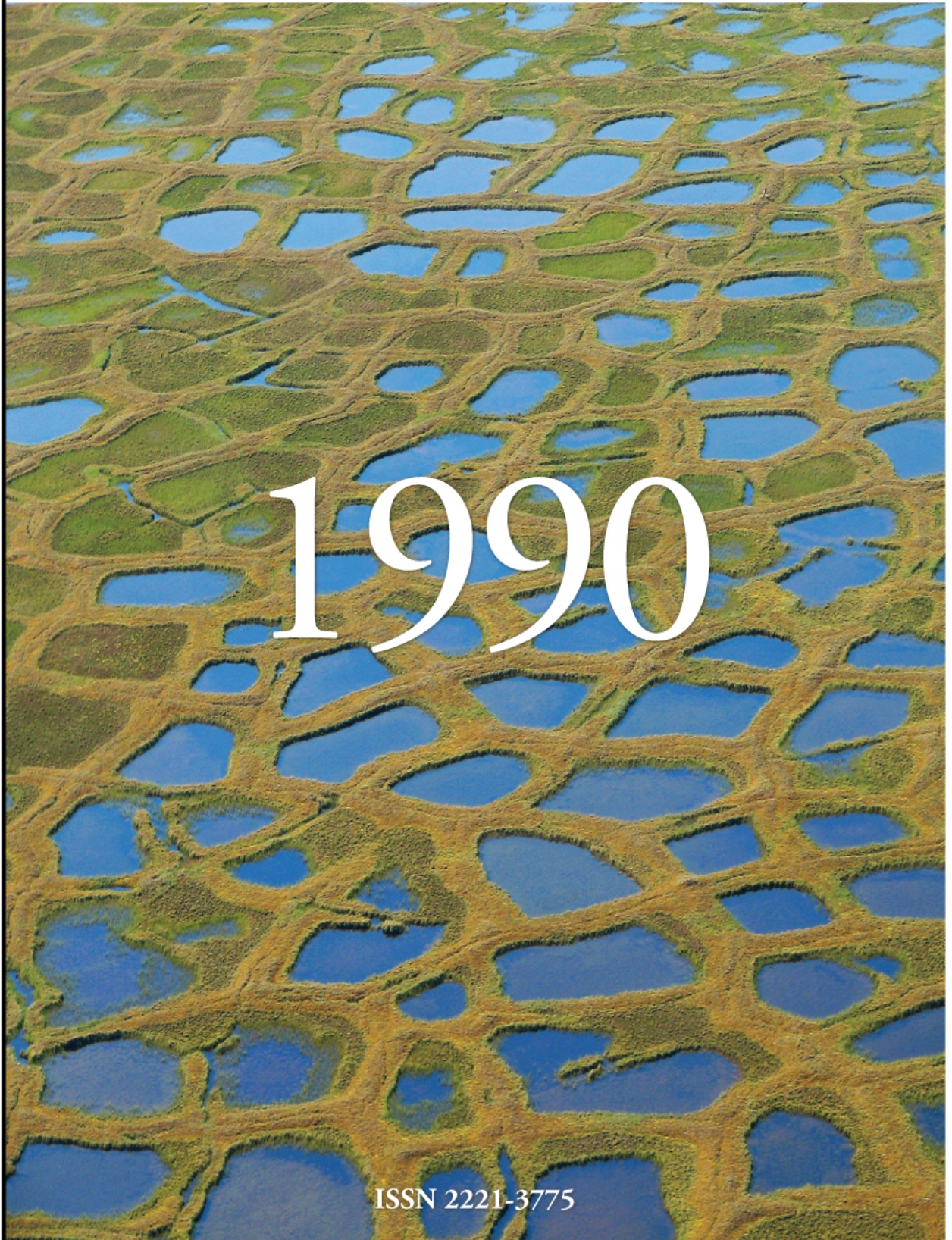


COUNTRY REPORTS



Reports from the Adhering Bodies of the International Permafrost Association



1990

ISSN 2221-3775

1 Canada

Report from July 1990

The Fifth Canadian Permafrost Conference was held at Laval University, Quebec City from 5 to 8 June, 1990. In this three-day period, 51 papers were presented on various topics in permafrost science and permafrost engineering, and several poster presentations were also shown. Nearly all the formal presentations were given by Canadian authors and the conference organizers made an effort to encourage the submission of papers by young Canadian scientists and engineers. The papers and posters have been published as No. 54 in the Collection Nordicana series of the Centre d'études nordiques, Laval University, with the general title "PERMAFROST - CANADA; Proceedings of the Fifth Canadian Permafrost Conference".

The conference volume was dedicated to Mr. G.H. (Hank) Johnson, a permafrost engineer of many years experience who recently retired from the National Research Council of Canada. Mr. Johnston was also the Honorary President of the conference. The conference opened with a retrospective look at permafrost research in Canada, given by Johnston and a review of the current program of airport construction and permafrost research in northern Québec, given by Mr. Clement Tremblay of the Quebec Department of Transport. The papers were grouped into theme sessions: geocryology, geophysics, hydrology, processes, thermal regime and climate change, and engineering. The conference concluded with a one-day engineering speciality session, convened jointly by the Permafrost Subcommittee of the National Research Council of Canada and the US Permafrost Committee. This session ended with a panel discussion on research needs and priorities in permafrost engineering. A noteworthy feature of the conference was that all the papers on the program were given, and with a minimum of substitutions of presenters.

In all, 146 people registered for the conference; of these 98 were Canadians (or foreign graduate students at Canadian universities). The largest foreign delegation, with 22 members, was from the USSR - this is the largest Soviet permafrost delegation ever to visit North America. The American delegation comprised 15 and 8 other countries were represented. The very large Soviet delegation was made possible because of the generous financial

support of Laval University, which contributed towards the attendance costs for some 15 young Soviet permafrost scientists and engineers.

The success of the conference is a tribute to the organizing committee and, particularly, to its chairman, Professor Michel Allard, Laval University. The conference was sponsored by the Permafrost Subcommittee, National Research Council of Canada; the Cold Regions Geotechnology Division, Canadian Geotechnical Society; the Canadian National Committee for the International Permafrost Association; the Centre d'études nordiques, Laval University and the Ministère des transports du Québec. Financial support was also received from Air Inuit Ltée and Kodak Canada Inc.

Copies of the volume of papers from the Fifth Canadian Permafrost Conference may be purchased, at \$40 Can per copy including postage, from:

Collection Nordicana
Centre d'études nordiques
Université Laval
Cité universitaire
Québec, Canada
G1K 7P4.

On the three days prior to the conference, the Executive Committee and the Council of the International Permafrost Association held meetings (see detailed account in Frozen Ground #7), as did the Canadian National Committee for the International Permafrost Association, and the Permafrost Subcommittee of the National Research Council of Canada. In the case of the Permafrost Subcommittee, this was its last meeting, as the Subcommittee and its parent body, the Associate Committee on Geotechnical Research, will cease to exist in their present form at the end of March 1991. How the work of the Subcommittee will be carried forward is still to be decided.

Report from December 1990

The Cold Regions Geotechnology Division of the Canadian Geotechnical Society (CGS) was founded in April 1988. Since then it has grown to a membership of about 165. Shortly before this, the CGS had changed its membership requirements so as to permit scientists working in disciplines related to geotechnical engineering to join. This has resulted in a number of geologists, geophysicists and even physical geographers becoming active members of the Cold Regions Division. The first chairman of the Division was Hayley, EBA Engineering Consultants Ltd.,

Edmonton. Don had chaired the task group within the CGS which developed the proposal for the formation of the Cold Regions Division. The other three divisions of the CGS are the Soil Mechanics and Foundations Division, the Engineering Geology Division, and the Rock Mechanics Division.

The purpose of the Cold Regions Division is to advance the interest and coordinate activities in cold regions geotechnology among engineers, earth scientists and associated professionals in Canada. It encourages communication between those working in the fields of snow, ice, frozen ground and related disciplines, by sponsoring meetings and conferences, and it represents the interests of the society and of the disciplines at the national and international level. The Cold Regions Division is, in effect, the professional society for permafrost in Canada. No other society has such a direct interest in permafrost science or engineering.

The Cold Regions Division has been busy since its founding. Apart from getting itself organised, the Division sponsored a workshop in "Saline Permafrost" in October 1989; was major co-sponsor of the Fifth Canadian Permafrost Conference in June 1990 (see Frozen Ground # 7, July 1990); and sponsored a short session on "Ice Force Prediction" at the annual CGS conference, October 1990.

The Roger J.E. Brown Award

On an ongoing basis, the Division is now responsible for selecting the recipient of the Roger J.E. Brown Award. This annual award, which was established in 1986 to honour the memory of this renowned Canadian permafrost scientist, is presented:

(a) to the author(s), preferably Canadian, of the best paper on permafrost science or engineering published in the Canadian Geotechnical Journal, the Canadian Journal of Earth Sciences, or the proceedings of National or International Permafrost Conferences: or

(b) to honour an individual for excellence in the field of permafrost.

The most recent recipient is G.H (Hank) Johnston, a former colleague of Roger Brown at the National Research Council of Canada. The previous recipients have been: (1986) Prof. Ross Mackay, University of British Columbia, Vancouver; (1987) Dr. Derick Nixon, (then with) Hardy Associates, Calgary; (1987) a joint award to Prof. Wayne Savigny, University of British Columbia, Vancouver, and to Prof. Norbert Morgenstern, University of Alberta, Edmonton; and

(1989) Prof. Hugh French, University of Ottawa.

Executive Committee

A new executive committee for the Cold Regions Division was elected at the recent annual meeting of the CGS, held in Quebec City, October 1990. The members are:

- * Denis Blanchet Canadian Marine Drilling, Calgary
- * Hugh French University of Ottawa, Ottawa
- * Pavel Kurfurst Geological Survey of Canada, Ottawa
- * Derick Nixon Esso Resources Canada Ltd., Calgary
- * David Sego University of Alberta, Edmonton

The new executive takes office on 1 January 1991, with Dave Sego as the new Chairman.

Future Activities

Future activities include co-sponsoring an ASCE Specialty Conference on Cold Regions Engineering, Hanover, USA, in February 1991, and organising a special session on "Permafrost Terrain" for the CGS annual conference in October 1991. The CGS and the Cold Regions Division are working with the National Research Council of Canada in planning an orderly devolution of some activities of the Associate Committee on Geotechnical Research (ACGR) to the CGS. Two subcommittees of the ACGR (Permafrost and Snow and Ice) are involved in activities of particular interest to the CGS.

Canadian Ground Freezing Test Facility

Earlier this year, the Associate Committee on Geotechnical Research of the National Research Council of Canada set up a small task force to examine the feasibility of constructing and operating a ground freezing test facility in Canada. The seven-member task force has prepared a report that addresses the feasibility of such a facility. The type of experiments that could be carried out, a description of the physical plant, a management structure and possible sources of funding were all examined. The group favoured the concept of a relocatable facility that could be used to test the behaviour of natural as well as reconstituted soils. The initial push for such a facility is to learn more about frost heave effects of pipelines buried in discontinuous permafrost soils. This would be a logical extension to a research program undertaken by Carleton University, Ottawa, at Caen, France, with financial support from the Government of Canada's Program of Energy Research and

Development and the Canadian petroleum industry. The new facility would be configured for frost effects research of various kinds, including behaviour of pavements and subgrades, development and testing of geophysical and geotechnical instruments, and studies of geomorphic processes in coldclimates. The task force, which has recently completed its draft report, comprises:

- * Derick Nixon Esso Resources Canada Ltd., Calgary (Chairman)
- * John Ellwood Foothills Pipe Lines Ltd., Calgary
- * Chris Graham Gulf Canada Resources, Calgary
- * Don Hayley EBA Engineering Consultants Ltd., Edmonton
- * Alan Judge Geological Survey of Canada, Ottawa
- * Bill Roggensack Centre for Frontier Engineering Research, Edmonton
- * Peter Williams Carleton University, Ottawa

Further information about the activities of the task force can be obtained from the chairman, Dr J.F. (Derick) Nixon, Esso Resources Canada Limited, 3535 Research Road NW, Calgary, Alberta, Canada, T2L 2K8.

"Geotechnical News"

News of the activities of the Canadian Geotechnical Society and its four divisions appears regularly in "Geo-technical News." the newsletter of the North American Geotechnical Community. "Geo-technical News" is published four times a year by BiTech Publishers Ltd., Suite 903-580 Homby Street, Vancouver, Canada, V6C 3B6. The newsletter regularly includes articles of interest to permafrost engineering and science.

2 China

Report from July 1990

During 1989 a delegation from the Chinese Academy of Sciences visited the Mongolian Academy of Sciences, where the Director of the Institute of Glaciology and Geocryology expressed interest in joint permafrost studies with Chinese geocryologists. An invitation to attend the Sixth International Symposium on Ground Freezing, to be held in Beijing on 10-12 September 1991, is to be sent to the Mongolian Academy of Sciences.

A joint Sino-Soviet joint expedition to the Chinese and Soviet sides of Tien Shan will take place from June to

September 1990. Five scientists from the Soviet Union will take drilling equipment to the Chinese Tien Shan to work on mountain permafrost, and three Chinese scientists (including IPA Vice-President Cheng Guodong) will visit the Soviet Tien Shan. The study will yield a joint monograph titled *Permafrost in Tien Shan*.

Discussions are under way concerning a joint Sino-US project to drill a 250 m deep borehole on the Qinghan Xizang plateau. This proposal is regarded, as offering a major contribution to research on global change and permafrost, and the plans should be consolidated through a visit to China by Professor Osterkamp in October 1990.

Zhu Yuanlin reports that a new cold region science research centre - the State-Major Frozen Soil Engineering Laboratory (FSEL) is under construction at the Lanzhou Institute of Glaciology and Geocryology, Academia Sinica, and is scheduled for completion at the end of 1992. With a wide range of analytical instrumentation, the main aim of the laboratory will be to investigate the physical, mechanical and physico-chemical processes of freezing, thawing and frozen ground, together with their application to engineering practice and environmental research in cold regions. Research will focus on the mechanism of mass transfer and ice formation during soil freezing and thawing; frost heave processes, forces and prediction; thaw consolidation processes and thaw settlement prediction; creep and strength behaviour of frozen soils under various loading modes and stress states; thermal creep behaviour and freezing point depression under loading of frozen soils; simulation of temperature and stress fields for various structures on and in frozen subsoil under various boundary conditions; and principles and techniques relating to frost damage prevention, the thawing of frozen soil, and the applications of natural cold energy. The Laboratory will be pleased to accommodate postgraduate studies from overseas scientists.

Following a decision by the ICSU Panel on World Data Centers in August 1988, World Data Center D (WDC-D) was established in China in January 1989, and comprises nine disciplinary centers. WDC-D for Glaciology (Snow and Ice) and Geocryology is operated by, and co-located with, the Lanzhou Institute of Glaciology and Geocryology (LIGG), Chinese Academy of Sciences, Lanzhou 730000, China. The Director is Professor Xie Zichu, Vice Directors are Professor Zeng Qunzhu and Professor Cheng Guodong, and the Executive

Secretary is Assistant Professor Chen Xianzhang. Contact can be achieved through telephone (0931) 26725 Extension 251; Cable Lanzhou 0393; and Telex 72008 IGGAS CN. Planned data holdings will cover Glaciology (glacier inventory; glacial hydrology; glacial climatology; ice cores; polar ice sheets; river, lake and sea ice; ice chemistry; ice physical parameters; satellite imagery of glacial areas; engineering parameters of ice), Geocryology (permafrost distribution; permafrost temperature; profile data on permafrost geology; thermal and mechanical parameters of frozen soil; ground ice; satellite imagery of permafrost regions), Snow Cover (ground data; snow chemistry; snow avalanche and snowdrift; snow physical parameters; remotely-sensed snow data; engineering parameters of snow) and literature and map resources. WDC-D is open to visitors during normal working hours. Data listings are issued periodically, and data can be provided on magnetic media (for snow and ice reflection, and northern hemisphere snow cover) and in printed or microfilm format or other data types.

Report from December 1990

General Information on the Notional Frozen Soil Engineering Laboratory, Lanzhou Institute of Glaciology and Geocryology, Academia Sinica.

Objective

Nearly half the land of the Northern Hemisphere is frozen in the winter. The areas of northern permanently and seasonally frozen ground in China are about 20%, and 50% of the total area, respectively, i.e., 75% of the total land area suffers the cyclic changes of freezing and thawing. Various kinds of engineering constructions frequently suffer damage due to the freezing and thawing of foundations. To utilize and reform frozen ground and ensure safe operation of engineering constructions in cold regions, it is necessary to understand the characteristics of frozen ground, to determine the relationship between frozen ground and engineering activities of mankind and to learn how to control adjust the various changes occurring in frozen ground.

The objective of the National Frozen Soil Engineering Laboratory (NFSEL) is to provide the place and facilities for experts, scholars and young scientists both at home and abroad to carry out the theoretical and practical research on frozen soils so as to obtain results with a high level of accuracy and to cultivate excellent scientists and engineers.

History

By ratification of the National Planning Committee and Chinese Academy of Sciences, NFSEL was begun in 1989 and will be completed at the end of 1991 with the total usable floor area of 3600 m² including 300 m² of low temperature rooms. At present, NFSEL is at the stage of construction and operation.

NFSEL was composed mainly of laboratories which originally belonged to the division of Engineering Geocryology and the Division of Geocryological Forecast and Environment of Lanzhou Institute of Glaciology and Geocryology, Academia Sinica. It has many experienced and qualified scientists, engineers and technicians, and some of them have visited or worked at associated laboratories of various countries such as the United States, Japan, the Soviet Union and France. For many years they not only systematically studied the physical, mechanical and thermal properties of frozen soils in the laboratory, but also undertook research work on the frozen ground problems of national major projects, such as the construction of highways, railroads and petroleum pipelines on the Qinghai-Xizang Plateau, the artificial freezing project in Lianghui coal mine and the previous study on the west line plan of the water transportation project from the south to the north. In recent years, three books and 215 articles were published, and ten of the research achievements were rewarded by the State or Chinese Academy of Sciences with 1st, 2nd, 3rd classes respectively. At the same time, the studies on strength and creep behaviour of frozen soils and water migration in freezing and frozen soils have gained new progress. The experimentation of the laboratory now is marching forward to precision, automation and regulation.

Personnel and Facilities

The total regular staff of the laboratory number 33, one full professor, 11 associate professors and senior engineers, 12 engineers including 9 postgraduate students (2 of them with Ph.D. and 7 with M.Sc.). They are working in three research groups and two technical service groups, respectively. The research groups contain 22 laboratories which have instruments and equipment valued at 4,000 yuan and will import and develop the instruments and equipment to the value of 3,800,000 yuan.

The academic committee of NFSEL consists of 18 eminent scientists and researchers both at home and abroad and will play a leading role in academic activities of the laboratory.

The Direction and Content of Research

The research direction of NFSEL is to investigate the physical, mechanical and physio-chemical processes which occur in freezing, thawing and frozen soils, as well as their mechanism and model, and their applications to the studies of engineering construction and environment.

The main contents of research are as follows:

- * Moisture redistribution in freezing and thawing processes of soils, mechanism and model of water migration and ice formation;
- * Solution migration on freezing and thawing processes of soils and its formation and forecast principle;
- * Creep and strength theory of frozen soil, rheological mechanism and constitutive relocations;
- * Developing processes, regularly modelling frost heave and heave forces;
- * Regularly modelling thaw settlement and drainage consolidation;
- * The influence of cryogenetic texture on the physic-mechanical properties of frozen soils and the influence of cryogenic phenomenon on engineering;
- * Thermo-rheology of ice and ice-rich soils, phase transition and thawing point changes under pressure: Interaction between various engineering constructions and frozen ground and its influence on the environment;
- * Analogue and model test for studying temperature, stress and moisture fields of various naturally and artificially frozen ground and constructions under various boundary conditions;
- * Freezing and thawing processes of soils under different heat and moisture conditions and principles of heat and moisture improvement;
- * Reforming and utilizing frozen ground, including principles and countermeasures for preventing structures from preventing soil freezing and use of natural cold energy;
- * Improvement and development of technique and method used for frozen soil test.

Application Guide

NFSEL can accept about 20 guest researchers every year and welcomes experts, scholars, engineers and young scientists who are engaged in the study of frozen ground or engineering construction in cold regions both at home and abroad coming to work there. Application formalities are as follows;

- * (a) Writing a letter to NFSEL and asking them to

send an application form;

- * (b) Completing the application and returning it to NFSEL before the end of June each year;
- * (c) The academic committee of NFSEL will consider all application forms and send out a notice before the end of September;
- * (d) If the application has been successful then the research work could be started from November each year;
- * (e) NFSEL will give financial support for all adopted research work (not including the international travel fee).

If you need further information about NFSEL, please write or call us using the following address: National Frozen Soil Engineering Laboratory (NFSEL), Lanzhou Institute of Glaciology and Geocryology, Academia Sinica, Lanzhou, 730000. China. Telegram: Lanzhou 0393. Phone number: 26725-399 or 389 or 472. Telex: 72008 IGGAS CN.

3 Finland

According to the rules, the National Committee on Permafrost Research and Technology in Finland works an IPA interconference period and the member organisations renominated their representatives in 1988 for the new committee. Dr. Matti Seppala (Department of Geography, University of Helsinki) is continuing as Chairman and the new secretary is Mr. Martti Eerola of the Finnish National Road Administration Laboratory.

The following events took place in Finland in 1989: an international ISSMFE symposium " *Frost in Geotechnical Engineering* ", held in Lapland in March, organised by the Finnish Geotechnical Society and Technical Research Centre of Finland (VTT) - the large proceedings volumes are available on request; the Committee had two meetings with discussions of frost and snow investigations in Finland; and, the National Road Administration Laboratory produced a film of frost on roads where some of the Committee members were specialists - the film was presented in Finnish TV programmes.

4 France

Report from July 1990

Interest in polar science and engineering is growing in France, and the Association Francaise du Pergelisol (founded in March 1988) includes both professionals and research workers. The Association's President is

Dr J. Aguirre-Puente, Vice President Professor J. Malaurie, Secretary General Professor A. M. Cames-Pintaux, and Treasurer Dr J. P. Lautridou. General Assemblies

of the Association have been held in January and December 1989, and another is planned for July 1990. Links between the industrial and research communities are promoted by CNRS, and the development of polar industries is encouraged. Polar research in France has traditionally focused on Antarctic co-ordination, but promulgation of Arctic research at a political level is now found. At Ministerial level there is a Franco-Canadian agreement which includes polar research (science and engineering). A symposium on polar engineering organized by the Club "Etudes Arctiques" in February 1989 was a product of such interests, and a further outcome of Franco-Canadian co-operation was a 2-day workshop on Cold Regions Technology held in Paris in March 1989. Other classic scientific research themes include permafrost on the Planet Mars, thermal behaviour of low temperature materials, and acoustics in frozen soils. The French permafrost community is seeking liaison with civil engineering associations.

Report from December 1990

The French Permafrost Association (IPA), created on 23 March 1988, met in General Assembly in January and December 1989. The next session was held on 4 July 1990.

In France, interest in Polar Engineering and Research has increased notably in the past few years.

From the laboratories working on Physics, Geography, Geomorphology, Geology and Ethnography, several institutions have been created, gathering together different specialties:

- * The "Groupement de Recherche Etudes Arctiques," principally supported by the CNRS.
- * The "Club CRIN Arctiques". This is an action of the CNRS Committee of Industrial Relations, meeting Industrials, Professors and Research Workers.
- * The French group for the Development of Polar Industries (DIPOL), created by several industries and having the CNRS, The Ministry of Research, the TAAF and the French Polar Expeditions as associated members.
- * The Cold Regions Aspect of the French-Canadian Agreement of Cooperation.
- * A program of the Ministry of Research on Civil Engineering (PROGEC). The Aspect of the Natural and Artificial Cold is notably included.

- * Project MATERLOC (Chalky materials-Frost Action aspect).

Two major activities occurred:

1. Cold Regions Technologies: a bilateral workshop (an initiative of the Canada/France Science and Technology Co-operation Program), Paris, 28-29 March, 1989.
2. Arctic Technology and Economy. International Symposium organised by the Club CRIN "Etudes Arctiques" with the participation of the "Banque Nationale de Paris," Paris, 15-17 February, 1989.

General programs are:

Ice-structures, Interaction (Ice-breakers), Freezing of Saline Solutions, Planetary Permafrost (March), Thermal Behaviours of Materials under Low Temperatures, Acoustics and Metrology of Frozen Soils, Influence of Organic Matter in Frost Susceptibility, Terre Adelie Research.

The French Permafrost Association is conducting formalities for its admission as correspondent member of the UIJA and a member of the Liaison Committee of Associations interested in Civil Engineering.

In the next congress of The International Institute of Refrigeration (Montreal, 1991), a session will be held concerning the applications of research regarding freezing on non-alimentary fields. The French Government is preparing a re-organisation of the research on Polar Regions, both Arctic and Antarctica. It wishes to establish an Agency for coordinating, evaluating and financing fundamental and applied research.

5 Germany

Report from July 1990

The German Permafrost Group now has a membership of about 50 people, who will receive a twice-yearly German-language newsheet to be distributed with Frozen Ground. Efforts are being made to increase participating contacts with colleagues in the German Democratic Republic.

A large expedition to Svalbard will take place in Summer 1990. About 50 participants will work at Liefdefjorden (Spitzbergen) from 1 June to about 1 September, with a research program including many permafrost topics. This project will probably be continued in summer 1991. Other activities are focused on artificial ground freezing, alpine

permafrost, and the permafrost environment of the South Shetland Islands, Antarctica.

Report from December 1990

The geoscientific expedition to Liefdefjorden, Northern Spitzbergen, took place from June 1 to August 28, 1990. About 50 geographers, biologists and geologists visited the area of continuous permafrost and carried out studies concerning "Land Sea Sediment Transport in Polar Geosystems". The topics and leaders of the different working groups were:

Glacial and periglacial geomorphological processes: Glacier fluctuations and dating of moraines (G. Furrer, Zürich) Glacial geomorphology and ecology: forms, microclimate and processes (L. King, Giessen); Periglacial processes (H. Liedtke, Bochum); Geomorphological mapping, glaciology of Erikbreen (J.-L. Sollid, Oslo); Permafrost and geomorphology (G. Stäblein, Bremen).

Fluvial and marine geomorphodynamics: Fluvial geomorphodynamics (D. Barsch and R. Mäusbacher, Heidelberg); Periglacial processes and mass movement in coastal areas (K. Priestnitz, Gottingen).

Geocology: Water and nutrient budget in geosystems (H. Leser, Basel); Weathering and soil development (W.-D. Bliemel), Stuttgart, logistic and scientific coordinator); Vegetation studies (D. Thannheiser, Hamburg); Pollution effect: water and plants (K. Pecher, Bayreuth); Geoecological satellite data (E. Parlow, Basel); Bioecology and fauna of lakes and coastal areas (G. Hartmann, Hamburg).

Geology and Geodesy: Geological mapping (P. Thiedig, Münster); Paleobotany (H.J. Schweitzer, Bonn); Geodesy and photogrammetry (K. Brunner, München & G. Hell, Karlsruhe).

The expedition will be continued in summer 1991.

After the unification of Germany, cooperation with permafrost and periglacial scientists of the former German Democratic Republic has started. The existing difficulties certainly will vanish after the reorganisation of most of the governmental and university institutions. Personal and institutional efforts are made for joint projects.

6 Italy

The Italian Adhering Body of the International Permafrost Association is constituted of 36 researchers belonging to several Universities and Research Centres.

A systematic study of Italian rock glaciers by means of both aerial photographic analysis and field survey is still in progress. In this framework, geomorphological surveys of periglacial features were carried out in the Monviso area (Western Alps) together with french colleagues and in Valfurva (Western Alps); for these latter studies geophysical investigations were also executed on some rock glaciers. In addition, fieldwork was carried out in the Valle d'Aosta (Western Alps) to determine the importance of soils for datings of geomorphological events (glacier changes, floods, landslides, debris flows, avalanches, solifluction, etc.) in an alpine environment. Moreover, some researchers of the Adhering Body participated in the last expedition of the Italian Antarctica Project and another two will collaborate in the next one (1989-90). The Group, together with colleagues from Switzerland and Austria, is also planning a post-congress excursion in the Eastern Alps for the Meeting of the IPA Working Group "Mountain Permafrost", organized by W. Haeberli for September 1991.

7 Japan

Report from July 1990

A meeting on the techniques of permafrost study was held on 22 March 1990 at the Institute of Low Temperature Science, Sapporo. 25 members assembled and discussed boring techniques for permafrost and long term data logging methods under cold environment conditions. The performances of three different models of solid state memory type recording systems were reported. Kadec system of Kona System Co. in Sapporo was tested at the temperature of -70°C and verified its performance under severe conditions. At east Antarctica this model was used by the Japanese Antarctica Research Expedition. JARE reported that two years' temperature data at one-hour intervals were obtained by this model.

Dr. Fukuda of the Institute of Low Temperature Science and his group undertook a field survey on the topic of permafrost occurrence in the Antarctic peninsula area with special relationship to global climatic changes. This field expedition was financially supported by the Ministry of Education of Japan, and was organized in cooperation with the University of Chile and the Instituto Antartico Argentino. Four Japanese, two Argentine members and one Chilean

member conducted their fieldwork at King George Island, Seymour Island and James Ross Island. At more than 30 locations, the electrical grounding surveys were made to locate the permafrost table there. The high solute concentration in permafrost layers was estimated from the results of the survey. Mr. T. Yoshikawa of the Graduate School of Environmental Science, Hokkaido University, conducted a field survey on the genesis of pingos in east Greenland.

Based on pollen analysis of the sediments at the site, he concluded that one of the pingos originated about 4000 years ago. Mr. T. Koaze of Meiji University, Tokyo and his group will conduct the field survey on permafrost at Reindillen and Adventalenin in central Spitzbergen from early July until the end of August 1990. The main objectives are field observation of pingo growth, ice wedge cracking processes and observation of the solifluction rate on the slopes. Seven people will join the field survey. Dr. K. Fujino of the Institute of Low Temperature Science will conduct a field survey at Tuktoyaktuk Peninsula near MacKenzie delta both this summer and winter season. By previous survey, the distribution of massive ice in permafrost layers was estimated by means of boring exploration and ground radar profiling. They will collect frozen materials and ice cored samples for pollen analysis and fabric analysis. Based upon these data, they will attempt the reconstruction of palaeoenvironment at that region.

Dr. Sone, Dr. Ishizaki and Dr. Fukuda conducted the field survey of permafrost occurrence in a lowland area in central Hokkaido where a ground ice body was excavated 10 years ago. The ice body with dimensions 12m long, 10m wide and 2m deep was covered with talus debris. For these 10 years long term ground temperature monitoring has been conducted. Group temperature profiles suggest the permafrost may exist under the talus deposit at the depth of 3m. Ground radar profiling and electrical grounding surveys were made at the site. The origin of local permafrost was discussed and reported at the meeting of the geocryological research group in Sapporo. The final report will be made in English in October. Dr. Takahashi and Dr. Sone made a bore hole survey at the site of palsas in Mt. Taisetsu. 6m long core samples were collected and subjected to detailed cross sectional analysis.

Report from December 1990

Dr Fujino from the Institute of Low Temperature Science and his group, conducted a field survey at

Tuktoyaktuk Peninsula, near the Mackenzie Delta in August 1990. In this survey they collected frozen materials and ice samples from massive ice, which were examined for pollen analysis and isotopic contents under laboratory conditions. In the coming winter season, they will conduct another field study at the same site.

Mr Koaze and his group visited Svalbard for a permafrost study. A total of seven scientists stayed for five weeks at Reindalen and Adventdalenin. The active ice wedge cracking was observed by means of long term event recorders. Water samples from pingo ice were collected for chemical analysis in relation with the genesis of pingo ice.

A Japanese Antarctic Expedition will depart for Showa Station in Queen Maud Land this November. Drs Iwata and Hasashi are conducting a field survey at the Sor Rondane Mountains. The process of active periglacial phenomena will be studied in this expedition.

8 Norway

The Norwegian Journal *Frost i Jord* (Frost Action in Soils) will cease to be published. The first issue was published in 1970 as part of a large research programme on frost action in soils. It was later taken over by the Norwegian Committee on Permafrost. The activity of this committee has been reduced after the V International Conference on Permafrost in Trondheim in 1988. The last volume was issued in 1988 after the IPA-Conference. We wish to thank all contributors and readers of the journal during its 20 years of life.

9 Switzerland

Report from July 1990

The main activity of the group which now consists of about 30 members concentrated on the discussion of the first analyses from the permafrost cores recovered by drilling through the Frozen Ground active rock glacier Murtel/Corvatsch in 1987. A corresponding national workshop took place at VAWIETH, Zurich, on 24 February 1989, during which the results of the pilot analyses were presented and discussed together with preliminary results from other studies (borehole measurements, thermal analyses, flow considerations) of the interdisciplinary project. The reason for carrying out such pilot analyses was the simple but remarkable fact that Alpine permafrost constitutes a so far inaccessible and therefore still completely unknown "archive" of information. A summary of the presentations and discussions is now being published

in order to document the state of understanding to coordinate further work.

Research projects of various institutes continue on permafrost and rock glacier mapping (Valais, Grisons), borehole and core studies (rock glacier Murtel/Corvatsch), hydrology of mountain permafrost (Valais), permafrost/snow-interactions and avalanche protection in Alpine permafrost (Grisons), and photogrammetric long-term monitoring of selected rock glaciers (Valais, Grisons). Current engineering problems to permafrost in the Swiss Alps concern foundations of avalanche protection work, dams for protection against rock falls, stability of galleries for ski runs in creeping rocks and foundations for cable car construction. A major study on periglacial debris flows from the catastrophic 1987 storm events is now reaching completion and steps are being undertaken to establish a long-term monitoring program on the thermal and mechanical stability of Alpine permafrost in view of possible future warming trends.

The Swiss Coordinating Group on Permafrost will be responsible for the organization of the 1991 International Workshop in Interlaken of the IPA Working Groups on Mountain Permafrost and on Periglacial Environments.

Report from December 1990

First analysis of core samples from the uppermost 20 metres (shallow core) of the active rock glacier Murtel indicate that the permafrost contains considerable refrozen water from the earlier part of the Holocene time period and which formed from an open reservoir without contamination by modern (20th-century) water. Analyses concerning ice fabrics, isotopes (^3H and stable isotopes), chemistry (major anions and cations, dissolved gases, particulate anthropogenic species), mineralogy, pollen and gas content (^3He , noble gases) are now being extended to greater depth. The highest-perhaps even late glacial-ages are expected at the base of the main shear zone at about 30 m depth. The blocky layer from 30 to 50 m depth may have a completely different origin than the massive near-surface ice studied so far. Material from the shallow core is still available for further tests and pilot studies, whereas the deep core must be saved for well defined studies at the most important and most appropriate depth intervals. Published results and more detailed information on availability of core material can be obtained from VAW/ETH Zürich.

A workshop was held at ETH Zürich on Alpine snow, ice and water in a warming atmosphere with

contributions about climatic scenarios and the enhanced greenhouse effect (Siegenthaler, Berne); energy exchange between the atmosphere and snow/ice surfaces (Föhn, Weissfluhjoch/Davos); glaciers (Patzelt, Innsbruck and Aellen, Zürich); permafrost (Haeberli, Zürich); periglacial debris flows (Zimmerman, Zürich); and runoff (Schindler, Berne). As a consequence of atmospheric warming during the first half of the 20th century, the lower boundary of Alpine permafrost distribution probably shifted in altitude, causing local degradation of underground ice and destabilization of formerly frozen slopes. Continued or even accelerated warming is likely to induce further retreat and degradation of permafrost in the Alps. The evolution of the coming years and decades should be documented with an appropriate monitoring programme (high-precision photogrammetry, borehole measurements, data bank containing results of geophysical soundings).

10 United Kingdom

The UK Adhering Body has undertaken a number of activities in the field of conference organisation and participation through which to progress its permafrost interests. In part, these activities are incorporated within the reports of the IPA Working Groups on Permafrost Data and Periglacial Environments. A conference on cold climate geomorphology was organised at the University of Wales, Cardiff in September 1989 jointly with the British Geomorphological Research Group. This included some 33 papers covering glaciological and hydrological topics as well as geomorphology as such. More recently a contribution has been made to the significant national conference on Geomorphology and Global Warming held at the Royal Geographical Society, London, in May 1990.

Of great importance to the permafrost community of the UK, and indirectly of other countries also, has been the production and distribution by the UK Natural Environment Research Council of a major report on British Arctic Science Policy. This document lists and prioritises the themes considered to represent major arctic research requirements for the future and represents a significant focussing of British activities in northern latitudes. Its recommendations and their implications were discussed at a conference titled "*Britain in the Arctic: Current and Future Research Opportunities*" held at the Scott Polar Research Institute in April 1990.

The conference was interdisciplinary and included reference to permafrost concerns. It was, for example, addressed by Jerry Brown (IPA Editorial Committee) on North American arctic research status. The keynote of the conference was an announcement by the Natural Environment Research Council of its provisional funding priorities for arctic science. A residential research base has been established by NERC at Ny-Alesund (Svalbard), a special topic funding opportunity in tundra ecology has been announced, and suggestions for future special topics have been made, including sea ice studies, surging glaciers and ice sheet modelling.

11 United States of America

Report from July 1990

This report includes brief summaries of recent activities of individuals, agencies and professional organisations involved in frozen ground research. Reports from the field include the following: David Esch, Alaska Department of Transportation and Public Facilities, reports that the paved airfield at Deadhorse in northern Alaska suffered from excessive thawing and settlement during 1989. Permafrost preservation beneath the Bethel Airport road is planned using an experimental installation of thermosyphons installed diagonally across the roadway in shallow trenches at 8-foot intervals. Tom Osterkamp, University of Alaska, continues measuring permafrost temperatures at about 20 sites between Prudhoe Bay in northern Alaska to Valdez. Several sites are instrumented for TDR, neutron logging, heave and electrical conductivity. Laboratory studies continue on solute redistribution during freezing. Model development to simulate permafrost changes to palaeotemperatures is underway. AL. Washburn, University of Washington, reports he is continuing his field work on Cornwallis Island, N.W.T., under the auspices of Canada's Polar Continental Shelf Project. The research focus is on patterned ground and mass-wasting, with background studies on glaciation and delevelling. T.L. WwB, Arizona State University, and his Canadian colleagues, J.A. Westgate and B.A. Stemper, have concluded that loess deposition in the Fairbanks, Alaska area, began at least 3,000,000 years ago. These findings are based on isothermal plateau fission-track ages from the Gold Hill permafrost section. This section is being designated for its special scientific importance and protected with funds provided by the State of Alaska. Frederick Nelson, Rutgers University, edited a special symposium issue of *Physical Geography* 10(3), containing several papers on permafrost by Nelson and O.A. Anisimov,

State Hydrological Institute, Leningrad. Nelson and Anisimov are conducting joint research on permafrost mapping and the effects of climate change on permafrost distribution.

K.A. Kvenvolden and T.S. Collett, US Geological Survey, report that publication of results and work continue on gas hydrates with collection of gases during drilling of the permafrost/gas hydrate stratigraphic interval at Milne Point, Alaska. O.J. Fenians, USGS, continues to revise and update the 1:2,500,000-scale permafrost map of Alaska. George Cryc, USGS, reports continued progress on the Circum-Pacific Map Project with both the Geodynamic map and the Plate-Tectonic map being available during 1990. A special thematic Arctic Sheet depicting geographic features including permafrost is also in preparation.

The Cold Regions Research and Engineering Laboratory (CRREL) reports several field and climate related activities. Dan Lawson continued analysis of stable isotope variations in Alaskan ground ice and permafrost stability. Richard Haugen developed a regional matrix of estimated spatial and temporal air and ground temperatures from along the pipeline road. Virgil Lunardini acquired a dataset on pavement surface temperature in order to further develop relationships of surface energy balance and changes in temperature of permafrost. James Rooney, Ray Kreig and Duane Miller attended the Fifth Soviet Conference on Engineering-Geological Site Investigation in Permafrost in Magadan, during October 1989. The conference was hosted by the Northeast Engineering Surveys Trust and chaired by Eduard Ershov, Moscow State University. Return visits to Alaska for several Soviet organisers and participants from Magadan, Anadyr and Moscow are planned for spring and summer 1990.

The American Geophysical Union bestowed the 1989 Walter H. Bucher Medal upon Arthur H. Lachenbruch for his original contributions to basic knowledge of the Earth's crust. His many accomplishments in advancing permafrost science were recognised as part of the award.

The American Society of Civil Engineers published the proceedings of last year's conference on climate change in its quarterly *Journal of Cold Regions Engineering*. Several design monographs are in preparation by the Technical Council on Cold Regions Engineering (TCCRE) and include the following: Cold Regions Hydrology and Hydraulics, Arctic Foundations, and Roadways and Airfields.

Several conferences are planned: The Sixth International Conference on Cold Regions Engineering focusing on engineering technology in the 21st century to be held in Hanover, New Hampshire, February 26-28, 1991; the Seventh Conference in Canada 1994; and The Society of Petroleum Engineers (SPE) sponsored International Arctic Technology Conference, Anchorage, Alaska, May 29-31, 1991.

The US Committee on Permafrost of the Polar Research Board, National Research Council, is reviewing the status of its recommendations prepared during the 1980s. The Committee participated in organizing several technical meetings including the ASCE climatic change workshop and its publication and is considering workshops on Antarctic permafrost and permafrost environments under conditions of global change. Members of the US Committee for IPA have completed their initial five-year terms of office and the new membership is under consideration at this time.

An International Symposium on Frozen Soil Impacts on Agricultural, Range and Forest Lands was held in Spokane, Washington, March 21-22, 1990. The Symposium grew out of more than ten years of intensive investigations concerning frozen soil impacts in northwestern United States and other northern regions. The work has been organized by the USDA Agricultural Research Service, Oregon State University, University of Idaho, and Washington State University. The Proceedings volume contains 43 papers and was published by CRREL as Special Report 90-1. For more information contact the symposium chairman, Keith Saxton, USDA, ARS, Pullman, Washington. Upon learning of the Symposium, the Chairman, USC/IPA provided the organisers of the Symposium with information on IPA and copies of Frozen Ground No. 6.

The Transportation Research Board's Frost Action Committee met in Washington, D.C., on 8 January 1990. Details of its activities can be obtained from the Chairman, Thomas Kinney, or the Secretary, David Esch (ADTPF), University of Alaska, Fairbanks, Alaska, 99775).

The US Interagency Arctic Research Policy Committee is coordinating the development of a multidisciplinary data directory and a CD-ROM based storage and retrieval system. The Arctic Environmental Data Directory (AEDD) has approximately 300 entries. The CD-ROM will include the permafrost bibliographies published in conjunction with previous permafrost conferences (GD 14 and GD 21). Permafrost data entries from other countries are encouraged.

Additional information is available from the IPA Data Working Group (Barry or Molnia) or J. Brown.

The report of the Workshop on Permafrost Data and Information held in conjunction with FICOP in Trondheim, Norway on 2 August 1988 was published in Glaciological Data Report GD-23. Copies can be obtained from Roger Barry, workshop organiser and report author and coeditor of Glaciological Notes (CIRES. University of Colorado, Boulder, Colorado 80309).

The Third International Conference on Ground Penetrating Radar was scheduled to be held in Lakewood, Colorado, 14-18 May 1990. Several papers on permafrost were included in the program. Additional information is available from Gert Olhoeft, US Geological Survey, PO Box 25046, DFC MS964, Denver, Colorado 80225-0046.

Copies of *Proceedings: Permafrost Fourth International Conference* Volume 1 only, 1524 pages, are still available for \$US 45.00 from Bruce Molnia, US Geological Survey, MS 917, Reston, Virginia. 22092.

Report from December 1990

CRREL Report

The following report highlights frozen ground research and related activities at the U.S. Army's Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire.

CRREL, conducts research and develops design criteria for geotechnical engineering problems in both seasonal frost and permafrost regions. The laboratory is located in Hanover, NH. and employs more than 30 professional staff members in frozen ground research and related activities. While CRREL is an Army research laboratory, its geotechnical engineering program is funded by other government agencies and is focused on both the military and civilian needs of the United States.

Facilities

CRREL has many unique facilities for conducting frozen ground research. There are 12 cold rooms devoted to preparing and testing soils and a 29,000 square foot refrigerated test facility (FERF) for full-scale tests on pavements, soils, structures and vehicles. Two servo-controlled test machines with controlled temperature chambers are available for conducting strength tests. There is specialised equipment for determining the frost susceptibility of soil, unfrozen water content by NMR spectroscopy,

soil moisture characteristics and hydraulic conductivity, thaw consolidation by permeability, and non-destructive measurement of frost heave phenomena by dual gamma techniques. An instrumented test vehicle is used to measure tire traction in thawing soil. In addition, there are analytical chemistry laboratories with gas chromatographs and spectrometers to analyse soil chemistry. A scanning electron microscope is used to determine frozen soil structure. CRREL also maintains an office in Fairbanks, Alaska. At the nearby Farmers Loop Road test facility are areas with permafrost soils. A 360 foot long tunnel in permafrost provides a unique facility for permafrost research at Fox, Alaska.

Activities

Much of CRREL's frozen ground research is focused on geotechnical engineering problems in seasonal frost regions. There is a major thrust to develop new designs and test and design procedures for pavements in seasonal frost regions. Mechanistic design procedures are being developed to replace less reliable and more costly empirical designs. The use of geotextiles, geocomposite drains and soil stabilisers to minimise the effects of frost action are also being evaluated. This work is being supported and conducted in cooperation with the FAA, FHWA and the Michigan and Minnesota Department of Transportation offices. Research into the fundamental properties and processes in freezing soils also continues. Test methods for determining the hydraulic conductivity of frozen soils are being developed. Studies also include the physical relationships that govern ice segregation in freezing soils and modelling frost heave. Research is also being conducted in the environmental area. Studies are proceeding on the effects of frost on soil liners and covers for waste disposal sites and the use of ground freezing to contain and concentrate spills and chemicals in soils.

There is a major study of off road mobility and traction in thawing soils. Studies are also being conducted on insulated foundations and buried utility lines. Thermal models are being developed to evaluate subsurface temperature and moisture regimes.

CRREL is developing design procedures for piles in permafrost. Special thermosyphons are being developed to freeze large horizontal areas. This work is directly related to the construction on permafrost of a very large Over-The-Horizon (OTH) radar antenna system. Studies are also continuing on the properties of subsea permafrost and on geophysical methods for delineating ice-bonded permafrost. CRREL is

monitoring the active layer in permafrost at the Caribou-Poker Creek watershed near Fairbanks, AK, to determine the effects of different terrain characteristics on freeze and thaw depths and moisture conditions. A drilling program in northern Alaska will soon begin to obtain ground temperature data for a paleo-climatic study related to global warming. There are also studies of the winter conditions in coastal wetlands, off-road vehicle use and moisture regime in organic soils. Studies are continuing on soil erosion along embankments, revegetation of trails, and the cold tolerance of plants in seasonal frost and permafrost regions.

Other CRREL News

The maturing of CRREL's staff has been recently marked by the retirement of three of its most prominent frozen ground researchers; Fred Croy, Frank Sayles and Thad Johnson. Croy is well known for his work with pile foundations in permafrost and Sayles for his studies of creep in frozen soils. Johnson was very active in pavements research. Croy and Sayles will continue to be associated with CRREL. CRREL is well aware that their expertise in the traditional permafrost foundation areas needs to be carried on by younger staff members and that new specialists need to be recruited to fill their vacancies. To foster communication, peer review and cross-fertilisation in frozen ground research, two new groups have been formed; the Pavements Research Group and the Geotechnical Engineering Group. Outside interest in these activities

is welcome. Contact Steve Ketcham on Pavements Group and Ed Chamberlain on Geotechnical Group.

ASCE/TCCRE News

The Technical Council for Cold Regions Engineering (TCCRE) of the American Society of Civil Engineers (ASCE) was organised in 1977 and has grown rapidly in the past decade. Comprised of an executive committee and seven administrative and technical committees, it is listed as a special interest area by over 4,000 ASCE members. The Council sponsors International Cold Regions Specialty Conferences at 2 to 3 year intervals, being careful to avoid holding such a conference in the same year as the International Permafrost Conference. The next (6th) Cold Regions Specialty Conference will be held in Lebanon, New Hampshire, on February 26-28, 1991. TCCRE committees also produce monographs of cold regions engineering practice. These have received much favorable comment from practitioners. The Council further produces a quarterly journal of peer reviewed papers, entitled the ASCE Journal of Cold Regions

Engineering. Two ASCE Society awards receive primary nominations from the Council, namely, the Can-Am Amity Award and the Harold R. Peyton Award. A best paper award is also given for the Journal of Cold Regions Engineering. TCCRE committee members give important service to the organizing and conduct of International Permafrost Conferences. Included are the peer review of papers in the civil engineering area, as well as the solicitation of paper contributions to these Conferences. TCCRE also pays a part of the US annual dues for the International Permafrost Association.

12 Russia

Report from the U. S. S. R.

The annual meeting of the Scientific Council for Earth Cryology of the USSR Academy of Sciences was held in March 1989 in Moscow. About 90 papers and posters were discussed at seven sessions. The Plenary papers were: Geochemical processes and mineral resources in the recent and ancient zones of gas hydrates; The development of the oil-gas industry on the North and the aims of the geocryological ecological researchers; The problem of icings; The problems of geocryological researches in Yamal peninsula; A theory of the soil cryogenesis; Northern hydrology; Numerical modelling of the interaction between cryolithozone and gas-hydrate deposit; The Cryosphere as a component of the water exchange system; The geocryological researches in the Arctic.

The same meeting of the Scientific Council was held in March 1990 in Moscow. 70 papers and posters were discussed at 8 sessions. The Plenary papers were: Climate change and permafrost; Temperature profiles and thickness of permafrost influenced by local conditions; Changes of recent permafrost caused by climate fluctuations; Quaternary glaciation in the permafrost area in middle Asia mountains; A genesis and age of the underground ice of the Novosibirskie islands; Engineering-ecological measures by oil-gas industry constructions. The conference' *Geoecology, problems and decisions* " was held in April 1990 in Moscow (Department of Geology of the USSR). At the session "The ecological problems in the Cryolithozone", 5 papers were discussed: The sensibility of northern ecosystems to a technogenic impact in permafrost area; Ecology and a development of the Cryolithozone; Problems of the landuse by a development of the Yamal Peninsula; geoecological research on permafrost field stations; geocryological research by mining in permafrost area.

Books, prepared by the Scientific Council for Earth Cryology, edited by "Nauka", Moscow in 1989 were:

1. Goncharov, Yu.M. "Foundations on Permafrost" (Effectivni konstrukcii fundamentov na vechnomerzlich gruntah).
2. Romanovski, N.N., Tjurin, A.L., Sergeev, D.O. "Rock streams of bald-mountain belts" (Kurumi golgsovogo pojasa)

Books, edited by "Nedra", Moscow (1989) include the Monographs' *Geocryology of the USSR* "which are detailed in the *Miscellaneous Items* section.

Several meetings concerning geocryologic issues were held during 1989. The All-Union Conference on geocryological base of soil cryogenesis was held in February near Moscow. The 3rd All-Union conference on icings met in Irkutsk in March. An international symposium on problems of boring in difficult conditions met in Leningrad in June. In Jamburg (West Siberia) an International Symposium on the Geocryology of the Arctic was held (see *Frozen Ground* No.6). In November there was a meeting on the ecology of cities in Siberia.

A further seminar is planned for September 1990 in Leningrad under the title: *Engineering - Geological Study and Estimation of Conditions of Permafrost, Seasonal Frost and Thawing Fine-grained Soils* . The meeting is organized by the USSR Ministry of Energy Industry. Discussion will cover methods, general results, and soil behaviour at the base of buildings, dykes and pits. Potential overseas participants should submit a short (5-6 pages) report for publication. For further details, contact 195220, Leningrad, Gzhatskay. Tel: Leningrad 555-88-90 (Kzivonogova): Moscow 280-13-86 (Nikitina).