIRONMENT	Commission on Geological Sciences for Environmental Planning (IUGS)	NES	Northern Eurasian Studies (IGBP)
DOMODIS	Documentation of Mountain Disasters (IAG)	NRBS	Northern Research Basin Symposium
EWN	Ecosystem Warming Network	PACE	Permafrost and Climate in Europe (EU)
GCOS	Global Climate Observing System	PAGES	Past Global Changes (IGBP)
GGD	Global Geocryological Database	PLC	Polar Libraries Colloquy
GLOCATS	Global Change in Antarctic Terrestrial Systems	QUEEN	Quaternary Environment of the Eurasian North
GRAND	Glaciation and Reorganization of Asia's Drainage (IGCP 415)	RAISE	Russian Arctic Initiative on Shelf-Land Environments (NSF)
GRID	Global Resources Information Database (UNEP)	SCAR	Scientific Committee on Antarctic Research
GTOS	Global Terrestrial Observing System	SCANTRAN	Scandinavia Transect (IGBP)
IARC	International Arctic Research Center	SITEX	Southern International Tundra Experiment
IASC	International Arctic Science Committee	TOPC	Terrestrial Observing Panel for Climate (GCOS/GTOS)
IAG	International Association of Geomorphologists	UNEP	United Nations Environmental Programme
ICSI	International Commission on Snow and Ice	WCRP	World Climate Research Programme
IGCP	International Geological Correlation Programme	WDCs	World Data Centers (ICSU)
IGU	International Geographical Union (Commission on Frost Action Environments)	WMO	World Meteorological Organization

liaisons. Both old and new Working Parties held meetings during the Conference and short reports were presented. The Table on the facing page presents the pertinent information; comments and official voting follow.

Existing Working Groups

See the IPA Web site for 5- to 10-year WG reports.

Periglacial Processes and Environments. Lewkowicz presented the report. The Council agreed Humlum would be the IPA representative to IAG. The motion to approve the WG report was made by Vandenberghe and seconded by Trombotto. The vote was unanimous.

Global Change and Permafrost. Nelson presented the WG report. The motion to approve the report was made by Hallet and seconded by Harris. The vote was unanimous.

Permafrost Engineering. Ladanyi presented the report on combining the two previous groups into a single group. Discussion followed on how best to present engineering practices, guidelines or standards. The purpose was changed to reflect both practices and procedures and to facilitate communications. The motion to approve the WG report was made by Hayley and seconded by Instanes. The vote was unanimous.

Cryosols. Gilichinsky reviewed accomplishments and future

plans. Although the group met in Yellowknife, only two full members were present (Gilichinsky and Tarnocai). Co-chairs were not decided upon. A recommendation for IPA Council approval will be made following the WG meeting at the 16th World Soil Congress in Montpellier, France, in August. The Russian delegates indicated support for Gilichinsky as a co-chair to insure continued cooperation between soils and permafrost scientists. Hallet moved that the WG be approved and that the recommendation be made on the two co-chairs after the Montpellier Conference. The motion was seconded by Harris and passed with two abstentions. (See Table on page 14 for approved co-chairs.)

New Working Groups

Coastal and Offshore Permafrost. Hubberten presented the rationale for the new group, building on several international programs including the Laptev Sea project. Several sub-groups will be organized, including one on coastal erosion chaired by Solomon. The motion to approve the WG report was made by King and seconded by Hallet. The vote was unanimous.

Southern Hemisphere Permafrost and Periglacial Environments. Boelhouwers made the presentation. Hall's name as co-chair had inadvertently been left off. The group would be

IPA COUNCIL RESOLUTIONS YELLOWKNIFE, 26 JUNE 1998

RESOLUTION 1: MONITORING OF ACTIVE LAYER AND PERMAFROST THERMAL STATE

Recognizing the increasing concern of the World Climate Research Programme and GCOS/GTOS Terrestrial Observing Panel for Climate (TOPC) to identify functional networks for permafrost monitoring (GCOS Report No. 32, 1997: GCOS/GTOS Plan for Terrestrial Climate-Related Observations, p. 19–20, 76–77), The International Permafrost Association resolves:

- to undertake coordination and collection of annual active layer depth and permafrost temperatures; and
- to ensure their timely reporting on the IPA Web site and the annual transfer of these data to WDC-A for Glaciology.

Furthermore, through the IPA Executive Committee, the IPA and its relevant Working Groups will address the following issues:

- assigning CALM, PACE and other representative monitoring sites to the GCOS/GTOS tier structure;
- assessing the representation of various permafrost climatic regimes in the network and identifying any gaps in coverage;
- evaluating options for filling any gaps in the network;
- formalizing organizational arrangements within the IPA/CALM structure; and
- finalizing the strategy and guideline documents to enable the preparation of invitation letters to the World Meteorological Organization representatives of the participating countries.

RESOLUTION 2: ANTARCTIC PERMAFROST MONITORING AND RESEARCH

Recognizing that the Antarctic continent serves as a rich archive and laboratory for paleoenvironmental information and present-day environmental processes; the fact that there is no systematic program for monitoring recent changes in the thermal history of the permafrost or active layer properties in the ice-free areas; and the growing requirements to coordinate with similar monitoring programs in the Northern Hemisphere and elsewhere in the Southern Hemisphere (see Resolution 1), the International Permafrost Association resolves:

- to encourage the establishment of a circum-Antarctic Permafrost Monitoring Network and related periglacial research activities; and furthermore recommends:
- that the newly formed IPA Working Group on Southern Hemisphere Permafrost serve as the formal link with SCAR.

the formal link to SCAR with its inaugural meeting at INQUA in August 1999. The motion to approve the Task Force report was made by Lieb and seconded by Trombotto. The vote was unanimous.

Task Forces

Isotope/Geochemistry of Permafrost. Vaikmäe presented the preparation for the group, which was done largely by E-mail and with considerable input from Vasilchuk in Russia. This activity provides linkage to several other international programs, including IGCP. Hallet commented that the term “geochemistry” should be applied more broadly. This point will be considered as the Task Force defines its scope. The motion to approve the Task Force report was made by Harris and seconded by Vonder Mühl. The vote was unanimous.

Rock Glacier Dynamics. Haeberli presented the background and relation as a joint activity with the International Commission on Snow and Ice. The motion to approve the Task Force report was made by Lieb and seconded by Trombotto. The vote was unanimous.

Mapping and Distribution Modeling of Mountain Permafrost. Etzelmüller reported on the meeting of the Mountain Permafrost Working Group and the decision to pursue a strategy of mapping and modeling in mountains of high

latitudes and high elevations of both hemispheres. The motion to approve the Task Force report was made by Dramis and seconded by Dobinski. The vote was unanimous.

Resolutions

Monitoring. Barry introduced the previously circulated resolution on monitoring and explained its relationship to GCOS/GTOS and CALM. Haeberli suggested wording to cover both active layer and permafrost temperatures, which was adopted. Since these activities embrace many IPA interests, including the potential development of a permafrost monitoring service, it was concluded that the Executive Committee should be responsible for appropriate wording and correspondence. The intent of the motion was approved unanimously.

Antarctic. Hall and Boelhouwers introduced the resolution encouraging the establishment of a circum-Antarctic Permafrost Monitoring Program and promoting related periglacial research activities. The resolution further recommended a single IPA point of contact to serve as a critical link with SCAR. There was general agreement with the main thrust of the resolution, but suggestions were made for changes in the title and for the need to maintain coordination with other IPA monitoring activities such as CALM

and PACE. One of the Southern Hemisphere Working Group co-chairs might serve as the SCAR contact. The intent of the motion was approved unanimously.

9. INTERNATIONAL CONFERENCE ADVISORY COMMITTEE

The Executive Committee recommended that the appointment of this group be delayed until the Canadian report on the Yellowknife Conference was received, and that the Executive Committee provide its recommendations on membership within the year.

10. MEMBER REPORTS

Time did not allow for individual reports. A number of Members submitted written reports. Other reports were submitted for *Frozen Ground*.

11. FUTURE MEETINGS

The new Executive Committee will meet informally before leaving Yellowknife. Members of the Executive Committee will try to meet regionally in Europe (winter-spring

1999), South Africa (INQUA, August 1999), South America (IGC, August 2000). Denmark will host the Third International Cryopedology Conference in 2001. Mongolia would like to host a meeting on mountain permafrost in the next 2-3 years. Norway has suggested an engineering meeting in Svalbard in the year 2000. Hallet reminded the Council of the annual December meetings of AGU in California. No specific date was set for the next Council meeting (2003 in Switzerland).

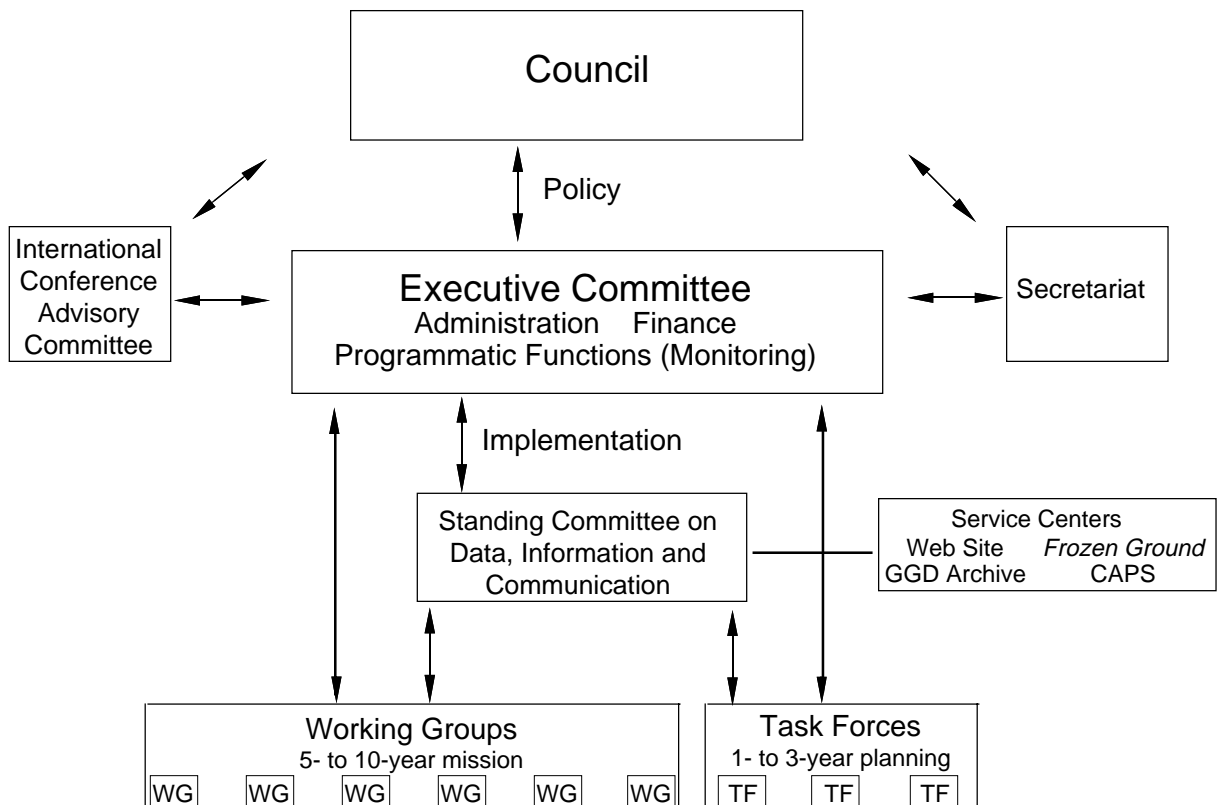
12. OTHER BUSINESS

Several provisional designs for a two-hemisphere logo were presented. Other designs will be circulated for comment. Barry noted that Julia Branson is continuing to maintain the IPA Web site on a voluntary basis. It was suggested that additional funding be provided to maintain the site. This was taken under advisement by the Executive Committee.

13. ADJOURNMENT

The meeting adjourned about 6:55 p.m.

IPA Administrative Framework (June 1998)



NEWS FROM MEMBERS

Members are encouraged to submit periodic updates of activities for posting on the IPA Web site.

ARGENTINA

The activities of 1997 concluded in December with two important events. The first was the donation of Arturo Corte's library to the Argentine Institute for Snow, Glaciology and Environmental Sciences (IANIGLA), which is part of the Geocryology Unit of Mendoza, a regional research center of CONICET. The Library of Ice and Snow, with over 10,000 items on mainly present-day and Pleistocene periglacial processes, is of great importance in South America.

The second event was completion of the book: *IANIGLA: 25 Years of Basic and Applied Research on Environmental Sciences*, edited by D. Trombotto and R. Villalba and dedicated to Arturo Corte, as the pioneer of environmental studies in Argentina and South America, who recently retired. The book consists of 45 bilingual (Spanish and English) scientific publications, seven of which are dedicated to geocryology and several others of which indirectly concern this field. Publication is awaiting financial arrangements.

The Geocryology Unit of Mendoza submitted a proposal to CONICET to perform tasks of climatic and cryogenic research on the permafrost conditions of the Morenas Coloradas rock glacier. Researchers of various institutions participate in this project: Trombotto from IANIGLA, Ahumada from the University of Tucumán, and Aristarain from the Argentine Antarctic Institute–Legán.

Once again a reunion will be held of the Argentine Group of Geomorphologists together with CONICET and the Argentine Agency of Scientific Promotion. Simultaneously the Argentine Permafrost Association is planning to meet. On this occasion a visit to the periglacial morphology of the Volcano Maipo and Laguna del Diamante region will be proposed.

This year Lucía Arena, Ice Physicist from the University of Córdoba, is doing research as a guest at the Regional Research Center of Mendoza (CRICYT). Her knowledge of and experience with experimental ice growth and its application to atmospheric, cryogenic and paleoclimatic studies are being utilized. Arena is studying the sequences of ice cores extracted from the Antarctic and may give an introductory course on ice physics in Mendoza. In addition, the Geocryology Unit of Mendoza will receive a delegation of students from the University of Bamberg (Germany) in October. They will visit IANIGLA and the Andean Cordillera. Two students from the University of Bonn who are particularly interested in geocryology will stay at IANIGLA.

The PROGEBA (a research program of Bariloche) is par-

ticipating as an active member of the paleoclimatic community by developing and collaborating in projects focusing on the landscape and biotic transformation as a response to climatic change. Through the recovery of continuous sequences of sediments from deep lakes, high resolution records including geochemical, paleomagnetic and microfossil data are being obtained. The recovered information will be entered into data banks for the understanding and prediction of global climatic trends.

In recent work at the University of Essen (Germany), G. Schellmann has found and registered a new till east of Condor Cliff (approximately 50°11'S, 70°51'W) in South Patagonia, which so far has been considered the limit of the extra-Andean glaciations in the valley of the Santa Cruz river. This confirms the previously assumed age of 2.7–3.5 million years, as suggested by Mercer. This important contribution also quotes an ESR dating of a level of marine shells in Puerto San Julián of 100–120 thousand years, below ice-wedge casts that represent the Pleniglacial (Finiglacial). These pseudomorphs display characteristics very similar to those found by Trombotto at 46°S, and confirm the cryostratigraphical position suggested for the latest generation of ice-wedge casts in South Patagonia.

Dario Trombotto (aristar@cpsarg.com)

CANADA

Major Canadian activities over the past year centered on the Seventh International Conference on Permafrost through the national, program, field trip and local organizing committees. As indicated in the minutes of the Council meetings, the Canadian Organizing Committee's final report on the Conference addresses the organization of future Conferences. At the opening ceremonies, Jean-Serge Vincent (Director, Terrain Sciences Division, Geological Survey of Canada) summarized the importance of permafrost research to Canada as well as permafrost regions of the world. Five immediate and essential research thrusts were addressed.

First, there is an urgent need to systematically acquire more baseline data on the precise distribution, thickness, ground ice content, ground thermal regime and engineering properties, and behavior of permafrost in many areas, particularly those where economic development is either ongoing or anticipated. For example, in Canada, outside of a few restricted areas, relatively little is known about permafrost in surficial deposits or in the bedrock of extensive areas of the Canadian Shield. Roads to the Arctic coast, port facilities, mines, and larger communities are being planned but baseline data are largely lacking.

Second, environmental concerns in northern Canada are increasing, particularly with regards to contaminant move-

ment or containment in frozen ground. As regards oil and gas, the disposal of waste drilling fluids in below-ground sumps has been a concern for over two decades in Arctic Canada. Now, as other forms of mining activities increase in both North America and Siberia, these problems become increasingly complex. For example, the knowledge of permafrost aquifers is limited, yet it is essential if the tailings from new mines are to be handled efficiently and safely. Finally, the clean-up and control of various wastes that have been left in northern Canada over the past 50 years, following industrial, military or other activities, can only be effective if there is a sound science base.

A third research area involves acquiring better information on permafrost-related hazards as they affect northern communities and infrastructures of all types. Slope stability, thaw settlement and frost heave are fundamental areas. Likewise, there are special issues such as, for example, coastal erosion of permafrost shorelines. At Tuktoyaktuk, in the Pleistocene Mackenzie Delta region of Canada, the coast is receding in places at rates of more than 10 m/year. There is a need to thoroughly understand permafrost-related geomorphic processes and mechanisms. Also, there is a need to understand how the various geotechnical and environmental conditions control these mechanisms, and how surficial geology, vegetation, climate and permafrost interact.

A fourth research need involves the development and testing of new or modified geophysical techniques. These are needed to accurately and inexpensively delineate massive ice bodies and high ice contents in frozen sediments. In this way one may hope to minimize potential terrain disturbance or infrastructure damage in permafrost regions.

The fifth research need deals with the issue of providing a sound and realistic understanding of the impact of climate change on permafrost to both the physical environment and to engineering structures. Monitoring and modeling capabilities must be developed that can determine the signal of change in the cryosphere, evaluate impact scenarios, and formulate adaptation measures. The high latitudes of both North America and Eurasia will be especially affected. For example, in Canada, current predictions indicate a substantial warming in the Mackenzie River basin. It is thought that an average 2°C warming in summer temperatures will result in the progressive degradation of permafrost, and eventually lead to its virtual elimination over large areas. Over time, this will have a substantial impact upon communities, infrastructures, transportation corridors, and the environment in general. Associated with the issue of climate change is the acquisition of information on the distribution of widespread and abundant, but poorly known, gas hydrates in permafrost, and the various conditions that control their

occurrence. The release into the atmosphere of large quantities of this greenhouse gas, that are presently trapped in permafrost, will significantly add to the global warming problem on the larger scale.

Based on presentation by Jean-Serge Vincent

CHINA

During the past five years, significant progress has been achieved on the following programs:

- Research on dynamic changes of the cryosphere in China
- Geocryological and engineering problems along Highway 214, Qinghai-Tibet Plateau (QTP)
- Studies on the interaction among permafrost, vegetation and the atmosphere on the QTP
- Monitoring active layer processes on the QTP
- Engineering geology on the trans-water project from the Yangtze River to the Yellow River: A western alternative
- Pre-studies on geocryological engineering for construction of the Qinghai-Tibet Railway, from Golmud to Lhasa
- Pre-studies of gas hydrates on the QTP

Important geocryological problems in China include:

- Thermal stability of permafrost and the impacts of climatic change
- Environmental engineering in the cold regions of China
- Water resources at high altitudes and their roles in the formation and stability of water resources in western China

Recent major breakthroughs include:

- Evidence of permafrost degradation in the eastern QTP
- Establishment of a cryosphere database in the eastern QTP
- Application of fracture mechanics in frozen soils
- Construction of tunnels in alpine permafrost regions

Two important meetings were held:

- The Chinese National Workshop on The Cryosphere and Global Change, 5-7 May 1995, at the Lanzhou Institute of Glaciology and Geocryology, Chinese Academy of Sciences
- The Fifth Chinese Conference on Glaciology and Geocryology, 18-22 August 1996, at Lanzhou University

Some recent major publications are:

- *Abstracts and Proceedings of the Chinese National Workshop on the Cryosphere and Global Change*
- *Cryosphere*, first issue in 1995, second and third issues in 1996 and 1997
- *Proceedings of the Fifth Chinese Conference on Glaciology and Geocryology*, two volumes
- *Assessment of Climate Change Impact on Snow Cover*,

Glaciers and Permafrost in China

- *Seasonally Freezing Halic Soils and Their Improvement: Utilization in the Hexi Corridor, Gansu, China*
- *Permafrost Distribution Map of the Qinghai-Tibet Plateau*
- *Mechanism of Frost Heave and Moisture Potential in Frozen Soils*
- *Strength and Creep of Frozen Soil*
- *Frozen Ground in China* (in press)
- *Fracture Mechanics of Frozen Soils* (in press)
- *Mechanism of Frost Heave and Moisture Potential in Frozen Soils* (in English, in press)

Recent doctoral dissertations include:

- Li Shuxun: *Heat-Moisture Transfer in Frozen Soils*
- Chen Ruijie: *Moisture Migration in Frozen Soils*
- Zhao Xiufeng: *Frost Weathering of Rocks on the Qinghai-Tibet Plateau*
- Mi Haizhen: *Temperature Field of Frozen Wall Rocks in the Dabanshan Tunnel, Qinghai-Tibet Plateau*
- Sheng Yu: *Experimental Study of the Creep of Frozen Soils Under Changing Temperatures*
- Wang Guoshang: *Environmental Engineering Problems in Permafrost Sections Along the Qinghai-Tibet Highway*
- Jin Huijun: *Exchange of CH₄, CO₂ and N₂ between Cold Wetlands and the Atmosphere on the Qinghai-Tibet Plateau*
- Li Xin: *The Cryosphere Information System in China and its Applications*
- Li Dongqing: *Predictions of Permafrost Degradation and Engineering Problems Along National Highway 214*

Two recent post-doctoral reports are:

- Lin Qing: *Reconstruction Paleoclimate from Frozen Lacustrine Sediments Sampled from Qingshuihe River, Interior Qinghai-Tibet Plateau*
- He Chongxun: *Modeling Wall Rock Temperatures in a Cold Regions Tunnel: Dabanshan Pass as an Example*

Jin Huijun (hjjin@ns.lzb.ac.cn)

DENMARK/GREENLAND

Funding for the interdisciplinary research project The Arctic Landscape: Interactions and Feedbacks Among Physical, Geographical and Biological Processes has been extended by the Danish Science Research Councils, and the project is continuing through 1999.

A snow fence manipulation experiment run by Bjarne Holm Jacobsen, Bo Elberling and Hanne H. Christiansen started this summer in High Arctic northeast Greenland at Zackenberg. This experiment will study the interaction between physical and chemical properties, particularly the carbon cycle, in the active layer when the snow cover is prolonged. This is done to study the effect of changes in the

amount and distribution of snow over the landscape, to simulate the effect of former and future climatic changes.

Until now the combined use of recurrent CALM (Circumpolar Active Layer Monitoring) measurements during summer, contemporary registration of the extent of the snow cover in the CALM grids, and meteorological data from the GeoBasis monitoring program of ZERO (Zackenberg Ecological Research Operation) has allowed an estimation of the effects of increased winter wind speeds on the summer snow cover extension.

The long-term ecosystem monitoring programs of ZERO in northeast Greenland are being continued by the Danish Polar Center in cooperation with the Department of Arctic Environment, National Environmental Research Institute in Denmark, and the Institute of Geography, University of Copenhagen. Morten Rasch is the scientific leader of ZERO.

During the last three years research has been carried out on glacial and periglacial phenomena and collection of mountain climate data in the Faeroe Islands (62°N, 7°W) in the North Atlantic Ocean. These islands are close to the present-day southern limit for the Arctic zone. The present potential lower limit for discontinuous permafrost (-2°C) is 250–450 m above the highest mountain summits (880 m a.s.l.). This investigation was carried out by Ole Humlum and Hanne H. Christiansen, and was funded by the Danish Natural Science Research Council.

On Disko Island Ole Humlum is conducting a project on rock glacier temperature and dynamics, funded by the Commission for Scientific Research in Greenland.

Bo Elberling is continuing his research project on chemical processes and transport mechanisms in the active layer of mining waste deposits in Arctic Canada (Nanisivik Mine) funded by the Environmental Department, Ministry of Environment and Energy (Denmark).

Hanne H. Christiansen (hhc@geogr.ku.dk)

FINLAND

The Adhering National Body of Finland comprises 11 Finnish scientific societies. It has had three meetings at which the participants have discussed national research activities and meetings as well as international congresses and symposia in the field of interest—frost, permafrost and other phenomena of cold climates. The work has been most interesting because the members represent different fields of science and technology. The Adhering Body began preparations for a Scandinavian workshop in Finnish Lapland entitled Changes in the Permafrost and Periglacial Environment: Scientific and Technical Approach. The tentative dates of the workshop are 20–24 August 1999. The organizing group has met twice.

(cont'd on page 25)



International Permafrost Association Constitution and Bylaws

The Constitution was adopted in Ottawa, Ontario, Canada, on 5 August 1987, and revised by mail ballot on 1 December 1992, and in Yellowknife, Canada, N.W.T., on 23 and 26 June 1998.

PREAMBLE AND DEFINITIONS

During the Fourth International Conference on Permafrost held in Fairbanks, Alaska, in July 1983, the International Permafrost Association (IPA) was founded. The founding countries were: Canada, The People's Republic of China, U.S.A., and U.S.S.R (Russia). The founding of the IPA and the election of its officers was announced at the closing plenary session, a set of principles was distributed to the delegates, and other countries with an interest in permafrost were invited to become members of the IPA.

The organizations referred to in the Constitution and Bylaws are defined as follows:

- (a) The *Council* is the governing body of the Association.
- (b) An *Adhering Body* is a representative organization or committee designated to represent in the Council of the Association the interests in permafrost of scientists and engineers of a country, or in special circumstances, a grouping of countries.
- (c) The *Executive Committee* and *Secretariat* conduct the day-to-day activities of the Association and implement and communicate the policies and views of the Association's Council between sessions.
- (d) *Standing Committees* and *Working Parties* perform designated activities as approved by the Council.
- (e) *Secretariat* (see Bylaws).

CONSTITUTION

1. Objective

The objective of the International Permafrost Association (hereafter called the Association) is:

To foster the dissemination of knowledge concerning permafrost environments and promote cooperation among persons and national or international organizations engaged in scientific investigations or engineering work on permafrost.

2. Activities

The Association will accomplish this objective by:

- (i) holding an International Conference on Permafrost approximately every five years;
- (ii) holding Council meetings at the time of the International Conference and, if required, at suitable times and locations between Conferences;
- (iii) cooperating with other national and international organizations whose aims are complementary to those of the Association;
- (iv) exchanging information through its Adhering Bodies;
- (v) promoting cooperative activities and the development of knowledge concerning permafrost environments;
- (vi) supporting the activities of Committees and Working Parties.

3. Membership

Membership in the Association is through Adhering Bodies. There shall be only one Adhering Body per country or grouping of countries. National or multi-national organizations wishing to join the Association must submit to the Secretariat documentation showing the existence of a bona fide Adhering Body, its mailing address and names of its officers. Membership in the Association must have the approval of two-thirds of the full Council. The Council has the right to terminate the membership of any Adhering Body by a two-thirds majority vote of the full Council.

In countries where no Adhering Body exists, an individual may apply directly to the Association to take part in Association activities.

4. Adhering Bodies

An Adhering Body is free to establish its articles of association and its organization in accordance with its requirements.

An Adhering Body shall at all times keep the Secretariat informed about its address and the names of its officers and of its representatives to Council.

5. Officers of the Association (Executive Committee)

The officers of the International Permafrost Association are:

- (i) The President
- (ii) Two Vice-Presidents
- (iii) Three Ordinary Members

Either the President or one of the Vice-Presidents must be from the country hosting the next International Permafrost Conference.

The officers shall be nominated in accordance with the rules stated in the Bylaws and shall be elected by the Council. The officers shall be from different countries and each shall have specific responsibilities approved by the Council.

The officers of the Association shall serve from the start of the second Council meeting of one International Conference on Permafrost to the end of the first Council meeting of the next Conference. The President shall not serve more than one term.

The President shall represent the Association and shall perform the duties pertaining to that office, as well as those entrusted to him by the Constitution and Bylaws or by the Council. The President shall be responsible, in collaboration with the other officers of the Association, for the conduct of its affairs.

In the event of the resignation or death of the President, one of the Vice-Presidents will assume the office for the unexpired term of office.

In the event of the resignation or death of one of the Vice-Presidents, or if one of the Vice-Presidents assumes the office of President, the Council will appoint a successor from among its members who will complete the term of office. The choice of the President will be made by the remaining members of the Executive Committee.

The Secretariat and its location shall be recommended by the Executive Committee and approved by the Council. The Secretariat shall not represent an Adhering Body on the Council.

6. Council

The Council shall consist of the officers and no more than two representatives from each Adhering Body.

Each Adhering Body shall have a vote. If no official representative is able to attend a meeting of the Council, his or her vote may be cast by an authorized proxy designated in writing by the Adhering Body and provided to the Secretariat.

The Council shall be presided over by the President of the Association or, in case of his or her incapacity or inability to attend, by one of the Vice-Presidents. In the event of an equal decision of votes, the President or acting President shall cast the deciding vote.

The Council shall meet in ordinary session at the call of the President normally every five years during an International Conference on Permafrost. The Council may meet in extraordinary sessions at the call of the President or at the request of a majority of the Adhering Bodies. The Council may make decisions by written communication on questions put to it through the Secretariat with the approval of the President.

The Council may set up, by a simple majority vote, Standing and Ad Hoc Committees, or Working Parties with whatever powers and terms of reference it may decide.

The Council shall determine, with the advice of the Executive Committee, the annual subscription fee to the Association. The Council shall review the annual budget and, unless there is an objection, the Secretariat, with approval of the Executive Committee, shall disburse the funds.

The responsibilities of the Council may be executed by electronic mail ballot, unless there is an objection.

7. International Conference on Permafrost

An International Conference on Permafrost shall be held approximately every fifth year in a country to be decided upon by the Council. The organization and financing arrangements of an International Conference are the responsibility of the Adhering Body of the host country. The Adhering Body shall follow the principles, rules and procedures for the Conference set out in the Bylaws and any additional procedures approved by the Council. An International Conference Advisory Committee shall be appointed by the Council to provide continuity in maintaining Conference policies and to assist in other matters as requested by the hosting member.

8. Entry into Force of Constitution and Bylaws

This Constitution and Bylaws shall come into force at the close of the session at which they receive the approval of at least two-thirds of the full Council.

9. Amendments to Constitution and Bylaws

Amendments to the Constitution and these Bylaws must be proposed by an Adhering Body. Such amendments shall be submitted in writing to the Secretariat early enough to have the proposal submitted to all Adhering Bodies at least six months prior to the Council meeting at which the amendment(s) is to be placed on the agenda. An extraordinary mail ballot can be conducted between Council meetings.

Adoption of an amendment will require an affirmative vote of at least two-thirds of the full Council.

Amendments to the Bylaws shall follow the same procedure except that a simple majority in favor of the amendments is required instead of two-thirds, as above.

10. Non-Profit Organization

The International Permafrost Association shall be carried on without purpose of gain for its members and any income or other accretions to the International Permafrost Association shall be used in promoting the objectives of the Association.

BYLAWS

1. Council

- (i) A quorum for a Council meeting shall be a simple majority of the Adhering Bodies, except if changes in the Constitution are to be made or a vote is to be held on the acceptance of an application for membership. In these cases, a quorum shall be two-thirds of the full Council.
- (ii) Any Adhering Body that will not be present for a vote requiring a two-thirds majority may submit its views and vote in advance in writing. In this case that Adhering Body will be regarded as being present for the purposes of the quorum for the vote.
- (iii) Voting shall in general be by a show of hands except for the election of the officers, the place for the next International Conference on Permafrost or Council meeting, or for other matters specified at the time by the presiding officer.
- (iv) Resolutions shall be made by a simple majority of those voting, except for resolutions altering the Constitution or on the acceptance of new Adhering Bodies, for which the assent of two-thirds of the Council is required.
- (v) Adhering Bodies wishing to have items placed on the agenda should submit them not less than six months before a Council meeting. Three months before the meeting the Secretariat will send the complete agenda to each Adhering Body. The agenda for the ordinary meeting of Council shall generally include the following items:
 - (a) Minutes of previous meeting
 - (b) Acceptance of new Adhering Bodies
 - (c) Business raised by the President
 - (d) Business raised by the Adhering Bodies
 - (e) Business from other sources
 - (f) Financial statement for the preceding period and the draft budget for the ensuing period

- (g) International Conference
- (h) Election of the President
- (i) Election of Vice Presidents and three Ordinary Members
- (j) Appointment of Secretariat
- (k) Review of activities and reports of Committees and Working Parties
- (l) Items submitted after preparation of agenda, subject to agreement of presiding officer
- (m) Any other business

2. Nomination and Election of Officers

The Executive Committee shall appoint a Nominating Committee of three people from the Council two years before a Conference. The Nominating Committee shall canvas the Adhering Bodies and submit to the Secretariat the name(s) of candidates for the office of President, Vice Presidents and three Ordinary Members one year before the Conference. The Nominating Committee shall ensure that the nominees are willing to serve if elected. The Secretariat, upon receipt of the report of the Nominating Committee, shall so inform the Adhering Bodies. Additional nominations may be made by Adhering Bodies prior to the meeting of the Council. Election by secret ballot at the Council meeting shall be sequential in the order President, Vice Presidents, and Ordinary Members. Candidates who are not elected to their nominated positions are eligible for election to a remaining office.

3. Secretariat

The Secretariat shall be nominated to the Council by the Executive Committee. The position shall be reviewed on a five-year basis.

The Secretariat shall be responsible, under the general direction of the President, for the conduct of current business of the Association, for the preparation and distribution of the Agenda of the Council meetings and for the preparation and maintenance of minutes.

The Secretariat shall send to each Adhering Body an annual account of the dues owing, and shall ensure that all contributions and dues paid to the Association are placed in a separate account and that a record is kept. The Secretariat, or duly appointed surrogate, is responsible for keeping the accounts of the Association, for the preparation of the annual budget of receipts and expenditures, and for payments on behalf of the Association up to the limit of the approved budget, and shall acknowledge all moneys received. The Secretariat shall prepare a summary of the accounts for each meeting of the Council and shall give any explanation required of expenses incurred.

4. *Conferences*

- (i) Invitations to act as host for an International Conference on Permafrost and the accompanying Council meetings shall be considered at the meeting of the Council at the time of the preceding International Conference.

The inviting country must provide assurance that no individual will be denied attendance on grounds of nationality, race, creed or political views. If an invitation is received from more than one Adhering Body the final selection shall be made by secret ballot.

Arrangements for the International Conference on Permafrost shall be the responsibility of the Organizing

Committee of the host country, in consultation with the Executive Committee and the International Conference Advisory Committee.

- (ii) Adhering Bodies or their affiliates, Committees and Working Parties are encouraged to organize technical meetings and Conferences. These may be designated as co-sponsored by the International Permafrost Association if approved by the Council or the Executive Committee.

5. *Committees and Working Parties*

The organization and activities of Committees and Working Parties are governed by guidelines approved by the Council.

Officers of the International Permafrost Association (1983–2003)

	1983	1988	1993	1998
President	P.I. Melnikov U.S.S.R.	T.L. Péwé U.S.A.	Cheng Guodong China	H.M. French Canada
Vice President	T.L. Péwé U.S.A.	Cheng Guodong China	N.N. Romanovskii Russia	F.E. Are Russia
Vice President	K. Flaate Norway	V.P. Melnikov U.S.S.R.	H.M. French Canada	W. Haeberli Switzerland
Secretary General	J.Ross Mackay Canada	J.Ross Mackay Canada	J. Brown U.S.A.	*
Ordinary Members	—	—	—	J. Brown U.S.A. T. Molmann Norway Zhu Yuanlin China

* Replaced by Secretariat.

The Chairman of the Adhering National Body is Matti Seppälä of Helsinki University and the Secretary is Martti Eerola of the Finnish National Road Administration.

Peter Kuhry, Arctic Centre, Rovaniemi, reports that INTAS has funded the project Permafrost in the Usa Basin, Russia: Distribution, Characterization, Dynamics and Effects on Infrastructure. Participating institutions and responsible scientists are: Peter Kuhry (project coordinator); Louwrens Hacquebord, Arctic Centre, Groningen, The Netherlands; Galena Mazhitova, Institute of Biology, Komi Science Centre, Syktyvkar, Russia; Naum Oberman, stockcompany Polaruralgeologia, Vorkuta, Russia; and Vladimir Romanovsky, University of Alaska, Fairbanks, USA. This INTAS-RFBR project will result in the creation of a GIS of permafrost conditions in the Usa Basin (East-European Russian Arctic) based largely on data from long-term monitoring of permafrost conditions and characteristics. The GIS will characterize the current condition of permafrost in an area which represents the tundra-taiga ecotone. Mathematical modeling of permafrost dynamics will be employed to forecast permafrost degradation, and potential impacts of permafrost degradation will be analyzed.

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FRANCE

C. Feis and Ch. Le Coeur continued their studies in Ireland and the Hebrides on the dynamics of slopes in a periglacial climate. A map of the distribution of periglacial features in France has been compiled by S. Courbouleix of BRGM (Orléans). In parallel, he has undertaken a study on the origin of pits and lakes in Sologne as possible thermokarst lakes or palsas. B. Van Vliet Lanoe (University of Lille) studied the evolution of thufurs in Iceland. Research was conducted on thaw-freeze cycles by B. Etlicher (St. Etienne) from granitic weathering products involving fine materials. G. Rovera is studying the withdrawal of slopes in the Pre-Alps (France). In 1997, field research was carried out on the Lena River to study the fluvial thermal erosion process. It was investigated by E. Gautier (CNRS, Meudon) and F. Costard (CNRS, Orsay) in cooperation with the Laboratory of Soil Erosion and Fluvial Processes at Moscow State University. A laboratory simulation of the gelifluction process was undertaken cooperatively by Cardiff University and the Centre de Géomorphologie, Caen.

This geomorphological work is represented by the Association Française du Périglaciaire, Ch. Le Coeur, President.

Modeling of the permafrost thickness in France during the last glaciation was undertaken by BRGM, ANDRA,

CNRS, LCPC. A research program was carried out by A.M. Cames-Pintaux of the Laboratoire Central des Ponts et Chaussées on the validity of numerical modeling from field measurements in Manitonuk. This research program is in cooperation with M. Allard of Centre d'Étude Nordique (Québec). A new project was initiated by J. Aguirre-Puente and F. Costard at the Centre de Géomorphologie, Caen. They are investigating the role of thermal erosion in Central Siberia (Yakutia) as well as on the planet Mars. The project is funded by the Programme National de Planétologie from the Institut National des Sciences de l'Univers. This program includes the elaboration of an ablation model and some laboratory simulations of fluvial thermal erosion in a cold chamber. The investigators are now working in the Planetary Geology Group of Orsay University.

This modeling work is represented by the Association Française du Pergélisol, J. Aguirre-Puente, President.

In memory of André Cailleux (1907–1986) a conference organized by F. Costard and J.C. Ozouf was held 16 and 17 January 1997 in Paris in association with the Société Géologique de France and the Groupe Français de Géomorphologie. A total of 28 papers were presented as well as posters on the works of A. Cailleux. The conference theme was periglacial processes and landforms, sedimentology and comparative planetology. Participants from Canada, Spain, Belgium, Iran, and France attended the conference.

A conference organized by J. Aguirre-Puente on Permafrost and Actions of Natural or Artificial Cooling is being convened by CNRS and the International Institute of Refrigeration on 21–23 October 1998 at Orsay University. Forty-four oral presentations will cover thermomechanical mechanisms, periglacial processes, and planetology.

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GERMANY

An extensive report on German activities has appeared in *Frozen Ground* No. 21, so only a short summary and new directions are highlighted here. Permafrost research in the terrestrial Arctic is mainly done at the Alfred Wegener Institute in Potsdam and in cooperation with several German and international university institutes. The main study areas are southeast Taimyr Peninsula (1994–97), Lena Delta (Laptev Sea project, 1998–2000), Central Yakutia (1997–98), Spitzbergen (Ny Ålesund, 1997–99) and East Greenland (Zackenbergl, 1998–2000). Field work in the Laptev Sea project started in July 1998 with 15 German and 15 Russian scientists. In addition, the extent and characteristics of sub-sea permafrost in the Laptev Sea are being investigated by BGR Hannover and AWI Bremerhaven. Papers and post-

ers with results of recent studies in Arctic permafrost were presented at the Yellowknife Conference.

Mountain permafrost research in the framework of the EU-PACE project is done in the Mattertal, Swiss Alps, by the University of Giessen (L. King, T. Herz, M. Schlerf, E. Schmitt) and in the Zugspitze area, German Alps, by D. Barsch/M. Gude (Heidelberg/Jena). An 80-m-deep drill hole is planned in the Mattertal early in 1999. Details of the PACE project are available on the PACE Web site. Additional studies of mountain permafrost are done mainly by individuals at a number of other German universities (Munich, Regensburg, Göttingen, Trier). Papers and posters on mountain permafrost in the Swiss Alps were presented in Yellowknife. The data of the 30-year-long survey of the Macun rock glacier (Swiss Alps) by D. Barsch/W. Zick was contributed to the CAPS CD.

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ITALY

In the last week of June 1998, two PACE boreholes were drilled and equipped with thermistor chains in Stelvio Park in the Italian Alps. The first reached 103 m depth in limestone bedrock. The second, drilled in an active rock glacier, reached the underlying bedrock at about 50 m depth.

An inventory of rock glaciers in the Italian Alps was completed in 1997. A report was given by M. Guglielmin at the Yellowknife Conference.

Research on permafrost at Terra Nova Bay, Northern Victoria Land, Antarctica, continued as part of the National Research Project on Antarctica. It includes geomorphological surveying and mapping of periglacial features on ice-free lands, geoelectrical soundings, trenching and borehole drilling, ground-ice analysis, thermistor measurement, and a continuous record of ground temperatures in the active layer and the upper part of the permafrost.

Permafrost investigations are being carried out around the Italian Research Station at Ny Ålesund as part of the Italian CNR (National Research Council) Arctic Project. The program, which will interact with both the PRNA and PACE projects, includes: geomorphological, permafrost, and vegetation mapping; geoelectrical soundings; and BTS survey and borehole drilling to monitor the thermal gradient of the permafrost (active layer and top of permafrost). A second field program of 20 days was undertaken in mid-July 1998.

The results of the workshop on Mountain Permafrost Monitoring and Mapping held in Bormio, Italy, on 27 August 1997 are nearing publication.

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JAPAN

In April 1998, the Mountain Permafrost Research Group (Chair, N. Matsuoka) was founded within the Japanese Geographical Union. This research group aims at encouraging permafrost studies in the Japanese high mountains where permafrost has been reported only on two volcanoes, Fuji and Daisetsu. However, permafrost is expected to be found on other, non-volcanic mountains, e.g. the Japanese Alps. Programs include mapping of past and present permafrost, monitoring of ground temperature and slope processes, and geophysical soundings.

Since 1994, a geomorphological group (N. Matsuoka, K. Hirakawa, T. Watanabe and others) has conducted field studies in the Engadin area, Switzerland, in cooperation with W. Haeberli, F. Keller and A. Kääh. The purpose is to understand the combination of active layer and permafrost processes on mountain slopes. Research topics also include rock glacier metamorphosis due to permafrost thawing and lithology in rock glacier morphology. Both are essential for understanding rock glaciers in Japanese mountains. Studies on rock glaciers and other permafrost-related landforms also continue in the Himalayas (T. Watanabe and S. Iwata) and Antarctica (T. Sone and H. Miura).

To better understand the energy and water cycle in permafrost areas, the international project GAME-Siberia is underway, mainly with Japanese, Russian and American scientists. Two observation stations are located in the Lena River basin at Spasskaya Pad near Yakutsk (taiga lowlands) and at Tiksi (tundra). A site for mountainous taiga will be established this year in Tynda at the southern boundary of the Lena River basin. A 32-m meteorological tower equipped with various kinds of sensors, including sonic anemometers, provides many kinds of hydrometeorological elements above and within the taiga forest canopy and soil.

The hydrological characteristics of a small tundra watershed in the vicinity of Tiksi are under study. An Automatic Climate Observation System (ACOS) with a 10-m mast was installed for meteorological observations that primarily focus on energy and water fluxes above the surface of the tundra. A CALM grid was also established at this site by Larry Hinzman in 1997.

During 1998, the GAME project is undertaking an Intensive Observation Period (IOP), and many GAME-Siberia researchers from Japan and Russia are visiting the Spasskaya Pad and Tiksi stations. It is expected that data will become available worldwide for researchers via the Internet after quality control of the raw data is accomplished. Some in situ data recorded at the Russian hydrometeorological network are being archived by GAME-Siberia; it is hoped that those data sets will become available in the future.

An emerging international research project in a discontinuous permafrost region is the Yukon Water and Energy Budget Experiment (YuWEX). Intensive field research is being conducted in the Caribou–Poker Creeks Research Watershed, about 50 km north of Fairbanks, Alaska, and on the Yukon River near Stevens Village and Pilot Station. This research is sponsored by the Japan Marine Science and Technology Center. The lead investigators include Nobuyoshi Ishikawa from the Institute of Low Temperature Science, Hokkaido University, and Atsushi Sato from the National Research Institute for Earth Science and Disaster Prevention in Shinjo. The U.S. collaborator is Larry Hinzman from the Water and Environmental Research Center, University of Alaska Fairbanks.

In October 1997 the Frontier Research System for Global Change (FRSGC) was established with its head office in Tokyo. It consists of three research institutes, the Institute for Global Change Research (IGCR: Tokyo and Tsukuba), the International Pacific Research Center (IPRC: Hawaii) and the International Arctic Research Center (IARC: Alaska). The FRSGC had 79 scientists as of August 1998. Detailed information on FRSGC activities can be obtained at their Web site, <http://www.frontier.esto.or.jp/>

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KAZAKSTAN

Observations of the dynamics of cryogenic processes (frost heaving and solifluction) at special polygons and geothermal monitoring of permafrost and seasonally frozen ground in Zailiysky Alatau Range (Northern Tien Shan) and adjoining plains are continuing.

An analysis of climatological data from high-mountain weather stations situated in the Northern Tien Shan for the last 120 years has been undertaken. An increase in annual, summer and winter air temperatures at various altitudes is indicated. An increase in mean annual temperature of 2.1°C for 1880–1996 is observed. This increase in air temperature is accompanied by other climatic effects such as glacier degradation, warming of alpine permafrost, and an increase in the movement rate of rock glaciers.

A rising trend is seen in permafrost temperature during 1974–97 of 0.2–0.3°C under natural conditions and up to 0.6°C in areas of human activity. Active layer thickness increased an average of 30%.

Numerical modeling shows that a rise in mean annual temperature of 2.5°C may lead to an increase in the absolute altitude of the lower permafrost boundary of 200–250 m.

On this basis a Predictive Map of Permafrost Distribution in Central Northern Tien Shan has been compiled at 1:200,000.

Current research includes:

- Monitoring of the thermal regime of permafrost, seasonally frozen ground, active layer thickness, dynamics of rock glaciers
 - Modeling of mountain permafrost in connection with climate changes
 - Role of regional and local factors in the extent of perennial and seasonal freezing
 - Geocryological mapping—various scales and purposes
 - Needle ice and its influence on a soil–vegetative cover
 - Role of cryogenic and post-cryogenic processes in mud-flow origin
 - Investigations of short-term permafrost conditions (pereletok) in the mountains and plains of Kazakstan
 - Creation of an electronic map of glaciers (aerial data of 1954, 1979, 1990) and permafrost distribution in the Northern Tien Shan (scale 1:200,000) in cooperation with Kazak glaciologists
- The CALM observations continue.
- Prospective research for interested investigators includes:
- Modeling and automated mapping of mountain permafrost in Asia
 - Determination of age and rate of creation of cryogenic forms (rock glaciers, thufur, solifluction terraces and lobes, patterned ground)
 - Investigation of cryogenic deformation (cryoturbation, frost fracturing, solifluction), and influence of pedogenic carbon concentration
 - Subglacial permafrost investigations
 - Influence of blocks of porous material on the thermal state of ground and associated processes (evaporation, ice formation, etc.)

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MONGOLIA

Permafrost underlies about 63% of Mongolia. To support studies of permafrost conditions for practical and scientific purposes N. Lonzhid organized a permafrost station in 1959. From 1962 to 1996 the station was run by the Department of Permafrost of the Institute of Geography and Geocryology, Mongolian Academy of Sciences. It was renamed the Laboratory of Permafrost of the Institute of Geocology in 1997. The department was headed by N. Lonzhid from 1962 to 1969, by N. Sharkhuu from 1970 to 1979, and by D. Tumurbaatar since 1980. From 1962 to 1990 the department was staffed by 10–15 researchers and workers and had drilling equipment and a soils laboratory. Since 1990 it has had a smaller staff of 8–10 persons and has had to do without the drilling capability and the soils lab.

The Geocryological Department of Moscow State University and the Permafrost Institute, Siberian Branch, Russian Academy of Sciences have rendered considerable assistance by training highly skilled specialists and supplying some devices. Senior scientific researchers, in particular N. Sharkhuu, are now engaged in studying the permafrost conditions of Mongolia on the basis of temperature measurements in boreholes. Since 1967 the depth and dynamics of seasonal freezing and thawing of ground have been studied by D. Tumurbaatar. Since 1987 the distribution and features of cryogenic processes and phenomena have been studied by R. Lomborenchen. At present, no permafrost studies are being carried out in Mongolia by other institutes. However, before 1990 some data on the permafrost characteristics of particular areas were obtained by Mongolian geotechnical and hydrogeological surveys. In addition, also until 1990, PNIIS in Mongolia conducted engineering geocryological surveys at several sites and compiled some reports and maps.

The joint Mongolian and Russian geocryological expedition carried out from 1967–71 was of great significance to permafrost studies in Mongolia. A geocryological map on a scale of 1:1,500,000 was compiled and a monograph on geocryological conditions was published. A preliminary permafrost study by Japan and Mongolia began in 1998. The National Permafrost Association became an Adhering Body of the IPA in 1995.

Over the last 30 years these works have been published:
N. Lonzhid, 1969. Perennially frozen ground in Mongolia

N. Sharkhuu, 1975. Basic features of permafrost in Mongolia

D. Tumurbaatar, 1975. Seasonal freezing and thawing of ground in Mongolia

D. Luvsandagva, 1987. Perennially frozen ground in the Khangai and Khubsugul Mountains

Hundreds of scientific articles have also been published, but only about 10 have been translated into English. Recently, monographs by N. Sharkhuu (Regularities in formation of permafrost conditions in the Selenge River Basin, 1997) and by N. Sharkhuu, D. Tumurbaatar and R. Lomborenchen (Permafrost conditions in Mongolia, 1998) have been prepared.

N. Sharkhuu has carried out temperature measurements in many boreholes in Nalaikh, Baganuur, Argalant and Erdenet and on Bogdkhan Mountain. As a result of the measurements, permafrost maps of the Nalaikh and Baganuur areas and Bogdkhan Mountain have been compiled. N. Sharkhuu has prepared more than 20 permafrost maps of different regions at various scales. Almost all the legends were translated into English. Three catalogues on the characteris-

tics of more than 70 boreholes with permafrost were prepared and translated and are available to the IPA.

We are interested in studying the permafrost conditions of Mongolia in more detail, and hope that these studies may be carried out in close collaboration with scientists from other Adhering Bodies of the IPA.

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NETHERLANDS

In The Netherlands most work on permafrost is focused on establishing relationships between permafrost development and climatic conditions and on the impact of permafrost on river dynamics. Work in present-day permafrost regions is relatively limited: Greenland (Utrecht University, University of Amsterdam), Russia (TUNDRA project in Pechora basin: VU Amsterdam, Utrecht U.), Russia (Taimyr, Nature Management Affairs), Svalbard (Groningen University).

Much attention has been paid in the last five years to the reconstruction of past permafrost in western and central Europe during several episodes of the last glacial period and the related climatic conditions (VU Amsterdam). Several Ph.D. theses and many scientific papers appeared on the subject of palaeo-periglacial river dynamics.

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NORWAY

A meeting was held in January 1998 at the Norwegian Geotechnical Institute. Fourteen representatives from universities and research institutes working with permafrost were present:

- Norwegian Geotechnical Institute
- University of Oslo, Department of Geography
- Norwegian University for Science and Technology
- University Studies on Svalbard
- Norwegian Polar Research Institute
- Norwegian Road Research Laboratory

The aim of the meeting was to establish better cooperation between organizations engaged in education, research, planning and operation of facilities in permafrost. The intent is to find the best solutions (technically, economically, environmentally) to problems arising from human activity in permafrost regions.

The participants documented their present activities:

- Arctic Oil Spills on Russian Permafrost Soils, Norwegian Research Council, NFR program
- Permafrost and Climate in Europe (PACE), EU program
- Understanding Land Surface Processes in the Arctic (LAAP), EU program

- Dynamics of the Seasonal Snow Cover in the Arctic (ALV), NFR program
- Climate Change, Use of Permafrost Data as an Indicator
- Studies of Rock Glaciers on Svalbard
- Svea Permafrost Station, Svalbard
- Pollution Problems on Permafrost
- Student projects and thesis work on slope stability, solifluction, rock glaciers, frost action in soils, hydrology, pollution and offshore ice loads

Better cooperation can obviously bring more data to light. Some areas like engineering geology mapping and field observations on structures need more attention.

Information has been a problem since the publishing of *Frost i Jord* ceased some years ago. It is necessary to use existing journals more actively. A "local" newsletter may be needed to make activities better known.

The University Courses on Svalbard (UNIS), a private foundation established by the Norwegian government and owned by Norway's four universities, is located in Longyearbyen, Svalbard. The objective of the foundation is to offer university courses and to perform research relevant to Svalbard's geographical location in the high Arctic. The courses complement the teaching given by the mainland universities, and they form part of the standard courses of study that lead to examinations and degrees at the undergraduate, graduate and doctoral levels. UNIS began operation in autumn 1993 when its first 23 students attended courses in Arctic Geology and Arctic Geophysics. In autumn 1994 the subjects offered were expanded to include Arctic Biology, and a total of 33 students were admitted. The Arctic Technology program was introduced in the autumn of 1996, and today there are 18 technology students at UNIS: 14 undergraduate, 2 graduate M.Sc., and 2 Ph.D. In spring 1998 UNIS had a total of 129 students from 17 different countries.

The Arctic Technology program at UNIS aims at providing students an understanding of the pristine environment and the technology required for sustainable industrial development and exploitation of the biological and mineral resources of the region. Two courses that focus on permafrost and frozen ground related problems are Frozen Ground Engineering for Arctic Infrastructure and Arctic Water Resources Management. Other courses are: Thermo-Mechanical Properties of Materials, Pollution in the Arctic, and Arctic Offshore Engineering. Contact: Professor Truls Molmann, UNIS, P.O. Box 156, Longyearbyen 9170, Norway.

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RUSSIA

This report summarizes activities for the period 1993–1998. Many of the earlier activities were reported in detail in previous issues of *Frozen Ground*. Annual meetings of the Council on Earth Cryology were held in Pushchino, Moscow region, in late April of each year at the Institute of Soil Sciences and Photosynthesis, Russian Academy of Sciences. The 1993 meeting resulted in 80 papers on the subjects of general and engineering geocryology. In 1994, 93 papers were presented, many of which concerned global climate warming and permafrost. In 1995 the main topic of the meeting was evolutionary geocryological processes in the Arctic regions and global changes of the environment and climate in permafrost areas. A number of foreign scientists participated in the meetings.

In 1996, the Russian Academy of Sciences restructured its permafrost organizations. The National Permafrost Committee and the Scientific Council on Earth Cryology were combined as the Consolidated Scientific Council on Earth Cryology, chaired by Vladimir P. Melnikov. The first annual meeting of the new Council was held in Pushchino during the International Conference on Fundamental Research of Earth Cryosphere in the Arctic and Subarctic. The conference was organized by the Council and was attended by approximately 125 participants, including 10 foreign scientists and engineers. A total of 109 abstracts were published in Russian and English in a special volume (234 pages).

On 3–5 June 1996 the First Conference of Geocryologists of Russia was held at Moscow State University. It was organized and sponsored by 16 main geocryological institutions of Russia and chaired by E.D. Ershov and co-chairs V.V. Baulin and R.M. Kamensky. A total of 165 reports were published in three pre-conference volumes in Russian.

In 1997, several major geocryological and cryopedological conferences were held in Russia as reported in *Frozen Ground* No. 21. Cryopedology '97: Second International Conference was held in Syktyvkar in the Komi Republic.

The annual meeting in Pushchino entitled International Conference on the Problems of Earth Cryosphere (Basic and Applied Studies) resulted in 162 abstracts. There were a total of 140 Russian and 30 foreign participants.

The 1998 conference in Pushchino was dedicated to the 90th birthday of Academician P.I. Melnikov, who died in 1994. Plenary lectures covered Melnikov's main research interests. The main sessions contained 151 papers, with abstracts published in Russian and English.

Analysis of the five-year cycle of Pushchino conferences shows increased reporting activity by Russian geocryologists. Several topics gained more attention (monitoring, geoinformation, modeling, trace gases, offshore permafrost,

microorganisms in permafrost). Some traditional permafrost studies were less active (regional studies, permafrost survey, hydrogeocryology). Studies that can contribute to solving the problem of permafrost response to global climate change were of great interest (periglacial processes prediction, active-layer dynamics). Less interest in applied ecological studies was compensated by greater activity in engineering studies in connection with construction stability.

Among other activities in the last five years was the publication starting in 1997 of the new quarterly Russian journal *Earth Cryosphere* (see *Publications*, pages 39–40, for more information and contents of the 1998 volume).

The Geocryological Map of the U.S.S.R (1:2,500,000) with explanatory note (edited by E.D. Ershov) in 16 sheets was published in December 1996. The map summarizes the results of a 25-year research effort by the Geocryology Department, Faculty of Geology, Moscow State University (see *Publications*).

Program 18, Environment and Global Climate Change, and its permafrost component included the assessment or estimate of the influence of climate change on the cryolithozone; monitoring of the cryolithozone; and methods and measures to protect construction and the environment in the North. Numerous institutes, universities and private contractors are involved. The program is financed by the Ministry of Science under the direction of Yuri Israel and Academician George Golitsin. The permafrost program was initially directed by Academician P.I. Melnikov and the Scientific Council on Earth Cryology.

Cooperation of Russian permafrost scientists and German geoscientists started in 1995 (N.N. Romanovskii, F. Are) in the framework of the Russian–German project Laptev Sea System (1994–96). The results of investigations showed the influence of cryogenic processes in the evolution of the Laptev Sea system's environment. Coastal and offshore permafrost investigations, including field, laboratory and modeling studies, are included in the next joint project, Laptev Sea 2000 (1998–2000). German collaborators are H.W. Hubberten (Alfred Wegener Institute on Polar and Marine Research) and H. Kassens (GEOMAR). Russian permafrost scientists took part in planning of permafrost investigations in several other international projects (RAISE, LOIRA, BASIS).

Eighteen Russian CALM sites are active. Based on measurements from experimental sites, engineering methods to protect construction are being developed, including use of thermopiles, thermosyphons, insulation, and special foundations using horizontal cooling of frozen basements.

The National Geocryological Foundation (NGF) was established in Russia in 1996 for the purpose of collecting

and disseminating permafrost data. Information on several Russian institutions' data collections is stored in the NGF. Specific regional databases are devised under its aegis. Meta-data concerning digital and paper databases on Yakutia, Transbaikalia, the Norilsk region, West Siberia, and European North Russia are available. A number of data sets and several bibliographies were contributed to the GGD and the CAPS CD.

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SOUTHERN AFRICA

The main focus of activity during the past year was on planning for the poster sessions and excursion linked to the INQUA conference that will be held in Durban, South Africa, in August 1999. A post-conference excursion to Sani Pass will be of particular interest to IPA and to its new Working Group on Southern Hemisphere Permafrost and Periglacial Environments (SHWG). The excursion will examine periglacial features, blockstreams, valley asymmetry, sedimentary successions and contemporary periglacial microforms on top of the Drakensberg and Lesotho mountains. A key issue will be the contrasting periglacial and glacial hypotheses for Pleistocene palaeoenvironments.

During the INQUA Congress two poster sessions with associated workshops will be of particular interest to IPA: Southern Hemisphere Periglacial Research and Quaternary Environmental Change (contact Jan Boelhouwers or Kevin Hall) and Current Periglacial Research and Palaeoclimatic Reconstruction (contact Stefan Grab or Ian Meiklejohn).

Other activities undertaken under the auspices of the SAPG, or by its members, during the past year include:

1. Two field workshops at Sani Pass were conducted under the leadership of Jan Boelhouwers. Emphasis was on boulder streams and their use as palaeoclimatic indicators. It is suggested that periglacial conditions existed and that the only possible glaciation is in the form of niche glaciers.

2. Ongoing field research on sub-Antarctic Marion Island by Jan Boelhouwers and Ian Meiklejohn includes an ice-mass balance study on the Marion Island icefield, monitoring of cryogenic processes, landforms and rock weathering.

3. Paul Sumner is investigating open-work block deposits in the Hogsback region, Eastern Cape Province, South Africa, to find geomorphic evidence for Pleistocene palaeoclimates. He conducted a field workshop during June 1998. These features have previously been used to argue for Pleistocene periglacial gradients and snowlines.

The annual general meeting of the Southern African Permafrost Group was held in July in Grahamstown. The following were elected to the council:

President and IPA Representative: Jan Boelhouwers
President Elect: Ian Meiklejohn
Secretary and Treasurer: Paul Sumner

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SPAIN

The third meeting of IPA–Spain was held in Andorra la Vella 17–19 July 1997. The 20 papers focused on the common theme of the dynamics and evolution of natural systems in cold climates and covered a range of geographical areas: the Iberian Peninsula (Pyrenees, Picos de Europa, the Galician and Portuguese massifs, Sierra de Gredos, Sierra Nevada), the Antarctic (South Shetland Islands), and Sweden (Tarfala Valley) (see *Publications*, page 41).

Three special talks helped unify the topics and provide a global perspective. Gérard Soutadé spoke about the importance of past and present cold-climate processes in the morphology of Andorra. André Baudière discussed the phytogeomorphological substitution taking place in the supraforest landscapes of the mountains in Catalonia. José L. Peña Monné summarized the status and prospects of current studies in Spain on cold-climate processes.

The papers represented a wide diversity and interrelationship among topics, but may be grouped according to:

- Subjects relating to climate and its influence on cold-climate processes (J.M. Raso et al., M. Ramos et al.)
- The effects of climate on geomorphological events (E. Martínez de Pisón et al., M. Fronchoso Sánchez et al.)
- Geomorphological topics, including the present dynamics of certain morphologies such as the functionality of rock glaciers (E. Serrano Cañadas et al.), or debris flows and the processes associated with their relationship to resulting periglacial forms (David Palacios Estremera et al.). Other topics under this heading include processes and periglacial forms at high elevations (E. Serrano Cañadas et al.) and periglacial landforms caused by past or recent slope collapse (J. Chueca Cía et al.)
- Systematic monitoring of specific cold-climate processes at designated research stations (A. Gómez Ortiz et al., J. García Ruiz et al., A. Pérez Alberti, David Palacios Estremera et al.).

Other papers included topics such as the geocological perspective of spatial variations in the nival and subnival morphodynamic levels determined by satellite imagery (J. Chueca Cía et al.) and soil processes occurring on the most recent moraines at two sites in Corral del Veleta in Sierra Nevada (M. Simón Torres et al.). A paper by L. Barthélemy suggested that periglacial processes are occurring at lower altitudes in the mountains of Andorra due to the influence of human activity, mainly the production of charcoal and overgrazing by cattle. M. Mateo García described

the technique used in lichenometric dating, the sample sites, the derivation of the growth curve for the Mariu Valley and the hypothetical existence of deposits (snowfield moraines) dating from the Little Ice Age. G. Teles Vieira et al. reviewed the status of periglacial studies in Portugal and highlighted the finding that ice action still has a morphogenic effect on the summit areas of the Sierra de la Estrella.

The Fourth Meeting of IPA–Spain will be in Albarrazin (Teruel), Spain, 15–17 July 1999 (16 July will be dedicated to field work). The theme of the meeting is Periglacial Processes and Landforms in Mediterranean Landscapes.

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SWEDEN

The following is a brief survey of groups having activities and interests in frozen ground and related topics.

Department of Physical Geography, Uppsala University: The department has begun to emphasize research in cold climates concerning landforms, processes and dynamics, and their relationship to environmental conditions in the past and present.

Else Kolstrup has set up a research program on boundary constraints of geomorphological forms and processes in past and present periglacial environments. Several faculty and partly-NFR-funded subprojects involve a thesis study by Bo Westin on boundary constraints of thermal contraction cracking and research student Frieda Zuidhoff's project on palsas in Lapland.

Philip Wookey, Else Kolstrup and Göran Possnert have recently begun an NFR-funded project Climate Change, Soil Organic Matter Lability and Decomposer Metabolism in High Latitude Soils in northern Iceland. Wookey is participating in an EU project Dynamic Response of the Forest–Tundra Ecotone to Environmental Change (DART). A research student, Sofie Sjögersten, is investigating soil processes and trace gas fluxes in relation to tree-line dynamics in Fennoscandia.

Department of Physical Geography, Lund University: As a result of recent administrative decisions research in Arctic and alpine geomorphology has been greatly reduced. Some activities continue through personal initiatives of professors emeriti Harald Svensson, Anders Rapp and J.O. Mattsson, and others. Svensson is maintaining field work and observations on fossil periglacial features on the southwest Swedish lowlands. Rapp is maintaining field observations in the Abisko area and is also organizing workshops and field symposia in the northern Swedish mountains. Mattsson continues editing the *Geografiska Analer* from Lund.

Other projects that remain active, essentially on a voluntary basis, are:

- Kärkevagge: Through international cooperation and funding and the support of the Abisko Research Station and its staff, A. Rapp and P. Schlyter continue geomorphological monitoring in the Kärkevagge valley. A number of field workshops have been organized in cooperation with the Abisko Research Station.
- Abisko area: In cooperation with the station, J. Åkerman is maintaining the CALM active layer sites along the east-west transect in the Abisko area. The ten active layer sites have been monitored since 1978 and annual basic data are presented within the CALM reporting system. Summary data appear on the IPA CAPS CD.
- Kapp Linne area, Svalbard: J. Åkerman is maintaining a limited monitoring program on periglacial processes and their climatic significance. The active layer monitoring program was started in 1972 and is now maintained within the CALM network. A vegetation map and a digital elevation model of vegetation and geomorphology forms and processes of the Kapp Linne area were completed as M.Sc. projects and await publication.
- Permafrost distribution in Sweden: Revisions to the IPA Circum-Arctic Permafrost Map, including more details, are planned by Åkerman.

The Department and Åkerman remain responsible for the Swedish IPA.

Abisko Research Station, Royal Swedish Academy of Sciences

The station has a number of permafrost-related research activities, many in cooperation with other institutions in Sweden and elsewhere. Personnel presently involved in permafrost-related research include: Christer Jonasson, Deputy Director, and Johan Kling, Abisko Scientific Research Station; Ph.D. students Markus Lundqvist and Markku Pyykönen, and M.Sc. student Karin Aune, Uppsala University; Gunhild Rosqvist, Ph.D. student Lena Johansson and M.Sc. students Johan Rytters, Ann-Helen Kronfjäll and Camilla Hansen, Stockholm University.

Ongoing projects include:

- Monitoring of present-day geomorphological processes
- Slope process variations during the Holocene
- Lake sediment studies and paleogeomorphology
- Base-line geomorphological studies in the Torneträsk area
- Present-day fluvial delta formation
- Permafrost studies in the Torneträsk region
- Avalanche monitoring and prediction
- Eolian deposition in mountain areas

International cooperation involves fieldwork on snow-melt processes in the Kärkevagge valley with colleagues from Switzerland (Dieter Scherer, Basel University) and Germany (Martin Gude, Jena University), and collaboration with the Polish Academy of Sciences, Krakow (slope processes), and

Krknose National Park, Czech Republic (nature conservation-geomorphology).

Several conferences with common interests were held:

- Research for Mountain Area Development-Europe, September 1997, report published in AMBIO Volume XXVII, June 1998
- Research for Mountain Area Development-Africa and Asia, September 1998
- Past Climates and Environment in Northern Scandinavia: Reconstruction from Multiple Sources, October 1998

Department of Physical Geography, Stockholm University: A number of activities are associated with projects financed or organized by the Swedish Polar Secretariat that include both the Antarctic and the Arctic. Reports of department activities are found in Reports and Newsletter of the Swedish Polar Secretariat (<http://www.polar.kva.se>). Periglacial and permafrost research have been carried out at the Tarfala Research Station, and field courses and workshops have been conducted. Stockholm is a partner in the EU-funded Permafrost and Climate in Europe (PACE) project, utilizing the excellent facilities in Tarfala.

Contact Per Holmlund (per.holmlund@natgeog.su.se)

Lulea University of Technology: The engineering and geotechnical aspects of frozen ground in Sweden are covered by the Department of Civil Engineering. The department is represented in IPA engineering working groups and many international organizations dealing with applied aspects of frozen ground. The International Symposium on Ground Freezing and Frost Action in Soils was held in Lulea in April 1997. Contact Sven Knutsson (sven.knutsson@ce.luth.se); (<http://www.luth.se/depts/anl/frost97/>)

Report compiled by Jonas Åkerman (agrisys@zamnet.zm)
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Anders Rapp, Else Kolstrup (else.kolstrup@natgeog.uu.se)
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SWITZERLAND

In collaboration among the Swiss Academy for Sciences (SAS), the Swiss Alpine Club, ETH Zurich and the Universities of Zurich and Fribourg, a project was set up to establish a concept for the Swiss Permafrost Monitoring Network. The stations are separated into three levels—low, middle and high-cost stations—mainly focusing on the thermal regime of the permafrost. Additional information is expected from other long-term observations like photogrammetry, borehole deformation, hydrology, etc.

Following the restructuring of the Glaciological Commission of SAS at the beginning of 1997, the task of this body has been expanded with respect to snow and permafrost. Delegates for glacier observation (M. Hoelzle) and for perma-

frost (D. Vonder Mühll) were appointed. The latter is in charge of connecting with international organizations, and acts as the national contact for the IPA, the Swiss Coordinating Group on Permafrost of the SAS.

Since there was much new information to report following publication of *Frozen Ground* No. 21 in December 1997, it was decided to produce a newsletter for the Swiss Coordinating Group on Permafrost of the SAS, called *Permafrost News Flash*. Articles in several languages report what's going on in Working Groups and projects dealing with permafrost. The *Permafrost News Flash* is to be published as needed, at least once a year.

The EU-project Permafrost and Climate in Europe (PACE) officially started on 1 December 1997. Twenty-two scientists attended the first coordinating meeting, held 22–25 March in St. Moritz.

On 3 May 1998 the 100-m-deep borehole at Hanssonhaugen in Svalbard was established. A thermistor chain was lowered on 7 May, and has been reading temperatures since. The drilling was a collaboration between Norwegian and Swiss partners.

The Hydrological Atlas of Switzerland includes tables relating to phenomena linked to hydrology. The Swiss Coordinating Group on Permafrost was asked to provide a table for the atlas on permafrost. The table has been co-produced by six institutes and will be published in early 1999.

The ETH Research Commission funded a three-year project in which the Institute of Geotechnics (S. Springman), the Institute of Geophysics (H.R. Maurer), and the VAW (D. Vonder Mühll) will investigate the Muragl rock glacier as an example of a creeping permafrost body. Boreholes, core analysis, cross-hole geophysics, and long-term monitoring will be performed.

Matthias Wegmann defended his Ph.D. thesis on Rock Stability in Permafrost. He measured a number of geotechnical parameters such as temperature and deformation in the crest near Jungfrauoch. In addition, he investigated the thermal behavior using numerical models.

Two Ph.D. students working on permafrost at the Universities of Lausanne and Fribourg are about to finish their theses. Others have just started or will shortly start their work.

Daniel Vonder Mühll (vdmuehll@vaw.baum.ethz.ch)

UNITED KINGDOM

The British National Adhering Body of IPA held a two-day Periglacial Workshop on 16 and 17 December 1997 at the University of Cardiff. The meeting was organized by Charles Harris and Julian Murton in association with the IPA Working Group on Periglacial Processes and Environ-

ments, the IGU Commission on Climate Change and Periglacial Environments, and the Cryostratigraphic Research Group of the Quaternary Research Association.

The first day focused on cryostratigraphy, with keynote papers by Hugh French on cryostratigraphic methods, Jef Vandenberghe on climate change and periglacial environments, and Julian Murton on the cryostratigraphy and dating of thermokarst lake deposits in the Pleistocene Mackenzie Delta, N.W.T., Canada. Presentations were also given by Matti Seppälä (Helsinki), Stephen Gurney (Reading), Steve Boreham (Cambridge), M.K. Bateman (Sheffield), Hanne Christiansen (Copenhagen), Colin Ballantyne (St. Andrews), Andrew Rochelle (Wolverhampton), Brigitte Van Vliet-Lanoe (Lille), Hideki Miura (Tokyo), Charles Harris (Cardiff) and Julian Murton (Sussex).

The second day of the meeting concentrated on monitoring and modeling of periglacial processes. Keynote papers were presented by J-C Ozouf (Caen) on laboratory modeling of cryogenic weathering, Norikazu Matsuoka (Tsukuba) on monitoring and modeling periglacial soil moments, Wilfried Haeblerli (Zurich) on key questions in rock glacier dynamics, and Michael Davies (Dundee) on geotechnical centrifuge modeling of cryogenic processes. Papers were also presented by David Robinson (Sussex), Colin Thorn (Illinois), Fiona Thompson (Warwick), Stanislav Grechishchev (Moscow), Charles Harris (Cardiff), Ole Humlum (Copenhagen) and Duncan Irving (Cardiff).

The workshop concluded with a visit to the Geotechnical Centrifuge Laboratory at the Cardiff University School of Engineering. The conference dinner was enlivened by musical entertainment provided by Wilfried Haeblerli (flute), Norikazu Matsuoka (guitar), and Stanislav Grechishchev (piano). Selected papers from the workshop will be published in *Permafrost and Periglacial Processes*, and copies of abstracts may be obtained from Charles Harris at the University of Cardiff, P.O. Box 914, Cardiff CF1 3YE, UK.

The European PACE Programme (Permafrost and Climate in Europe) is coordinated by Charles Harris at the University of Cardiff (see *Frozen Ground* No. 21, pages 3–4). The project held coordination meetings in Cardiff (December 1997) and St. Moritz, Switzerland (March 1998). Information, results and latest news from the PACE project may be found on the new Web site (<http://www.cf.ac.uk/uwcc/earth/pace/>) or by contacting the administrative secretary (meldrumke@cardiff.ac.uk).

The IPA Web site continues to be maintained by Julia Branson at the Geodata Institute, University of Southampton, U.K. (j.branson@soton.ac.uk)

Charles Harris (harrisc@cardiff.ac.uk)

UNITED STATES

Completion of the CD-ROM Circumpolar Active-Layer Permafrost System (CAPS) by the staff of the National Snow and Ice Data Center was a major activity during 1998. Members of a small international Working Group met for several weeks in Boulder during February and March to prepare the final documentation. The group included Julia Branson and Mike Clark (U.K.), Marina Leibman (Russia), Jerry Brown (U.S.) and from NSIDC, Chris Haggerty, Claire Hanson, Ann Brennan and Roger Barry. Following demonstration of the prototype CD at Yellowknife over 350 disks were mailed to the Conference attendees and contributors to the CD (see inside back cover for more details). The CD was presented at the 17th Polar Libraries Colloquy in Reykjavik, Iceland, in September.

Several new National Science Foundation Arctic programs began in 1998: Arctic Transitions in the Land-Atmosphere System (ATLAS) and the Russian-American Initiative on Shelf-Land Environments in the Arctic (RAISE). The first set of RAISE proposals is under review.

ATLAS is the next terrestrial phase (1998-2002) of the Arctic System Science (ARCSS) program and is focusing on north-central Alaska and ultimately on projects in northeast Russia (see *Frozen Ground* No. 19 for the ARCSS report). Included are permafrost thermal studies by V. Romanovsky, soil carbon studies by C.L. Ping, University of Alaska, and the CALM network by Ken Hinkel, University of Cincinnati. The new five-year CALM project provides support to the existing Russian sites (see *Frozen Ground* No. 21), the establishment of a Web site, and collation of all site data for transfer annually to the WDC-A in Boulder. As the first step in the new CALM project, F.E. Nelson met in Moscow in May with Russian investigators to discuss summer 1998 sampling and equipment. The CALM protocol was reviewed at a meeting in Yellowknife. Ron Paetzold and C.L. Ping instrumented a site for soil temperature and moisture at the Fenghuo Shan Station, Qinghai-Xizang (Tibet) Plateau, in cooperation with Zhao Lin and the Lanzhou Institute of Glaciology and Geocryology.

NSF support of the U.S. International Tundra Experiment projects continues for sites at Barrow, Atkasuk and Toolik in Alaska and Niwot Ridge in Colorado, as well as permafrost-climate modeling (Nelson at University of Delaware) and data analysis (Barry at University of Colorado).

Of the 50 U.S. participants at the Yellowknife Conference, 14 (including 7 students) received partial support from an NSF travel grant to the American Geophysical Union.

The Ninth International Conference on Cold Regions Engineering was held in Duluth, Minnesota, 27-30 September 1998. The conference theme Cold Regions Impacts on

Civil Works was addressed in 24 technical sessions, and there was an exhibition of engineering products and services developed for cold regions. The Technical Council on Cold Regions Engineering (TCCRE) committees met to plan future activities. The State of the Practice Committee is in the final phases of preparation of a new monograph entitled *Piles in Frozen Ground*. The ASCE President-Elect Daniel S. Turner reappointed R. G. Tart as the ASCE Liaison Representative to the USC/IPA, and requested he report IPA activities to the ASCE as they relate to civil engineering.

Special sessions on permafrost continue to be organized by Bernard Hallet at the annual fall meeting of the American Geophysical Union in San Francisco. In 1997 a session honoring A.L. Washburn resulted in 25 oral and poster abstracts and presentations. The 1998 session is being held to honor A.H. Lachenbruch and his contributions to permafrost and geothermal research; 59 reports are planned.

Syun Akasofu, Director of the newly established International Arctic Research Center (IARC), University of Alaska, reports that the Center's primary goal is to study Arctic climate change. Eight broad research subjects are identified as the framework: (1) Detection of contemporary change, (2) Paleoclimatic reconstruction of past changes, (3) Interactions and feedback that affect change, (4) Atmospheric chemistry of the Arctic region, (5) Impacts and consequences of change, (6) Space weather prediction, (7) Tectonics in the Arctic, and (8) Integration of 1-7 on a regional scale. The first seven subjects will be studied by researchers from Japan, the US, and International Arctic Science Committee (IASC) participating countries.

The program FROSTFIRE, a landscape-scale prescribed fire experiment, is underway north of Fairbanks, Alaska, in the Caribou-Poker Creeks Research Watersheds. A research project Improving Predictive Capability of Boreal Forest Response to Forest Fires seeks to determine the impacts and interrelated effects of fire on boreal ecosystems in a 2600-acre sub-watershed (C4). This diverse project includes studies related to fire science, nutrient dynamics, permafrost and vegetation response and recovery, climatic influence and feedbacks, and hydrology. The research will measure the carbon storage and flux in a boreal forest. This program is sponsored by the Research Institute of Innovative Technology for the Earth, Kyoto, Japan. The principal investigators are Masami Fukuda of Hokkaido University and Larry Hinzman, University of Alaska Fairbanks. International participants include scientists from the Institute of Low Temperature Science, Hokkaido University, and the Canadian Forest Service, Natural Resources Canada.

Gary Clow, U.S. Geological Survey, reports that he has established six new climate-monitoring stations in northern

Alaska at Tunalike, Awuna, Umiat, Inigok, West Fish Creek, and Drew Point. These stations provide increased spatial coverage and are associated with the deep geothermal borehole sites reported on the CAPS CD-ROM.

To improve communication concerning scientific and technical aspects of permafrost, active layer and frozen ground studies, Tom Osterkamp, Geophysical Institute, University of Alaska Fairbanks, has established an electronic (e-mail), unmoderated and international discussion list. It is supported by the University of Alaska computer staff in Fairbanks. If you wish to become part of this discussion list (i.e. to subscribe to the list), send the following command (and only this command) in the body of an e-mail message:

SUBSCRIBE PALS-L

to: listserve@galileo.admin.uaf.edu.

The server (computer) should automatically send you a welcome and instruction message which will enable you to take part in discussions.

Compiled by Jerry Brown (jerrybrown@igc.org)
with contributions by

Larry Hinzman (ffldh@aurora.alaska.edu)
and Bucky Tart (btart@golder.com)

OTHER NEWS

NEW ZEALAND

Within the 1997–98 New Zealand Antarctic Research Program studies of dry frozen permafrost were carried out by Doug Sheppard, New Zealand Institute of Geological and Nuclear Sciences, Iain Campbell, Land and Soil Consultancy, and William Mahaney, Atkinson College, Toronto. The till deposits studied are part of a high altitude sequence (around 1800 m elevation) which are believed to be old tills, possibly Miocene aged, deposited from a previous expansion of the West Antarctic Ice Sheet. The main purpose of the investigation was to study the geochemistry of salt horizons within the permafrost and to obtain samples for Be-10 dating.

Recovery of two years of soil temperature data (Iain Campbell and Graeme Claridge) from a datalogger in a dry frozen soil has allowed the position of the permafrost table to be accurately determined. During 1998–99 summer installation of three soil temperature and moisture monitoring sites in the coastal McMurdo Sound–Dry Valley region is planned with the assistance of the USDA (John Kimble and Ron Paetzold). These sites will contribute to a more extensive Antarctic permafrost monitoring network.

Results have been completed from a study headed by Warren Dickinson, Victoria University of Wellington, who investigated a till deposit from the controversial-aged Sirius Formation. Samples from a 3.5-m-deep hole revealed authi-

genic quartz, zeolite and calcite in the pore network suggesting that there must have been appreciable quantities of water present some time previously.

During the 1998–99 summer season, Paul Augustinus, University of Auckland, will undertake subsurface imaging of raised beaches on the Southern Victoria Land and Ross Island Coasts. The project involves ground penetrating radar and resistivity surveys of the beaches with the primary objective of mapping permafrost and buried ice. Other personnel involved are Ed Butler (Antarctic Unit, Victoria University of Wellington) and Scott Nichol (Geography Department, University of Auckland).

The Eighth International Symposium on Antarctic Earth Science will be held in Wellington, New Zealand, 5–9 July 1999. With a growing interest in permafrost geochemistry in New Zealand, the organizers are hopeful that there might be sufficient interest to hold a permafrost session. If interested, contact Warren Dickinson (Warren.Dickinsen@vuw.ac.nz).

Iain Campbell (campbell.lsc@xtra.co.nz)
Paul Augustinus (p.augustinus@auckland.ac.nz)

ROMANIA

Monitoring of permafrost conditions continues in the Retezat, Parâng and Fagaras Mountains (Southern Carpathians). The results of BTS and summer temperature measurements of springs situated at the base of block fields in the Apuseni Mountains (western part of Romanian Carpathians) indicate the existence of sporadic permafrost at low elevations (1050–1100 m asl). A map has been prepared on the geomorphologic risks associated with the Transfagarasan highway area, which is situated in the central part of the highest massif of Romania, the Fagaras Mountains (2544 m). A bibliography prepared on the glacial and periglacial geomorphological problems contains 332 references. Mapping and monitoring of periglacial processes in the Tarcu Mountains (C. Gruia), Lotrului Mountains (C. Ancuta), Surianu Mountains (L. Dragut) and Cernei Mountains (D. Gureanu) continue. A. Szepesi (Bucarest) in his doctoral dissertation modeled and identified the existence of permafrost in the Iezer Mountains.

Petru Urdea (urdea@cbg.uvt.ro)

PORTUGAL

A field trip and symposium were organized on behalf of the IGU Commission on Climate Change and Periglacial Environments from 26–29 August 1998 in Portugal, in conjunction with the IGU Regional Conference that took place in Lisbon (30 August–2 September). The field trip was dedicated to the glacial and periglacial geomorphology of the Serra da Estrela, and was organized by Antonio de Brum

Ferreira and Gonçalo Teles Vieira (Centro de Estudos Geográficos, University of Lisbon). Thirteen visiting participants from Italy, The Netherlands, Canada, Belgium, Brazil, Denmark and Spain attended.

The highest mountains in Portugal (Serra da Estrela, 1993 m asl) were glaciated by an ice cap and several valley glaciers during the Weichselian. The field trip focused on relict glacial and periglacial phenomena. The main aspects of the Pleistocene glaciation were presented and observed. Visits to periglacial sites included the observation of the head deposits of Sao Gabriel, the screes of Várzea do Crasto, the stratified coarse sand deposits of Barroca de Agua, and the Alto da Pedrice blockslope. The latter site presents a significant relict macrogelivation. The age of the deposit, its genesis and environmental conditions were discussed. Present-day cryogenic processes and their relationship with hydric and aeolian processes were also treated. The geomorphological significance of wind in the plateaus was observed in the Cantaro Raso and Fraga das Penhas areas.

In a marginal periglacial environment like the Serra da Estrela, with a Mediterranean climate where annual precipitation averages 2500 mm and mean annual temperature in the summit regions is 3–4°C, the present-day geomorphological dynamics are the result of the complex interaction between different processes (e.g. needle ice, deflation, runoff). Therefore it is difficult to attribute a single genetic mechanism to most of the observed features (e.g. coarse sand accumulations, incipient patterned ground, vegetation crescents).

On the afternoon of 29 August a symposium on Periglacial Landscapes: Their Development, Preservation and Climatic Significance was held in the Faculdade de Letras (University of Lisbon). Jef Vandenberghe chaired the session and presented a report on climatic control of periglacial river patterns. Six oral presentations followed, divided in two groups: Mediterranean and tropical areas, and high latitude areas. The symposium provided the opportunity for discussions among researchers from different areas and resulted in valuable suggestions for future research. The significance of the marginal mountains and of their sensitive and complex geomorphic responses to climate was emphasized.

Gonçalo Teles Vieira (gtvieira@ceg.ul.pt)

CLIMATE AND CRYOSPHERE

Roger Barry reports that the first session of the Task Group on Climate and Cryosphere (CLIC) of the WCRP

(Joint Scientific Committee/Arctic Climate System) was held in Utrecht, Holland, 8–11 July. The background to the CLIC proposal of the Arctic Climate System (ACSYS) Scientific Steering Group was presented by WCRP Director H. Grassl. Roger Barry, NSIDC Director, was nominated to chair the first session of the Task Group comprising 11 members and 3 invited experts from 10 countries. Oleg Anisimov represented permafrost concerns. The Task Group drafted a CLIC Science and Coordination Plan to be submitted to the ACSYS and JSC in March 1999. It addresses the role of the cryosphere in climate, the cryosphere signature of climate and climate variability, and the potential impacts of climate changes on the cryosphere. The coordination of CLIC activities with those of other WCRP components, and of other international programs, institutions and activities, is also addressed. The report of the meeting will be published by the WCRP in fall 1998.

CRYOSOLS

Symposium 39, Cryosols and Their Relationships with Global Climate Change, David Gilichinsky and Brigitte Van Vliet-Lanoe, Convenors, was held at the 16th World Soil Congress in Montpellier, France, 20 August 1998. In addition to the presentations listed below, 21 posters were presented.

Introduction, The Soil Cover of the Earth's Cryosphere, D. Gilichinsky

Spatial Organization, Zonality of Arctic Soil Systems and Their Transformation Due to Global Change, S. Goryachkin, N. Karavaeva, V. Targulian, and M. Glazov

Synthesis of the Posters, R. Arnold and B. Van Vliet-Lanoe
The Effect of Climate Warming on the Carbon Balance of Cryosols in Canada, C. Tarnocai

Soil Solutions and Geobiochemical Processes in High Arctic Soils, Northeast Greenland, B.H. Jakobsen and B. Elberling
Properties, Genesis and Global Significance of Antarctic Cryosols, L. Beyer, I. B. Campbell, J.G. Bockheim, and G.G.C. Claridge

Comparison of Permafrost Effects: Soil of North Canada and Alaska and the Kolyma Region of Far Eastern Russia, J.M. Kimble, Chien-Lu Ping, C. Tarnocai, S. Smith, and G.G. Mazhitova

Mineral Transformations in Permafrost-Affected Soils, A. Alekseev, T. Alekseeva, V. Ostroumov, and C. Siegert

PUBLICATIONS



John Wiley and Sons Ltd., publishers of *Permafrost and Periglacial Processes*, has agreed to offer reduced individual subscription rates of US\$50.00 to those individuals who can demonstrate a professional interest in permafrost and other forms of frozen ground. Recipients of *Frozen Ground* and participants in the international permafrost and related periglacial conferences can qualify for this reduced subscription rate. Those interested in obtaining more information should contact: Subscriptions Department, John Wiley and Sons Ltd., Baffins Lane, Chichester, West Sussex, PO19 1UD, England.

Volume 9, Issue No. 1 (January–March 1998)

Windpolished Boulders as Indicators of a Late Weichselian Wind Regime in Denmark in Relation to Neighbouring Areas, H. Christiansen and H. Svensson

Permafrost Changes in Rock Walls and the Retreat of Alpine Glaciers: A Thermal Modelling Approach, M. Wegmann, G.H. Gudmundsson and W. Haeberli

Aeolian Sediment Transport During Winter, Black Top Creek, Fosheim Peninsula, Ellesmere Island, Canadian Arctic, A.G. Lewkowicz

Rock Temperatures and Implications for Cold Region Weathering II: New Data from Rothera, Adelaide Island, Antarctica, K. Hall

Morphology and Surface Structures of Maxwell Creek Rock Glaciers, St. Elias Mountains, Yukon: Rheological Implications, P.G. Johnson

Thaw Depth Characteristics Over Five Thaw Seasons Following Installation of a Simulated Transport Corridor, Tulita, N.W.T., Canada, S. Nolte, G. Kershaw and B.J. Gallinger

Short Communications

Comments on Permafrost Monitoring and Detection of Climate Change by Smith and Riseborough [7(4): 301–309, 1996], T.E. Osterkamp and V.E. Romanovsky

Permafrost Monitoring and Detection of Climate Change—A Reply, M.W. Smith and D.W. Riseborough

Book Review

The Periglacial Environment, K. Hall

Volume 9, Issue No. 2 (April–June 1998)

Topographic and Drainage Control on Weichselian Ice-Wedge and Sand-Wedge Formation, Vennebrügge, German–Dutch Border, C. Kasse and J. Vandenberghe

Thermal Regimes Beneath Coarse Blocky Materials, S.A. Harris and D.E. Pedersen

The Relationship Between Frost Heave and Downslope Soil Movement: Field Measurements in the Japanese Alps, N. Matsuoka

The Rock Glaciers on Prins Karls Forland, Svalbard. I: Internal Structure, Flow Velocity and Morphology, I. Berthling, B. Etzelmüller, T. Eiken and J.L. Sollid

Periglacial Patterned Ground on the Styggedalsbreen Glacier Foreland, Jotunheimen, Southern Norway: Micro-Topographic, Paraglacial and Geoecological Controls, J.A. Matthews, R.A. Shakesby, M.S. Berrisford and L.J. McEwen

Les Bourrelets-Protalus: Liens entre les Eboulis et les Glaciers Rocheux, A. Pancza

Short Communications

Oxygen-Isotope and C¹⁴ Data Associated with Late Pleistocene Syngenetic Ice Wedges in Mountains of Magadan Region, Siberia, Y.K. Vasil'chuk and A.C. Vasil'chuk

Periglacial Processes and Physical (Frost) Weathering in Northern Mongolia, R. Lomborinchen

Volume 9, Issue No. 3 (July–September 1998)

Observations on Mountain Climate and Periglacial Phenomena in the Faeroe Islands, Southeast North Atlantic Ocean, O. Humlum and H.H. Christiansen

The Influence of Mineral Earth Hummocks on Subsurface Drainage in the Continuous Permafrost Zone, W.L. Quinton and P. Marsh

Impact of Climatic Factors on the Active Layer and Permafrost at Barrow, Alaska, T. Zhang and K. Stamnes

Late Cenozoic Permafrost History of the Russian Arctic, G. Rozenbaum and N. Shpolyanskaya

Short Communications

Radiocarbon Dating of Post Glacial Morphologic Evolution in Upper Valtellina and Livignese Area (Sondio, Central Alps), G. Calderoni, M. Guglielmin and C. Tellini

Broad Occurrence of Extrazonal Periglacial Landforms in the Lowlands of Western Japan and Korea, T. Oguchi and Y. Tanaka

Volume 9, Issue No. 4 (October–December 1998)

Periglacial Cryostratigraphy, Palaeoenvironments and Processes: Papers from a Periglacial Workshop, University of Wales, Cardiff, U.K., December 16–17, 1997

Preface, C. Harris and J. Murton

An Appraisal of Cryostratigraphy in Northwest Arctic Canada, H.M. French

The Origin and Age of Coversands in North Lincolnshire, U.K., M.D. Bateman

Age and Significance of Mountain-Top Detritus, C.K. Ballantyne

Thufur Formation in Northern Iceland and Its Relation to Holocene Climate Change, B. Van Vliet-Lanoe, O. Bourgeois, and O. Dauteuil

New Permafrost Observed in Finnish Lapland, M. Seppälä

The Climatic Significance of Rock Glaciers, O. Humlum

Modelling Frost Creep Rates in an Alpine Environment, N. Matsuoka

Regular Papers and Short Communications

The Active Layer: Two Contrasting Definitions, C.R. Burn

Occurrence of Frost Heaving in the Selenge River Basin, Mongolia, N. Sharkuu

A Note on Sorted Patterned Ground in the English Lake District, J. Warburton and N. Caine

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JOURNAL OF GLACIOLOGY AND GEOCRYOLOGY

SELECTED FROZEN GROUND TITLES

Volume 19, No. 2, June 1997

Permafrost Evolution in the Northeastern Qinhai-Tibetan Plateau During the Last 150,000 Years, Pan Baotian and Chen Fahu

The Change of Thaw Bulb Under Asphalt Pavement in the Region of Permafrost on the Tibetan Plateau, Li Shuxun and Wu Ziwang

Dynamic Strength Characteristics and Failure Criterion of Frozen Silt, Shen Zhongyan and Zhang Jiayi

A Experimental Study on the Acoustic Wave Parameters of Artificial Frozen Soil, Yang Ping, Li Qiang and Yu Chuhou

Volume 19, No. 3, September 1997

An Observation and Discussion on the Physical Processes at Ice-Rock Interface, Cui Zhijiu, Xiong Heigang, and Liu Gengnian

Environmental Change in Patchy Permafrost Zone in the South

Section of the Qinghai-Tibet Highway, Wang Shaoling and Zhao Xiufeng

Engineering Geological Conditions of Permafrost and Suggestions for Route Selection and Construction of Photocommunication Lines Embedded Along the Qinghai-Xizang (Tibet) Highway, Wang Jiacheng, Wu Ziwang and Liu Yongzhi et al.

Effect of Confining Pressure on the Dynamic Features of Frozen Silt, Shen Zhongyan and Zhang Jiayi

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A Simulated Weathering Experiment of Small Free Granite Blocks under Freeze-Thaw Conditions, Zhu Liping, W.B. Whalley and Wang Jiacheng

A Study on the Relation Between Freezing Point and Load of Wet Soil, Cui Guangxin, Yang Weihao and Li Yi

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A Preliminary Simulation Experiment on Regeneration Mechanisms of Gold Placers in Permafrost, Zhang Baolin, Wang Chunhe and Wang Jiacheng et al.

Experimental Study on the Effect of the Sample Size on Fracture Toughness K_{1c} of Frozen Soils, Li Hongsheng, Zhu Yuanlin and Liu Zengli et al.

Experimental Researches on Expansion Behaviors of Saline Soil with NaCl and Na₂SO₄ Solutions, Gao Minhuan, Li Bin and Jin Yingchun

Study on Using Short Cone Pile to Improve Frost Heaving and Thaw Settlement of Soil, Xu Xueyan, Zhang Piezhu and An Ying

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The Role of P.I. Melnikov in the Organization and Development of Permafrost Research Within the Framework of the Russian State Committee on Science and Technical Policy (1991–1995), A.V. Pavlov

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The Problem of Hypogene Gas Emission into the Atmosphere, F.E. Are

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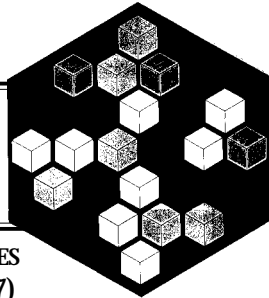
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Volume 26, No. 1 (September 1997)

Estimating Seasonal Values of Thermal Diffusivity in Thawed and Frozen Soils Using Temperature Time Series, K.M. Hinkel

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Modelling Vertical and Lateral Water Flow in Frozen and Sloped Forest Soil Plots, D. Stadler, H. Flüher and P.-E. Jansson

An Evaluation of Three Numerical Models Used in Simulations of the Active Layer and Permafrost Temperature Regimes, V.E. Romanovsky, T.E. Osterkamp and N.S. Duxbury

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A Review of Insect Survival in Frozen Soils with Particular Reference to Soil-Dwelling Stages of Corn Rootworms, M.M. Ellsbury, J.L. Pikul Jr., and W.D. Woodson

Volume 27, No. 2 (April 1998)

Laboratory Study of Stone Heave in Till Exposed to Freezing and Thawing, P. Viklander

OTHER PUBLICATIONS

Permafrost: Seventh International Conference, Proceedings (A.G. Lewkowicz and M. Allard, Ed.). Price CA\$140.00 (add 15% for non Canadian currency). Order from Collection *Nordicana* No. 57, Centre d'études nordiques, Université Laval, Ste.-Foy, Quebec G1K 7P4, Canada.

Glossary of Permafrost and Related Ground-Ice Terms

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Living with Frozen Ground: A Field Guide to Permafrost in Yellowknife, Northwest Territories (1998)

Stephen A. Wolfe (Ed.), Geological Survey of Canada

Miscellaneous Report 64. CA\$15.55 for orders inside Canada; CA\$20.20 for orders outside Canada. Available from GSC Bookstore, 601 Booth Street, Ottawa, Ontario K1A 0E8, Canada. Tel: 1 613 995 4342; Fax: 1 613 943 0646; gsc_bookstore@gsc.nrcan.gc.ca

Problems of Geocryology (Collected Papers)

R.M. Kamensky, V.V. Kunitsky, B.A. Olovin and V.V. Shep-elev (Eds.). Russian Academy of Sciences, Siberian Branch, Melnikov Permafrost Institute, Yakutsk, Russia. lans@imzran.yacc.yakutia.su

An Assessment of Climate Change Impact on Snow Cover, Glacier and Permafrost in China

Cheng Guodong et al. Contact Lanzhou Institute of Glaciology and Geocryology, Lanzhou 730 000, China.

Atlas of Geocryological Features and Permafrost of the Republics of the Former Soviet Union (in English)

US\$300. Available from Geotechnical Sciences Laboratories, Attention E. Groves, Carleton University, 1125 Colonel By Drive, Ottawa K1S 5B6, Canada. Tel: 613 520 2852; Fax: 613 520 3640; gsl@carleton.ca

General Geocryology

E.D. Yershov (P.J. Williams, Technical Editor), February 1998. Available from Customer Services Department, Cambridge University Press, FREEPOST CB27, The Edinburgh Building, Cambridge CB2 1BR, United Kingdom. Tel: 44 0 1223 325588; Fax: 44 0 1223 325152.

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December 1993–May 1996. J.M. Nicholls (Ed.). World Climate Data and Monitoring Programme, WMO-No. 856, 95 p. Contact: World Climate Programme Department, World Meteorological Organization, 41 Avenue Guiseppe-Motra, P.O. Box 2300, CH-1211 Geneva 2, Switzerland. Tel: 41 22 730 83 77; Fax: 41 22 734 80 31; wcdmp@gateway.wmo.ch

Procesos Biofísicos Actuales en Medios Fríos: Estudios Recientes

Antonio Gómez Ortiz, Ed. 1997. Andorra la Vella, Universitat de Barcelona (available from Publicacions de la Universitat de Barcelona, Gran Via 585, 08007 Barcelona, Spain. Fax: 93 403 5446; gomez@trivium.gh.ub.es

Beiträge aus der Gebirgs-Geomorphologie (Contributions to Mountain Geomorphology)

VAW-Mitteilung 1658 (1998), 226 p. Laboratory for Hydraulics Hydrology and Glaciology (VAW), Swiss Federal Institute of Technology (ETH), Zürich. Publisher: D. Vischer. 18 reports (3 English, 3 French, 12 German). Contact Dani Vonder Mühl (vondermuehl@vaw.baum.ethz.ch)

FORTHCOMING MEETINGS

1999

International Conference on Monitoring of the Cryosphere

Late April 1999, Pushchino, Russia

Contact: Evgeny S. Melnikov, Earth Cryosphere Institute, Russian Academy of Sciences, SB, Vavilov str. 30/6, Room 74a, Moscow 117982, Russia

Tel: 7 095 1359828

Fax: 7 095 1356582

emelnikov@glas.apc.org

Assessment and Remediation of Contaminated Sites in Arctic and Cold Climates

3-4 May 1999, Edmonton, Alberta, Canada

Contact: ARCSACC Conference - Edmonton '99, Room 303 CEB, Department of Civil and Environmental Engineering, University of Alberta, Edmonton, Alberta T6G 2G7, Canada

Tel: 1 403 497 3862

Fax: 1 403 497 3842

kwbigger@civil.ualberta.ca

nahirm@pwgsc.gc.ca

ISOPE-99: 9th International Offshore and Polar Engineering Conference and Exhibition

30 May-4 June 1999, Le Quartz, Brest, France and

ISOPE EUROMS-99 Moscow: International Pipeline Symposium 7-9 June 1999, Moscow, Russia

Contact: Contact: Jin S. Chung, ISOPE, P.O. Box 1107, Golden, Colorado 80402-1107, USA

Tel: 1 303 273 3673

Fax: 1 303 420 3760

ISOPE@worldnet.att.net

<http://www.isoape.org>

International Union for Quaternary Research XV International Congress

3-11 August 1999, Durban, South Africa

Contact: Secretary General, INQUA

P.O. Box 61

Cape Town, 8000 South Africa

Tel: 27 21 243 330

Fax: 27 21 246 716

mavery@samuseum.ac.za

<http://inqua.nih.no>

Periglacial Research and Quaternary Environmental Change INQUA Congress

12-15 August 1999, B3: Drakensberg Periglacial Field Excursion

Contact: Greg Botha

Fax: 27 21 9592438

gbotha@mail.tcs.co.za

10th International Conference on Cold Regions Engineering: Putting Research Into Practice

16-19 August 1999, Lincoln, New Hampshire, U.S.A.

Contact: Jon E. Zufeld, USACRREL, 72 Lyme Road, Hanover, New Hampshire 03755-1290, U.S.A.

Tel: 1 603 646 4275

Fax: 1 603 646 4477

jzufeld@crrel.usace.army.mil

www.asce.org/confconted/cold99.html

Nordic Field Symposium: Limits and Changes in Permafrost and Periglacial Environments

20-24 August 1999, Kevo Subarctic Research Station, Finland

Contact: Martti Eerola, FINRA, P.O. Box 157, 00521 Helsinki, Finland

Tel: 358 9 1918674

Fax: 358 9 1918670

martti.eerola@tieh.fi

matti.seppala@helsinki.fi

Sixth International Symposium on Thermal Engineering and Sciences for Cold Regions (ISTESCR)

22-25 August 1999, Darmstadt, Germany

Contact: K. Hutter or Yongqi Wang, Institut für Mechanik, TU Darmstadt, Hochschulstr. 1, D-64289 Darmstadt, Germany

Tel: 49 6151 162991 (Hutter) 49 6151 163196 (Wang)

Fax: 49 6151 164120

hutter@mechanik.tu-darmstadt.de,

wang@mechanik.tu-darmstadt.de

12th Northern Research Basins International Symposium and Workshop

23-27 August 1999, Reykjavik, Iceland

Contact: Iceland Tourist Bureau/Congress-Iceland, Skógarhlíð 18, IS-101 Reykjavik, Iceland

Tel: 354 562 3300

Fax: 354 562 3345

bryndis@itb.is

2000

31st International Geological Congress

6-17 August 2000, Rio de Janeiro, Brazil

Contact: 31st IGC, Secretariat Bureau, Av. Pasteur, 404-ANEXO 31 IGC, Urca, Rio de Janeiro RJ, CEP 22.290-240 Brazil

Tel: 55 21 295 5847

Fax: 55 21 295 8094

31igc@cristal.cprm.gov.br

ISOPE-2000: Offshore and Polar Engineering Conference and Exhibition

28 May-2 June 2000, Seattle, Washington, USA

Contact: Jin S. Chung, ISOPE, P.O. Box 1107, Golden, Colorado 80402-1107, USA

Tel: 1 303 273 3673

Fax: 1 303 420 3760

2001

Fifth International Conference on Geomorphology

23-28 August 2001, Tokyo, Japan

Contact: Prof. K. Kashiwaya, Department of Earth Sciences, Kanazawa University, Kanazawa, 920-1192 Japan

kashi@kenroku.kanazawa-u.ac.jp

III International Conference on Cryogenic Soils

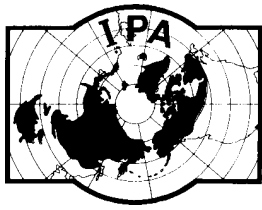
27-31 August 2001, Copenhagen, Denmark

Contact: Dr. Bjarne Holm Jakobsen, Institute of Geography, University of Copenhagen, Øster Voldgade 10, 1350 Copenhagen K, Denmark

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IPA HIGHLIGHTS

CIRCUMPOLAR ACTIVE-LAYER PERMAFROST SYSTEM (CAPS)

The CAPS CD-ROM issued by the National Snow and Ice Data Center, Boulder, Colorado, contains:

- Digital versions of the IPA circumarctic permafrost and ground ice map (USGS CP-45), Alaska (USGS I-445) and Switzerland
- Cumulative bibliography of permafrost literature spanning 1978–1997
- Twelve-language glossary of frozen-ground-related terms
- Bibliography and index of more than 700 Russian permafrost maps
- Global Geocryological Database (GGD) containing 200 descriptions of permafrost-related data sets held by individuals and organizations around the world;
- Fifty-six data sets of active layer, borehole temperature profiles, and rock glaciers representative of sites from many of the 22 IPA member countries, including the 69-site data set of the Circumpolar Active-Layer Monitoring (CALM) network
- International soil (cryosol) database and paleogeographical database of Europe

For further information contact:

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CIRCUM-ARCTIC MAP OF PERMAFROST AND GROUND ICE CONDITIONS

For the first time areas of permafrost types and their relationship to ground ice, physiography and overburden thickness have been accurately computed based on the ArcInfo database of the digitized map. The total area of permafrost, including glaciers, agrees reasonably well with that presented in *Geocryology* (Washburn 1980): 25.5 million km² for the map vs. 24.7 million km² in the book.

This represents 25.4% of the total land area of the Northern Hemisphere.

Almost 75% of the hemisphere's permafrost is found in mountains, highlands and plateaus; of this, 60% is low in ice content. As warming occurs, significantly large areas of permafrost at high elevations would be susceptible to thawing and increased ground instability. The remaining 25% of the hemispheric permafrost occupies lowlands, highlands and intermontane depressions characterized by thick overburdens.

The table was prepared by Jerry Brown, based on the digital version of the USGS Circum-Pacific Map Series CP-45. Paper copy available for purchase (US\$4.00 +\$3.50 postage) from the U.S. Geological Survey, Information Services, P.O. Box 25286, Federal Center, Denver, Colorado 80225, U.S.A. Digital version available at: ftp://ftp.ngdc.noaa.gov/Snow_Ice/Permafrost/IPA_map/

Permafrost Areas of Northern Hemisphere Based on Continuity (Extent) and Ground Ice Content

Extent of permafrost	Area, 10 ⁶ km ² (%)					
	Lowlands/uplands with thick overburden			Mountains with thin overburden		Total
	High > 20%	Med 10–20%	Low 0–10%	High > 10%	Low 10%	
Continuous (90–100%)	1.49 (5.9)*	1.31 (5.1)	0.38 (1.5)	2.14 (8.4)	5.66 (22.2)	10.98 (43.1)
Discontinuous (50–90%)	0.08 (0.3)	0.87 (3.4)	0.38 (1.5)	0.75 (2.9)	2.34 (9.2)	4.42 (17.3)
Sporadic (10–50%)	0.11 (0.4)	0.31 (1.2)	0.56 (2.2)	0.32 (1.3)	2.66 (10.4)	3.96 (15.5)
Isolated (0–10%)	0.34 (1.3)	0.07 (0.3)	0.60 (2.4)	0.03 (0.1)	2.85 (11.2)	3.89 (15.3)
Relict [†]						0.12 (0.5)
Total area	2.02	2.56	1.92	3.24	13.51	23.37
Permafrost (%)	(8.6)	(11.0)	(8.3)	(14.1)	(58.2)	(100)
Glaciers (area)						2.12

* Percentages include areas underlain by glaciers; glaciers in mountains of Asia and Europe were not included since digital information was not available.

† Area of relict permafrost is for region south of permafrost boundary in Russia; additional areas of relict permafrost included in other units.

Northern Hemisphere land area is 100,407 million km² (Oleg Anisimov, pers. comm., June 1998).



IPA Web site with links to other permafrost-related sites:
www.soton.ac.uk/ipa

CAPS CD information:
<http://www-nsidc.colorado.edu/NSIDC/CATALOG/ENTRIES/G01175.html>

IPA Circum-Arctic Permafrost Map:
ftp://ftp.ngdc.noaa.gov/Snow_Ice/Permafrost/IPA_map/

On-line metadata for Global Geocryological Database (GGD):
<http://www-nsidc.colorado.edu/NOAA/GGD/>

Circumpolar Active Layer Monitoring:
<http://www.geography.uc.edu/CALM/>

Permafrost and Climate in Europe (PACE):
<http://www.cf.ac.uk/uwcc/earth/pace/>