NUMBER 29

APRIL 1969

ICE

SYMPOSIUM ON THE HYDROLOGY OF GLACIERS

Cambridge, 7 - 13 September 1969

REMINDER!

Booking forms for registration, social events and tours during and after the Symposium were issued in November 1968, in the Second Circular, and repeated in ICE 28, December 1968. If you have not yet returned your forms to the Secretary of the Glaciological Society, please do so without delay. Early September is still tourist time in Britain, with many music festivals and exhibitions, and hotel rooms become difficult to find.

All correspondence and requests for information about the Symposium should be addressed to:

The Secretary, Glaciological Society,
c/o Scott Polar Research Institute,
Cambridge, England.

ICE

NEWS BULLETIN OF THE GLACIOLOGICAL SOCIETY

APRIL 1969 NUMBER 29

CONTENTS

NOTICES 1

FIELD WORK: Canada 2

Italy 8

New Zealand 10

United Kingdom: Greenland 10

PROFILE: Prof. Manfredo Vanni 11

MEETINGS 13

GLACIOLOGICAL DIARY 17

NEWS 18

NEW MEMBERS 20

SELIGMAN CRYSTAL. We are pleased to announce that the Council of the Society has agreed to award a Seligman Crystal to Dr John Nye, in recognition of his outstanding contributions to glaciological research. The Crystal will be presented at the Society's Annual Banquet, 11 September 1969, in Cambridge, England, and we hope that many members will be present on this occasion.

HONORARY MEMBERSHIP. The Council has also agreed to the appointment of Sir Charles Wright as an Honorary Member of the Society, in recognition of his eminent contributions to glaciology. Honorary Members, limited in number by the Society's Constitution, are: H. W: son Ahlmann, R. Haefeli, Sir Raymond Priestley, M. de Quervain, Sir Charles Wright.

ANNUAL GENERAL MEETING, 1969. As announced in the previous issue of ICE, this will be held on Thursday, 11 September, in the University Centre, Cambridge, England, at 7.15 p.m. It will be followed at 8.30 p.m. by the Society's Annual Banquet. Tickets may be obtained from the Secretary, price £2. 5s. (US$5.40), wines included. These events are timed to take place during the Symposium on the Hydrology of Glaciers. Participants in the Symposium who are not members of the Society will be welcome at our Banquet and may purchase their tickets either when they book or upon arrival in Cambridge. ***Last day for booking for the Banquet is Monday, 8 September.***

1969 DUES. Have you paid? NO DUES BY JUNE—NO JUNE JOURNAL.

We are sorry to report the sudden death on 11 June 1968 of Hirobumi Oura, Director of the Institute of Low Temperature Science, University of Hokkaido, Japan. He had been appointed to the Directorship in April 1968. An obituary will be published in the Journal of Glaciology.

COVER PICTURE. Imprint of a ski-pole; after some wind erosion and removal of soft snow, the compressed snow remained. (The wind direction was from the lower right corner of the picture.) Photograph taken by H. C. Hoinkes near Little America V on 5 February 1957, US-IGY-Antarctic Expedition 1957-58.

FIELD WORK

CANADA

GLACIER RESEARCH

(News of work on snow and ice in the field and in the laboratory will be published in the next issue of ICE)

SOUTHERN CORDILLERA AND COAST MOUNTAINS, BRITISH COLUMBIA AND ALBERTA (Glaciology Sub-Division, Inland Waters Branch, Department of Energy, Mines and Resources: A. D. Stanley)

INTRODUCTION

The Sub-Committee on Glaciers held a regular meeting on 21 February 1968 and organized an international Seminar on the "Causes and Mechanics of Glacier Surges". The latter was jointly sponsored by the Associate Committee on Geodesy and Geophysics of the National Research Council and by McGill University, and was held on 10 and 11 September at the Gault Estate of McGill University at St. Hilaire, P.Q., and the Handfield Inn, St. Marc, P.Q. Seventy scientists from twelve countries participated. Thirteen papers and nine short notes were presented. Much of the time was devoted to discussion. The proceedings were summarized at the end of the meeting by Dr. M. F. Meier, President of the Commission on Snow and Ice, and recommendations for future research were promulgated.

A "Symposium on surging glaciers and their geologic effects" was held at Banff, Alberta, 6-8 June 1968, under the auspices of the University of Alberta and the Building Research Division. Twelve papers were presented.

The papers of the two symposia will be published as a special volume of the Canadian Journal of Earth Sciences.

The Glaciology Sub-Division of the Inland Waters Branch of the Department of Energy, Mines and Resources (Head: Dr. O. H. Løken) reorganized and expanded in the fall of 1967 and it is now divided into four sections: Arctic, Cordillera, Ice Science and Glacier Inventory. The Sub-Division has 21 permanent staff members. An Ice Science Laboratory has been set up during the last year and is now operating.

Sir Charles Wright of Victoria, B.C. has been elected an Honorary Member of the Glaciological Society. He is the first Canadian to be so honoured.

(1) Mass and water balance measurements

Field programs included continuation of long-term studies at six glacier basins selected as I.H.D. basins. Five of the basins are part of a transect across the southern part of British Columbia, and the other is Berendon Glacier, 750 km north. In the winter of 1967-68, snowfall in British Columbia was slightly above normal and the snow above 2,000 m did not begin melting until late May. The summer was average for most areas and ablation was considerably less than the previous year. Ice surfaces were exposed in the latter part of June for the eastern part of the transect but further west were first exposed in late July.

(2) Place Glacier — IWB-RB-35 — B.C.-25 (O. Mokievsky-Zubok)

On 31 May the winter snows had accumulated to depths of up to 6.00 m and 226 soundings gave mean specific accumulation of 2.32 m w.e. Ablation measurements were obtained periodically from more than 47 stakes throughout the summer and by 1 October the mean specific ablation was 2.48 m. By the end of the summer the snowline was at 2070 m a.s.l. and the net balance was -0.16 m.

(3) Sentinel Glacier — IWB-RB-36 — B.C.26 (O. Mokievsky-Zubok)

Accumulation was measured on 8 June and data from 17 stakes and 152 soundings gave a mean winter accumulation of 3.42 m w.e. Meteorological observations were maintained throughout the summer, and measurements of 32 stakes gave a mean summer ablation of 3.04 m. By 1 October the snowline had receded to 1750 m but several of the stakes from 1967 were still covered by snow. The meltwater stream was gauged continuously from 6 June until 30 September.

(4) Woolsey Glacier — IWB-RB-36

The winter accumulation determined 25 May from 16 stakes and 198 soundings had a mean value of 2.84 m. Meterological observations were maintained until 2 September and measurements of 33 stakes gave a mean

ablation to 3 October of 2.74 m. At the end of the summer the snowline was at 2080 m a.s.l. and the mass balance was +0.17 m. The stream was gauged continuously from 13 June until early October.

(5) Peyto Glacier — IWB-RB-33 — Alta.-73 (A. C. D. Terroux)

The winter accumulation was measured on 29 May and ablation data was obtained until 7 October. By the end of the summer the snowline lay at 2550 m. Meteorological, hydrological and movement studies were continued from previous years. Ice depths for part of the accumulation area were obtained with a 440 MHz radio echo sounder on loan from the Canadian Forces. Sounding profiles were extended to cover part of the Wapta Icefield, and continuous soundings over a number of profiles totalling 40 km indicate an average depth of 200 m for most of the northern section of the Wapta Icefield.

(6) Ram River Glacier — IWB-RB-32 — Alta.-72 (A. C. D. Terroux)

The winter accumulation was determined on 5 June and the ablation measured to 2 October. Meteorological and hydroolgical measurements were continued until early September.

(7) Berendon Glacier (R. J. Rogerson)

Snow depth measurements at 20 stakes in early June indicated an average specific value of 2.33 m for the winter accumulation. By 31 August the snowline had receded to 1400 m a.s.l. and the ablation measured at 49 stakes gave a mean summer ablation of 1.378 m.

In 1968, water discharge was measured at Bowser River, the stream from Berendon Glacier, and at an overflow channel for Summit Lake. The Bowser had a discharge more than double that of the Summit Lake, although both have similar drainage areas of almost 40 km^2. To determine if the difference in discharge results from continuous leaking of lake waters beneath Salmon Glacier to the south, the hydrological balance of the lake drainage basin was examined in detail. Main tributaries on the east side of the lake were monitored, and the rise of water level was noted several times each day. To assist in calculation of the rate of filling a detailed topographic map of the lake is to be compiled from aerial photographs taken on 3 August, 1968, when the level was 40 m below the previous maximum for the lake.

To detect possible leakage beneath Salmon Glacier, fluorescent dye was placed in the lake and the waters draining from Salmon Glacier were sampled using a fluorometer. Dye was dumped into the lake three times during the month of August, and on each occasion small quantities were detected in the Salmon River.

ROCKY MOUNTAINS, ALBERTA

(1) Drummond Glacier (University of Galgary: M. J. Chambers)

Bad weather and logistic difficulties impeded much of the work during the summer of 1968. However, some ablation rates were measured.

(2) Athabasca Glacier (Inland Waters Branch, Department of Energy, Mines and Resources: I. A. Reid)

I. A. Reid of the Water Survey of Canada repeated terrestrial photogralphy of the glacier to determine the volumetric changes on the basis of biennial detailed topographic mapping.

A. D. Stanley and R. H. Goodman measured the ice depths of the Athabasca Glacier with a 440 MHz radar altimeter borrowed from the Canadian Forces. Continuous soundings were obtained from profiles down the length of the glacier to duplicate a profile with depth measurements determined by seismic methods. Radio sounding depths of 300 m were determined for part of the glacier but for some sections sounded depth appeared to be 30 m less than the seismic determinations.

The reason for this difference was not identified but could be discrepancies in timing reflected signals resulting from modifications to the system in the field. The sounding profiles obtained from the Athabasca Glacier and Wapta Icefield gave consistent results and demonstrate that a radio echo sounding unit operating at a frequency of 440 MHz can be used to determine ice depths on alpine glaciers.

YUKON TERRITORY

The Icefield Ranges Research Project, 1968 (American Geographical Society and Arctic Institute of North America: W. A. Wood)

The Icefield Ranges Research Project (IRRP) conducted its 8th field program in the St. Elias Mountains between mid-April and the first days of September. The scientific and organizational direction was in the hands of Professor M. Marcus. More than 100 persons took part in the overall endeavour of IRRP.

(1) "Fox Glacier"

For the second successive year intensive studies of the total environment of "Fox Glacier" were pursued in the anticipation that this small ice body may surge in the foreseeable future. In 1968 primary emphasis was placed on studies leading to an understanding of the mass balance of the glacier. Measurements of

accumulation, ablation and surface movement were carried out periodically during the course of the summer by a team under the leadership of Sam G. Collins of the Rochester Institute of Technology. Seismic and gravity studies were undertaken by a team directed by Gary Clarke of the University of British Columbia. Independently a team from the Inland Waters Branch, DEMR, made measurements of the water discharged by the Fox, Hyena and Jackal glaciers. Using chemical processes, this team was able to differentiate between waters discharged by the Fox and the other two independent glaciers. Of the total discharge of the main stream from 9 July to 15 August ($6.1 \times 10^6 m^3$) 25% is estimated to be derived from the "Fox Glacier". Of particular interest in the "Fox Glacier" study was a series of measurements over the surface of the glacier, and to a depth of several meters, to determine englacial temperatures. The negative temperatures recorded by Ragle in 1967, at a single drilling site, were found to have counterparts over the entire "Fox Glacier" above the 7,500 foot contour.

George Denton completed studies begun in 1967 of the moraine sequences of the "Fox Glacier" Valley. This investigation is expected to provide a detailed chronology of glacier fluctuations in this area during recent times. Working with Denton was David Murray (Memorial University of Newfoundland) who completed his phytogeographical studies of the alpine zone of the continental slope of the St. Elias Mountains begun in 1965.

(2) Steele Glacier

At the request of the Inland Waters Branch, DEMR, "Fox Glacier" personnel undertook to establish seven photogrammetric bases in critical areas of the trunk of the Steele Glacier above the 6,000 foot level. These bases were reoccupied following a ten day interval, and a critical evaluation of surface movement along selected profiles is expected to result from this work.

During August, W. A. Wood spent several days in the Steele watershed, during which photographic panoramas illustrating portions of the Steele Glacier were exposed. An aerial photographic reconnaissance of the Steele Glacier were exposed. An aerial photographic reconnaissance of the Steele Glacier was flown for purposes of extending interpretation of surface movement since the beginning of the surge in 1965.

Research on the surging Steele Glacier — and the geological and hydrological aspects of surging glaciers in general — is being carried out by L. Bayrock, T. Berg and J. Kinisky of the Alberta Research Council and by A. J. Broscoe and S. Thomson of the University of Alberta. The Steele Glacier was visited and rephotographed in May. It appears that movement is now negligible, amounting to only a few inches per day.

(3) St. Elias Mountains — radio echo sounding

The SPRI echo sounder, owned by the Arctic Institute, was applied to a number of navigationally controlled traverses of portions of the St. Elias Mountains during the months of May and June. A recording camera had been adapted to the instrument by the Ohio State University and photographic records of oscilloscope traces were secured. It appears that meaningful results can be interpreted from the film; a report is in preparation.

(4) Isotope studies (University of Alberta Department of Physics: E. R. Kanasewich)

H_2O^{18}/H_2O^{16} studies have been resumed on a number of glaciers in the St. Elias Mountain Range. In addition, a hydrogen/deuterium analyser has just been built jointly by H. R. Krouse and F. D. Otto (Petroleum Engineering, University of Alberta) and this mass spectrometer will be used for HDO/H_2O measurements on glacier ice. Kenneth West collected nearly 400 samples near the "Fox Glacier"; "Divide Camp" and Mount Logan.

(5) Meteorological and climatological observations

As in previous years a network of five weather stations was in operation: Kluane Lake, Divide Camp, "Fox Glacier", Chitistone and Mt. Logan. All data was transmitted to Whitehorse, where it was used for regional forecasting; furthermore D. Kolberg is utilizing this data for his Ph.D. dissertation which is aiming at a regional climatology of the St. Elias Mountains.

BAFFIN ISLAND

(1) Glaciology Sub-Division, Inland Waters Branch, Department of Energy, Mines and Resources: O. H. Løken.

The field work was extensively hampered by weather and operational difficulties, and some of the planned projects were only partially completed.

Barnes Ice Cap — R-SIG-17, NORTH 3 (O. H. Løken)

The winter accumulation was measured in May-June and showed that the winter snowfall had been heavier than during any of the three preceding winters. Specific winter accumulation between 0.3 — 0.4 m w.e. was measured over large areas of the northern part of the ice cap. On the south dome values between 0.5 — 0.6 m were common. The large values are partly due

to an early snowfall in August-September 1967 which did not melt away. Exceptionally high accumulation figures were also recorded on Decade Glacier (see below).

Movement stakes near the south end of the ice cap were resurveyed and surface movement of up to 24.2 m per year was recorded.

The SPRI radio echo sounder with recording camera was tested successfully but logistic difficulties prevented any survey from being done.

Decade Glacier — IWB-RB-26-NORTH 2 (U. Embacher)

A two-man party did mass balance and discharge measurements during July and August. Mean specific winter accumulation as measured in mid-July before extensive melt had started was 0.39 m w.e., an exceptionally high value in comparison with previous years. Ablation until mid-August was 0.13 m w.e. Additional melting is likely to have occurred but all indications are that the annual mass balance will be positive. The snowline was at an altitude of about 700 m in mid-August.

(2) Glacial geomorphology (Geological Survey of Canada: D. A. Hodgson and G. M. Haselton)

In a reconnaissance of the glacial history of northeast Baffin Island, studies were concentrated on the pattern and chronology of deglaciation in the northeast fiord area (between Dexterity Fiord and North Arm) and observations are being correlated with the submarine profiles obtained in 1967. The numerous outlet glaciers from interfiord ice caps are receding from their recent maximum, and drainage of the short-lived ice dammed lakes is nearly complete.

DEVON ISLAND (Arctic Institute of North America: R. J. Braithwaite and I. M. Whillans)

(1) The dynamic response of a subpolar ice cap (Institute of Polar Studies, Ohio State University)

The purpose of this investigation was to test and develop techniques. Two grids of gravity stations were placed in the northwest portion of the ice cap, one near the edge and the second 15 km from the edge. The density of stations was such that one milligal separated the gravity values at neighbouring stations; this was equivalent to about 150 metres horizontally. The edge grid contained 121 stations and the upper grid contained about 30 stations. Each grid was levelled within itself using a spirit level and staff. Both grids were levelled to rock, using two theodolites reciprocally and simultaneously. An eight-leg traverse was necessary for the upper grid. The edge grid was additionally levelled by spirit level to rock. Horizontal position was obtained by a subtense-bar and theodolite traverse. Except for near the edge, there are no topographic features suitable for baseline stations.

A Worden Master gravimeter was used. This proved satisfactory except at the upper grid where severe beam wandering was encountred. This may have been due to microseisms resulting from discontinuous settling of the snow or pressure release in thermally stressed ice.

(2) Mass balance and climatological observations (McGill University and Sub-Division of Glaciology, Inland Waters Branch, Department of Energy, Mines and Resources)

The glacier-climatology program was mainly confined to the study of the firn stratigraphy and taking meteorological observations on the northwest side of the ice cap. The results indicate an ablation season of very low intensity; with the transient snowline hardly reaching the ice cap edge (90 m a.s.l.), and no sign of the development of "slushers". The firn studies were not initiated until after the onset of melting but it seems that the melt was retained in the snow pack of the 1967/68 balance year and downward percolation of waters into previous layers was nil or very small.

The mean net accumulation was computed as 0.14 m of water with a standard deviation of 0.06 m of water equivalent. This net accumulation is higher than the 1961, 1962 and 1963 values (Koerner 1966) — the 1963 net accumulation on the northwest traverse was 0.04 m of water. In 1963 the annual snowline was at about 1200 m a.s.l. and in 1962 at nearly 1600 m.

SOUTHEASTERN ELLESMERE ISLAND: GLACIER FLUCTUATIONS (Geological Survey of Canada: W. Blake, Jr. and R. A. Souchez)

A study of the glacial history of southern Ellesmere Island, begun in 1967 in the southwestern part of the island, was continued in 1968, with the main emphasis being on the area east of the 85th meridian. The field party was based at Grise Fiord, and logistical support was provided by a Piper Super-Cub equipped with oversize tires.. Blake continued to collect samples for radiocarbon dating so as to establish an abslute chronology of events for as long a time as possible. Souchez continued his investigations of shear moraines and also studied the push moraines around the Jakeman

Glacier. As noted in 1967 many outlet glaciers are now close to their maximum extent since general deglaciation.

MELVILLE ISLAND (Polar Continental Shelf Project)

W. J. Seifert continued the mass balance observations on the four ice caps. All gained mass in 1966-67. No figures can be given, however, because melting began before the party's arrival on the ice caps and so the 1967 summer surface could not be definitely identified.

MEIGHEN ISLAND (Polar Continental Shelf Project: W. S. B. Paterson)

Two meteorological stations were established: Main Camp (elevation 241 m) on the ice cap about 3 km north of the borehole site and North Camp (elevation 78 m) 1 km north of the ice cap. Three hourly synoptic observations were taken from 1 June to 3 September at Main Camp and from 7 June to 21 August at North Camp. These were relayed to Isachsen and thence to Arctic Weather Central in Edmonton. In addition, radiation and micrometeorological measurements were carried out and a hygrothermograph and barograph maintained at the borehole site (elevation 267 m) and at a camp (elevation 115 m) on land west of the ice cap during parts of the summer.

Lowering of the ice cap surface was recorded daily or twice daily at several locations near Main Camp and weekly at many of the stakes used in the continuing mass balance studies. The data collected this summer and during the next two summers will be combined with those already available to make a meso-scale study of the relation between climate and the "health" of the ice cap. This project, which is under the general direction of Dr. S. Orvig of the Department of Meteorology, McGill University, is being carried out by B. Taylor.

W. J. Seifert continued the routine mass balance measurements. The net mass balance of the ice cap was zero for 1966-67. The mean accumulation for 1967-68, as measured in late May, was 17 gm cm^{-3} which is close to the average for the past 9 years.

K. C. Arnold made terrestrial photogrammetric measurements in the northern part of the ice cap to find out how the surface elevation has changed since the ice cap was mapped in 1960. As ice flow is negligible, these observations will provide a useful check of the mass balance measurements.

Preliminary measurements of H_2O^{12}/H_2O^{16} abundancies have been made on a core from the Meighen Island ice cap by E. R. Kanasewich, University of Alberta.

AXEL HEIBERG ISLAND (McGill University: F. Müller)

A McGill University party of 12 carried out field work on Axel Heiberg Island for the tenth consecutive summer from 25 April to 26 August. Personnel: F. Müller (leader); M. Kälin, A. Iken, G. Young, J. Whiting, T. Caflisch (graduate students); 4 undergraduate student assistants; G. and R. Desrochers (2 permafrost drilling specialists); and E. Hofer (photographer).

(1) The Thompson Glacier push moraine

An orthophoto map and a contour line map, both at the scale 1:5,000, were successfully completed in co-operation with the Photogrammetric Research Section of N.R.C. The following field program was carried out: 1) Gravity and seismic measurements to establish the thickness and sub-surface shape of both the push moraine and the advancing glacier snout. 2) Movement measurements of 4 surface profiles. 3) Permafrost drilling to 119 ft in the outwash plain in front of the push moraine to establish stratigraphic sequence and temperature regime. 4) Mapping of tectonic and stratigraphic evidence in push moraine and frontal portion of glacier. The field work is completed, and the results will form the content of a Ph.D. thesis (M. Kälin).

(2) Glacier-climate relationship study and the automatic weather stations

The network of about 120 stakes on the White and Baby glaciers was maintained and surveyed twice (in some cases more) to calculate the 1967/68 gross and net mass balance. The related meteorological observations in the meso-climatic space of these two glaciers is slowly improving to the point where the two sets of data (mass balance and climatic) are of corresponding quality and quantity. The Australian automatic weather stations (one on bare land at the Base Camp and one at the equilibrium line on the White Glcier) produced about 80% data during their third all-year-round operation. The 6-hourly synoptic observations as well as the installation and further testing of the automatic weather saions was carried out by J. Whiting.

(3) Glacier movement

The glacier surface movement study on the White Glacier, started in 1959 with usually two sets of observations per summer, was intensified last summer. For 15 weeks four profiles in the ablation area were surveyed at intervals of 1 to 14 days. In addition, in early August, some 4-hourly surveys were made. Temperature, ablation and run-off measurements were carried out throughout the summer in order to relate the observed velocity fluctuations to hydrological and climatic changes. This work is being carried out by A. Iken as part of her Ph.D. research.

(4) Glacial history

A preliminary investigation of the physical limnology of two glacial lakes (Phantom Lake, 600 ft deep; Colour Lake, 80 ft deep) including test sampling of the bottom sediments, provided encouraging results regarding the glacial and palaeoclimatic history of the area. This study forms part of T. Caflisch's Ph.D. program.

Most of the logistic support for the Axel Heiberg Island operations was again provided by the Polar Continental Shelf Project.

(5) Snow hydrology (IHD project) — see next issue of ICE for report

NORTHERN ELLESMERE ISLAND (Defence Research Board: G. Hattersley-Smith)

The Defence Research Board operated Tanquary Camp from late April until the end of August. The field program was directed by G. ;Hattersley-Smith for the first month and by H. Serson thereafter. Logistic support was provided by RCAF C.130 ("Hercules") aircraft from Ottawa to Eureka and Alert, and by chartered "Otter" aircraft.

(1) Tanquary Fiord area

Mass balance and movement studies were continued on the Per Ardua Glacier for the fifth successive year by K. C. Arnold, U. Embacher, and assistants from the Glaciology Sub-Division, Department of Energy, Mines and Resources with logistic support from the defence Research Board. Winter accumulation was .14 m and the specific mass balance as determined in mid-August was -.37 m w.e. The snowline was at 1350 m on 6 August.

(2) Gilman Glacier

R. B. Sagar (Simon Fraser University) assisted by S. Outcalt (University of British Columbia) continued mass balance studies on the Gilman Glacier. Data on ablation, snow cover and stratigraphy were obtained from more than 70 stations. Preliminary calculations from this and previous years' data for the Gilman Glacier indicate highly positive net budgets for the period 1962-67 (c. + 230 x 10^6 m^3) and for the year 1966-67 (c. + 50 x 10^6 m^3).

(3) Ward Hunt Ice Shelf

Measurements were made at 19 poles on the Ward Hunt ice rise north of the island and at 96 poles set in a 1 km-square grid on the ice shelf 5 km east of the island. These measurements showed a mean net deficit of 156 kgm^{-2} on the ice rise and of 247 kg m^{-2} on the ice shelf for the 1966-67 budget year. Strain-rate measurements were repeated on the Ward Hunt Ice Shelf by E. Dorrer and two assistants from the University of New Brunswick.

(4) Radio depth-sounding of glacier ice

A report is nearly completed on the results of the radio depth-sounding of a number of glaciers and ice caps in northern Ellesmere Island and of the Ward Hunt Ice Shelf, carried out by S. Evans and G. de Q. Robin of the Scott Polar Research Institute, Cambridge, England, with logistic support from the Defence Research Board.

GLACIER INVENTORY (Glaciology Sub-Division, Inland Waters Branch, Department of Energy, Mines and Resources: C. S. L. Ommanney)

The inventory of 1100 glaciers on Axel Heiberg Island has been completed and a start made on the inventory of Baffin Island and selected areas in the Rockies. A computer program has been developed by R. H. Goodman for the first stage analysis of the inventory data. Using this program it is possible to obtain, for any parameter, the maximum and minimum value, the total, the average and a histogram. The main sorting control is the glacier classification but limits can be placed on any of the parameters, singly or together, to obtain a more limited analysis. The program has been written to handle data from an unlimited number of glaciers. The second stage analysis, which will permit the drawing of trend surfaces and the study of correlations, will be developed as soon as sufficient amount of data becomes available.

F. Müller

ITALY

GLACIER VARIATIONS 1968

Snowfalls in winter 1967-1968 where unexceptional; on the whole falls were greater in the Central and Eastern Alps than in the Western and, in fact, more residual snow was found in the former than in the latter.

Generally speaking, however, the control season saw glaciers under thick snow, particularly in the high collection basins. The reason for this was not residual winter snow but recent summer falls. The four spring-summer months (June, July, August, September) were particularly troubled and snow fell at an altitude of 2500 m, covering glacier snouts to a depth of between 20 and 25 cm. Mean temperature was lower than normal.

The features observed in previous years thus continued in the winter period of 1967-68: little snow but comparatively low mean summer temperature. This would explain the very high number of uncertain and stationery glaciers and those under snow. The temperature factor affcets glacialism by limiting ablation; but as there is little new snow there is no particular renewal of glacial advance.

Some definitely advancing glaciers were noted (by Dr Zanon) in the Eastern Alps where the snowfalls were more intense. Some considerable advances were also noted in the massif of Mont Blanc (by Prof Cerutti); this may be explained by the vastness and altitude of the glacier collection basins of this important massif.

113 glaciers were observed. Of these, 49 were retreating, 16 advancing and 48 were uncertain, under snow or stationery. The percentage of retreating glaciers (43%) is of the same order as that of recent years; the high percentages seen in recent decades are a thing of the past. It may therefore be concluded that there is an indisputable slowing down in the long phase of retreat characteristic of past years. A true return to glacialism would require more abundant snowfalls.

SUMMARY

Controlled 113 of which
- 49 retreating (43%)
- 16 advancing (15%)
- 48 stationary, uncertain or under snow (42%)

	retreating	advancing	uncertain under snow, stat.
Western Alps—13		4	7
Central Alps—34		12	35
Eastern Alps— 2		—	6
	49	16	48

Glacialism is more evidently stationery in the Eastern and Central Alps than in the Western.

M. Vanni

PERCENTAGE OF ADVANCING, STATIONERY AND RETREATING GLACIERS FROM 1925 TO 1968

Year	Glaciers observed	Advancing %	Stationary uncertain %	Retreating %
1925	74	3	3	94
1926	84	24	11	65
1927	108	11	8	81
1928	126	0	6	94
1929	147	0	4	96
1930	150	15	14	71
1931	179	4	7	89
1932	209	9	22	69
1933	258	2	5	93
1934	252	4	5	91
1935	228	5	3	92
1936	133	22	14	64
1937	149	7	10	83
1938	186	7	4	89
1939	112	21	7	72
1940	57	22	11	67
1941	110	20	13	67
1942	94	7	4	89
1943	25	14	11	75
1944	25	12	10	78
1945	25	13	9	78
1946	63	6	10	84
1947	71	4	4	92
1948	59	6	14	80
1949	96	2	3	95
1950	95	1	4	95
1951	105	10	4	86
1952	100	2	11	87
1953	102	12	9	79
1954	102	9	9	82
1955	123	4.1	15.4	80.5
1956	119	8.4	17.7	73.9
1957	118	8.5	13.5	78
1958	125	4	9	87
1959	112	4.5	15.5	80
1960	101	6.93	42.57	50.50
1961	107	10.4	30.0	59.0
1962	119	4.1	27.9	68.0
1963	115	9.6	45.2	45.2
1964	119	8	13	79
1965	142	7	49	44
1966	141	15	36	49
1967	91	11	35	54
1968	113	15	42	43

VARIATIONS IN ITALIAN GLACIERS

WESTERN ALPS

MARITIME ALPS

1968 Reg. No.	Glacier	Years 1967	1968
1	Clapier	−3	−0.90
2	Peirabroc	−2	−1.00
3	Maledia	−4	−1.30
4	Muraion	−2	−1
5	Ciafraion	−2	−0.50
6	Gelas	−2	−0.50

GRAIAN ALPS

40	Bessanese	−2	−3
43	Ciamarella	−1	stat.
61	Capra	=	−8
64	Basel	=	stat.
69	Breuil	=	under snow
72	Neaschetta	stat.	under snow
144	Lavassey	−5	−18
147	Soches-Centel.	−4.70	−10.50
155	Torrent	+3.95	−8
168	Gliaretta Vaudet	=	−6.80
180	Morion Or. le	=	−11.10
181	Chateau Blanche	=	under snow
204	Chavannes	=	+?

Monte Bianco

209	Lex Blanches	stat.	stat.
208	Estellette	−3	stat.
213	Miage	stat.	+1
221	Toula	+12	+5
235	Prè de Bar	+20	+10

CENTRAL ALPS

Pennine Alps

244	Mont Gelè	=	−4
257	Col Collon	=	−?
255	Oren Nord	=	−?
265	Solatset	=	stat.
259	Tza de Tzan	−15	−17
260	Grandes Murailles	−15	+6.50
272	La Roisette	under snow	+60
281	Montabel	under snow	−12
282	Cherillon	−0.40	−4.50
283	Leone	=	under snow
284	Tyndall	stat.	stat.
285	Cervino	stat.	stat.
261	Forca	+11	−10
289	Valtournanche	−20	−10
290	Gran Sometta	+?	+?

Monte Rosa Group

297	Grande Verra	−2	−4
298	Piccolo di Verra	stat.	stat.
299	del Castore	stat.	−2
304	Lys	−6	−6.20
308	Netschio	=	−2.7
325	Belvedere	−5	+3
324	Nordend	−10	stat.

Pontine Alps

337	Leone	?	?
338	Aurona	?	−274
339	Rebbio	=	stat.
340	Taramona	=	stat.
341	Mottiscia	=	stat.
324	Boccareccio	=	stat.
363	Basodino	=	stat.
361	Siedel	?	stat.
354	Gemelli di Ban	under snow	under snow
355	Costone	under snow	−?
357	Hohsand Sett. le	?	?
360	Blindenborn	under snow	under snow

Rhaetian Alps

408	Preda Rossa	stat.	stat.
409	Corna Rossa	stat.	stat.
467	Val Lia	=	−21
465	Eastern Cardonnè	−2	−3
469	Western Cardonnè	−1.5	−1
471	Verva Maggiore	stat.	stat.
473	Eastern Dosdè	−12	−10
488	Southern di Campo	stat.	stat.
997	Northern di Campo	stat.	stat.
996	Val Nera	−1	−1
511	Tresero — North	+1.5	−3
	South	+1.5	stat.
512	Dosegù	+14	+1
516	Sforzellina	−1.5	+6.5
517	Lago Bianco	+34	−2
518	Gavia	under snow	?
503	Cedek	−8	+29.40
506	Rosole (South)	−9	+30.20
507	dei Forni	−6.5	−?
762	Solda	−7.50	−3.50
632	Carè Alto	under snow	under snow
633	Niscli	−4	stat.
634	Lares	−5.5	−2
637	Lobbia	+1	stat.
639	Mandron	−6	−9
640	Nardis	?	?
644	Amola	−2.4	−5.8
646	Cornisello (south.)	−22.7	−22
678	Presanella	−7.2	stat.
577	Western Pisgana	−13	−13
531	Venerocolo	+1	stat.
583	Centrale d'Avio	−2	stat.
604	Salarno	−15	stat.

Brenta Dolomites

649	Vallesinella	−8	stat.
650	Turket	−?	+?
652	Brentei	?	+?
653	Sfulmini	−3	stat.
655	Crozzon	−?	?
657	Lagol	−?	stat.
658	Prafiorì	−?	stat.
659	XII Apostoli	?	−4

Western Venoste Alps

777	Vallelunga	=	−10 (from '65)
778	Barbadorso di dentro	=	+14 (from '64)
779	Barbadorso di fuori		+41 (from '65)
780	Western Fontana		−1.5 (from '66)
813	Giogo Alto	=	−12 (from '66)

Orobian Alps

550	Scais	=	−20
549	Parola	=	−5

EASTERN ALPS

Dolomitic Alps

973	Western Sorapis	−3	−50
	Central Sorapis	−1.3	−20
937	Cristallo	?	stat.
963	Cresta Bianca	−1.5	−30

Julian Alps

985	Canin (West.)	under snow	under snow
944	Eastern Canin	under snow	under snow
983	Ursic	under snow	under snow
980	W. Montasio	under snow	under snow
981	Eastern Montasio	under snow	under snow

M. Vanni

NEW ZEALAND

WATER AND SOIL DIVISION, NEW ZEALAND MINISTRY OF WORKS

In the last three years a small field party stationed at Timaru has been specialising in elementary snow and ice measurements.

Seasonal snow

Two courses have been established in selected foothill areas to collect data for yearly snowfall comparisons. Snow depths and densities are taken over an altitude range on each course.

Tasman Glacier

Work is continuing on a project to measure snowfalls at monthly intervals for various altitudes on this glacier. Each of the 7 survey sites are marked by installing a rigid pvc pole guyed by wires to sacks buried in the snow. After each survey of snow depth and density, a layer of sawdust is used to mark the surface. This layer is readily picked up by a snow corer on the subsequent survey and defines the lower boundary of that snowfall increment. Adverse weather and excessive precipitation (up to 10 m snow, or 3 to 4 m water equivalent at 2350 m altitude) have introduced problems. Although extended each visit, the marker poles are frequently overtopped. This is usually due to continuous adverse weather preventing the party from returning for some weeks after the survey was due.

Taking supplementary snow depths by probing has proved unsuccessful as there is no significant difference in hardness at the boundary between the snow above and below the "summer surface". In fact it is almost impossible to detect this boundary line in a snow core. The faint dirt band is usually used to define the beginning of a season's snowfall.

IHD glacier basin

An investigation to locate a suitable glacier basin for study has been completed. Over 200 glaciers were seen during the search and almost every one either contained steep icefalls or terminated in deep porous outwash gravels rendering runoff measurements feasible. One suitable, although small, glacier basin has been located. A report and estimates for an eperimental programme have been prepared and the project submitted to New Zealand Government for approval.

T. J. Chinn

UNITED KINGDOM

GREENLAND: GLACIOLOGICAL INVESTIGATIONS IN THE STAUNINGS ALPER (Queen Mary College, University of London, East Greenland Expedition 1968)

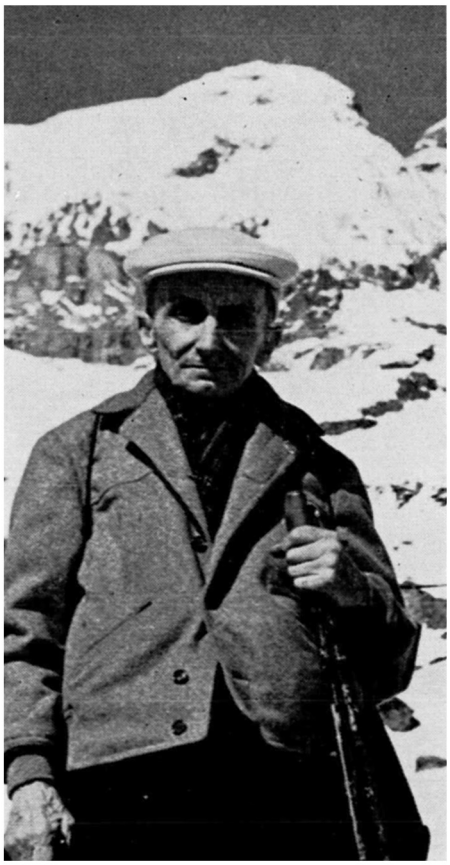
During July and August 1968 studies were made on the Bersaerkerbrae Gletscher to measure velocity, ablation rates, and strain and to examine the development of dirt cones.

(1) Movement studies. Two lines of stakes were placed across the central section of the glacier above and below the largest tributary ice stream. Weekly surveys were made between 12 July and 23 August.

(2) Strain measurements. These were undertaken at four localities between the snout and firn line. Six strain networks were placed above, in and below a large ice-fall. A further eight grids were located across the glacier.

(3) Dirt cones. Natural cones up to 1.6 m in height were found at glacier margins or near to adequate sediment supply. The attitude of initial sediment deposits was found to be the primary factor in the alignment of cones; direction of maximum insolation was important as a secondary factor in the orientation of slopes. Several experimental cones were 'grown' under controlled conditions; they rarely developed at more than half the ablation rate. The highest dirt cones developed from sediments of coarse sand grade.

D. J. Drewry



MANFREDO VANNI

Although Manfredo Vanni was originally a student of the classics, he soon became absorbed in geography and took his degree in this subsject in 1913. All problems, both human and physical, connected with the mountains have been of constant interest to him, both as a scholar and as an alpinist. He carried out geomorphological studies in the Biella, Varese and Como pre-Alps, dealing inter alia with the problem of the glacial origin of Lake Como. His main interest has been in the impressive formations among the upper mountain levels of the Aosta Valley, where glacial development has been most marked. He took part in the preparation of a general description of the Aosta Valley glaciers and has published articles dealing with various aspects of the Tza de Tzan (Valpelline Valley) glaciers. Another of his papers has dealt with the perglacial terrain of the Valtournanche Valley. He has written on alpine hydrography in papers and articles relating to the alpine streams and small lakes of the Sesia, Biella and other valleys.

In Turin, he lectured first of all on problems of economic geography at the Technical and Commercial Institutes, and introduced geographical studies of the Piemont province. He was then elected to a lectureship in Physical Geography at the University of Turin, where he was Professor Magnaghi's successor. From 1946 to 1960 he was Reader in General Geography at the University.

In 1927, he became a member of the Italian Glaciological Committee, which carried out measurements of glacier variations. He was given the task of taking the measurements in

the Ossola and Susa Valleys and more particularly in the Valtournanche Valley, where he is still working on the Matterhorn and Breithorn massifs. On the death of Professor Monterin in 1941, he was appointed Secretary of the Committee and Editor of the annual bulletin, which has regularly carried his reports on glacier behaviour in the Italian Alps. This topic has also been dealt with by him in many papers read before national and international congresses, with particular reference to the signs of considerable glacier retreat and its causes. His work as Secretary of the Committee carries many responsibilities and it has enabled him to make contact with glaciological colleagues all over the world.

In 1954, Professor Vanni became a member of the Snowfall Study Commission and was given control of a number of snowfall measuring stations in the Aosta Valley. He became very interested in the study of snow conditions and has carried out with considerable scientific vigour and practical ingenuity research into the depth and density of the snow layers and their water equivalent. In the International Geophysical Year (1957-58) he contributed to the drawing up of the list of Italian glaciers, which was published by the Glaciological Committee. In recent years he has directed his attention to the study of avalanches, which are now attracting much attention in scientific and tourist circles in Italy.

Professor Vanni is no longer a young man, but he directs in Italy all work on the study of ice, carries out glaciological and snow surveys in the mountains, and—as always— takes part in the international glaciological excursions held from time to time in the Alps. He is a well loved and respected figure and has a well deserved high reputation in the field of alpine glaciology.

MEETINGS

THE GLACIOLOGICAL SOCIETY

BRITAIN

21 November 1968, Birmingham University: (Joint meeting with the Lapworth Society)

Carl S. Benson—Glaciological and vulcanological research on Mount Wrangell, Alaska.

20 February 1969, Leicester University: (Joint meeting with the University Geographical Society)

Carl S. Benson—Glaciological research in Alaska.

NORTHEASTERN NORTH AMERICAN BRANCH

The third annual meeting was held under sunny skies at Mount Tremblant, P.Q., Canada, home of the famous 'Flying Mile' ski trail, on 7 and 8 February 1969. Between attempts to replicate Bowden and Tabor's experiments on the sliding friction of skis (and bodies), some 40 members and their families found time to listen to the papers listed below. Officers elected for the following term are: Dr. Elton Pounder: President; René O. Ramseier: Vice-President; Charles M. Keeler: Secretary-Treasurer.

Austin Kovacs: Pile tests in polar snow.

T. Nakamura and Y. Yamada: Creep measurements of a snow cover.

S. Lee Bear: The ice of the ice ages.

B. Michel: The Ice Mechanics Laboratory at Laval University.

D. Carter: Influence du taux de déformation sur la résistance ultime de la glace de lac et de rivière.

R. Ramseier: River and lake ice classification.

L. Gold: Crack formation in columnar — grained ice during creep.

Caspar Cronk: On the formation of Thule type moraines near Wilkes Station, Antarctica.

David Fisher: Continuous water leakage under Salmon Glacier, B.C.

Philip: Howarth: Glaciological studies at Breidamerkurjökull, Iceland.

J. R. Weber: The vertical motion of sea ice.

Philip Langleben: Ice research at Tanquary Fiord.

E. R. Pounder: Ice drift in the Gulf of St. Lawrence.

SOCIETE HYDROTECHNIQUE DE FRANCE

The Glaciology Section held a meeting in Paris, 4—5 May 1969. The President, M. Messines du Sourbier, was in the Chair. The following papers were given:

P. Kasser—Variations of Swiss glaciers.

L. de Crécy—1967-68 field work on the glacier de Sarennes.

A. Poggi—Experimental studies in mass balance made by the Laboratoire de Glaciologie Alpine, Grenoble.

F. Gillet—Drilling and coring in the glacier de Saint-Sorlin.

A. Bauer—Radio echo sounding of ice, Expédition Glaciologique Internationale au Groënland, 1968.

L. Lliboutry—Study of micro-relief resulting resulting from glacial erosion.

L. Lliboutry—Organization of glaciological studies in the Université de Grenoble.

J. Poirel—Internal and bottom moraines.

A. Roch—Distinguishing avalanche zones for purposes of building controls.

P. Guillot—Discussion of results obtained by levelling with a horizontal beam from a radioactive source.

WORKSHOP SEMINAR ON ICE DRIFT AND RELATED STUDIES

The seminar was arranged by the Marine Sciences Centre of McGill University, Montreal 112, P.Q., Canada. The following papers were read. Further information may be obtained from Dr. O. M. Johannessen at the Centre.

W. J. Campbell: Ice drift theories, present state of art.

T. Tabata: Sea ice reconnaissance with radar.

W. Wittman: U.S. Navy ice program.

E. Palosuo: Compacted ice edge in the Baltic.

W. Weeks: Some current problems in ice mechanics bearing on pressure ridge problems.

K. Hunkins: Report on the Lamont program carried out from T3.

O. M. Johannessen: Report on the McGill ice drift program.

S. Smith, E. Banke and O. M. Johannessen: Wind stress measurement over ice by sonic anemometer.

E. Paul McClaine: Report on the ice program of National Environmental Satellite Centre, ESSA.

W. Markham: Punch card system for ice distribution and characteristics.

J. R. Weber and R. L. Lillestrand: Reports on the projects North Pole — 1967 and 1969 of the Dominion Observatory and Polar Continental Shelf Project, Department of Energy, Mines and Resources, Ottawa.

H. Valeur: Danish Ice Service in Greenland waters.

T. C. Walford: The United States Coast Guard program on iceberg detection and drifts.

C. Taggart: Report from Satellite Centre, Meteorological Branch.

R. Ragle: Plan for study of ice pressure ridge in the Beaufort Sea.

D. Lindsay: Polar Continental Shelf Project ice program.

M. Langleben: Growth and decay of ice, present state of art.

Instrumentation for ice drift and distribution studies —

a. H. Serson and J. Keys: Report on McGill study.

b. K. Hunkins: Lamont Geological Observatory studies.

c. Navigation.

d. I.R.L.S. (Interrogation, recording and location system.)

e. Oceanographical and meteorological instrumentation.

Discussion on future aspects of ice drift and related problems.

FUTURE MEETINGS

THE GLACIOLOGICAL SOCIETY

BRITAIN

2 May 1969, Edinburgh University: (Joint meeting with the University Geographical Society) at 4.15 p.m.

Malcolm Mellor—Ice-its forms and problems.

8 May 1969, at the Scott Polar Research Institute, Cambridge:

Morning session (beginning at 9.15)

J. Walker—Deformation of ice.

M. J. Murray—Dislocation and pressure melting.

M. Gage—Recent behaviour of the Franz Josef Glacier.

A. C. Palmer—A model for glacier surge initiation.

G. de Q. Robin — Further thoughts on glacier surges.

Afternoon session (beginning at 2.15)

J. Muguruma—Effects of surface condition on the deformation behaviour of ice crystals.

M. Mellor—Some effects of low temperatures on the mechanical properties of rocks.

C. S. Benson—Ice fog.

PHYSICAL METALLURGY GORDON CONFERENCE

The 1969 Conference will be held from 7—11 July at Providence Heights College, Issaquah, Washington, U.S.A. Request for attendance at the Conference should be addressed to Alexander M. Cruickshank, Director, Gordon Research Conference, University of Rhode Island, Kingston, Rhode Island 02881, U.S.A. Some of the papers of interest to glaciologists are:

H. Eyring—Significant structures influencing viscous and plastic flow.

J. C. M. Li, C. Barrett, W. Nix—Experimental data on effective stress concept in high temperature creep of metals.

W. J. McG. Tegart, G. B. Gibbs—Theory of glide controlled by local obstacles: application to low and high temperature creep.

J. Hirth, T. Alden—Recovery creep and grain boundary sliding theories of superplasticity.

M. F. Meier—The flow of glaciers: creep, slip and gallop.

GLACIER COURSE 1969

Under the direction of Dr W. Hofmann (Brunswick/Germany), Dr H. Hoinkes and Dr H. Kinzl (Innsbruck/Austria) the next Glacier Course will be held from 17-24 August 1969 at Rudolfshütte (Hohe Tauern, Austria). It will be the 17th of these courses, initiated by Sebastian Finsterwalder in 1913.

The main purpose of the Glacier Course is theoretical and practical instruction in modern methods of glaciological fieldwork, especially in the scope of:

Geographical glaciology and climatology.
Physical glaciology (mass balance and dynamics).
Glacier survey.
The course language is German.

Those interested in participation should report before 31 May 1969 to Dr Walther Hofmann, 33 Braunschweig, Technische Universität, Lehrstuhl für Photogrammetrie und Kartographie, West Germany. Fees for the course will be 50.-DM (US$ 12.50). Daily expenses for lodging and food will not exceed DM 12.— (US$ 3.00).

NATIONAL RESEARCH COUNCIL, CANADA—CONFERENCE ON SNOW AND ICE PROBLEMS

The sixth conference on snow and ice problems, sponsored by the NRC Associate Committee on Geotechnical Research, will be held at the University of Calgary, Calgary, Alberta, 23 and 24 October 1969. The first day of the conference will be devoted to snow problems in mountainous areas, with particular emphasis on avalanches and avalanche defence. The subject of the second day will be the deformation and strength properties of ice, and topics on ice engineering.

Further information concerning the conference can be obtained by writing to the Secretary, Associate Committee on Geotechnical Research, National Research Council of Canada, Ottawa 7, Ontario, Canada.

NATIONAL RESEARCH COUNCIL, CANADA—SYMPOSIUM ON WINTER CONSTRUCTION

Plans for a Symposium on Winter Construction to be held in February 1970 have been announced by the National Research Council, through its Division of Building Research. The Symposium will take place in Edmonton, Alberta, Canada, beginning on Tuesday, 3 February. The five day Symposium is under the joint auspices of RILEM (Réunion Internationale des Laboratoires d'Essais et de Recherches sur les Matériaux et les Constructions) and CIB (Conseil International du Bâtiment pour la Recherche l'Etude et la Documentation), and will consist of three days for presentation of papers and two days of visits to winter building sites in Edmonton and Calgary.

The purpose of the Symposium is to provide an opportunity to report on studies that have been carried out on winter construction equipment, materials, procedures, costs, policies and incentives and to promote discussion on these matters by specialists from those countries that have experience in building in cold weather.

The Symposium will immediately precede the 52nd Annual Meeting of the Canadian Construction Association, 8-11 February 1970 in Edmonton.

Further information may be obtained by writing to: Mr. M. K. Ward, Secretary, Winter Construction Symposium, c/o National Research Council of Canada, Ottawa 7, Ontario, Canada.

SNOW AND ICE CONTROL OF ROADS AND RUNWAYS

The Symposium is co-sponsored by the Highway Research Board of the U.S. National Academy of Sciences and the Cold Regions Research and Engineering Laboratory of the U.S. Army Terrestrial Sciences Center, and is planned for a three-day period during the week of 6—10 April 1970 at the Terrestrial Sciences Center in Hanover, New Hampshire, U.S.A. The Symposium will be coordinated with the 10th Annual North American Snow Conference to be held during the same week in Boston, Massachusetts. It will provide a forum for discussions on the technical aspects of snow and ice control on roads and runways and on the course of future field work. The scope will cover chemical, mechanical, thermal and electrical techniques of snow and ice control and removal; ice adhesion research; snow drift control; winter visibility (fog and blowing snow).

Further information may be obtained from: J. F. Andrews, Chairman, Department of Maintenance, Highway Research Board, National Academy of Sciences, Washington, D.C., U.S.A.

UNESCO SYMPOSIUM ON WORLD WATER BALANCE

In connection with the international Hydrological Decade, a Symposium on the World Water Balance (inventories, balances, research and measurements) is to be held in the University of Reading, England, from 15-23 July 1970. Anyone interested in obtaining further information should write to the chairman of the United Kingdom Organizing Committee: Professor R. C. Sutcliffe, Department of Geophysics, University of Reading, Building No. 2, Earley Gate, Whitenights Park, Reading, RG6 2AU, England.

GLACIOLOGICAL DIARY

1969

2 July - 15 August
McGill University Geography Summer School, Program of Polar Studies—Arctic Seminar. Stanstead, Quebec, Canada. (Dr. Theo L. Hills, Director, Geography Summer School, McGill University, Montreal 110, Canada.)

7 - 11 July
Physical Metallurgy Gordon Conference. Providence Heights College, Issaquah, Washington, USA. (Alexander M. Cruickshank, Director, Gordon Research Conferences, University of Rhode Island, Kingston, Rhode Island 02881, USA.) (See p. 15 of this issue of ICE for details.)

13 - 21 August
Eighth International Congress of Crystallography. State University of New York at Stony Brook, N.Y., USA.

17 - 24 August
Glacier Course. Rudolfshütte, Hohe Tauern, Austria. (Dr W. Hofmann, 33 Braunschweig, Technische Universität, Lehrstuhl für Photogrammetrie und Kartographie, West Germany.) (See p. 15 of this issue of ICE for details.)

30 August - 5 September
International Union for Quaternary Research (INQUA). VIII Congress, Paris, France. (INQUA Secretariat, Institut de Géographie, 191 rue Saint-Jacques, Paris 5, France.)

7 - 13 September
Glaciological Society, Cambridge, England. Symposium on the hydrology of glaciers. Sponsored by the Glaciological Society and the Commission of Snow and Ice (IASH). (Mrs H. Richardson, Glaciological Society, c/o Scott Polar Research Institute, Cambridge, England.)

13 - 20 September: Tours of Scotland Norway following Symposium on hydrology of glaciers.

11 September
Glaciological Society 1969 Annual General Meeting and Banquet.

14 - 16 October
Remote sensing of environment, sixth Symposium. Center for Remote Sensing of Environment, University of Michigan, Ann Arbor, Mich., USA.

23 - 24 October
Conference on snow and ice problems, sixth conference. University of Calgary, Calgary, Alberta, Canada. (National Research Council Associate Committee on Geotechnical Research, Ottawa 7, Canada.) (See p. 15 of this issue of ICE for details.)

1970

3 - 7 February
Symposium on winter construction. Edmonton, Alberta, Canada. (Mr M. K. Ward, Secretary, Winter Construction Symposium, c/o National Research Council of Canada, Ottawa 7, Ontario, Canada.) (See p. 16 of this issue of ICE for details.)

6 - 10 April
International symposium on snow and ice control on roads runways. Hanover, New Hampshire, USA. (Highway Research Board, Division of Engineering, National Research Council, USA, and CRREL of US Army Terrestrial Sciences Center. Mr L. David Minsk, Applied Research Branch, US Army Cold Regions Research and Engineering Laboratory, Hanover, New Hampshire 03755, USA.) (See p. 16 of this issue of ICE for details.)

15 - 23 July
Symposium on the world water balance, Reading, England. (Unesco/IASH.) (Professor R. C. Sutcliffe, Department of Geophysics, University of Reading, Building No. 2, Earley Gate, Whiteknights Park, Reading, RG6 2AU, England.)

1971
(dates not announced)

XVth General Assembly of IUGG, Moscow, USSR. Symposium on environmental and interdisciplinary studies of glaciers and of snow in mountain regions. (IASH/Unesco.) Symposium on air-water reactions involving floating ice. (IASH/Unesco.)

Pacific Science Association, congress. Australia. (Geography Chairman: Akira Watanabe, Dept. of Geography, Ochanomizu Univ., Bunkyo-ku, Tokyo, Japan. Meterology Chairman: J. F. Gabites, Director, Met. Service, P.O. Box 722, Wellington, New Zealand. Solid Earth Sciences Chairman: W. H. Mathews, Dept. of Geography, Univ. of British Columbia, Vancouver 8, B.C., Canada.)

1972
(early August)

International Geological Union Congress
International Geographical Union Congress } both in Montreal, Canada, on successive weeks.

(Secretariat, 22nd International Geographical Congress, P.O. Box 1972, Ottawa, Canada.)

International symposium on snow and ice, hydrology and forecasting. Banff School of Fine Arts, Banff, Alberta, Canada. (Dr I. C. Brown, Secretary, Canadian National Committee for IHD, No. 8 Building, Carling Avenue, Ottawa 1, Canada.)

NEWS

THE INSTITUTE OF POLAR STUDIES AT THE OHIO STATE UNIVERSITY

The Institute of Polar Studies was organized in February 1960 under the direction of Dr R. P. Goldthwait. It was an outgrowth of the data reduction center established at The Ohio State University following the Internaional Geophysical Year (IGY) (1957-58) and the International Geophysical Cooperation (IGC) (1959). Since then there has been continual expansion of facilities and staff.

The purposes of the Institute as set up in the constitution are:

(1) To plan, encourage, support, and direct significant scientific research in polar phenomena.
(2) To bring together or develop inter-related polar investigations and teams of investigators.
(3) To seek and facilitate the training of research workers devoted to polar studies.
(4) To make available to scientists and the public the fruits of significant polar studies.

The Institute is administered by a Director, an Assistant Director, and an Assistant to the Director. Service staff has varied over the years but generally includes a secretary, technicians, and a librarian. Membership in the Institute includes any member of the Ohio State teaching faculty who supervises or is a principal investigator who possesses the Master's degree or equivalent.

Facilities

With continued expansion the Institute's space in 1968 comprised a central office with a polar reprint, map, and news library, four large rooms with about eighteen offices, a two-compartment low-temperature room, a well-equipped workshop and an equipment room. The library now includes about 1500 books, 2000 reports, 5000 reprints, and 20 journals. Besides the Institute Library, the Main Library System of the University maintains a polar collection with emphasis on Antarctica and Alaska.

Other facilities available on campus include: (1) a Wild A-7 stereo plotter, a Zeiss RMKA 15/23 aerial camera, a Zeiss PSK stereocomparator, and Wild T4 and T3 theodolites with associated timing devices; (2) IBM 360 Model 75 and 7094 computers for batch processing, an IBM 360 Model 50 for time sharing, and IBM 1620 and 1130 computers with drum plotters; (3) mass spectrometer, X-ray diffractometer, and X-ray fluorescence equipment; (4) all ordinary field equipment and instruments in the physical and biological sciences. Field stations have been operated in Alaska, Antarctica, Greenland, and elsewhere, and much field equipment is on hand.

Staff

The staff of the Institute by early 1969 had grown to 54. The present Director is Dr C. Bull. In August 1967, Mr J. Splettstoesser filled the position of Assistant Director formerly held by Dr A. Mirsky, and in November 1968, Dr G. MacKenzie was appointed Assistant to the Director. Other additions to the senior staff in the past two years include Dr James R. Rastorfer and Dr Steven B. Young, botanists, Dr Terence J. Hughes, a metallurgist-glaciologist, and Dr Jean Roland Kläy, a glacial geologist.

Publications Program

Early publications of the Institute consisted of reports on data from the IGY and IGC. The first publication in the Institute Report Series, which now numbers 25, with six more in press, was in 1962. By the end of 1968 the Contribution series, published in standard scientific journals, numbered 143. The first Institute Newsletter was published in January 1969 and will be published biannually; it is intended to inform research organizations, former Institute members and others of Institute activities, and will keep current the list of publications.

Research

Initially the Institute's main areas of research were glaciology, glacial geology and bedrock geology. Other disciplines were soon added, so that now the following fields are represented: agronomy, anthropology, bedrock geology, botany, city planning, civil engineering, coal studies, geochemistry, geography, geophysics, glacial geology, glaciology, ice physics, meteorology, photogrammetry, and zoology. There are now a total of 59 active projects at the Institute

The main source of Institute research funds are the National Science Foundation and the Ohio State University. Other sources have included the American Geographical Society, Arctic Institute of North America, Atomic Energy Commission, Battelle Memorial Institute, and military service laboratories. The home facilities and the salaries of the senior members of the Institute are supported by the regular budget of The Ohio State University.

Graduate students carry out a large part of the research at the Institute and many are principal investigators on their own projects. Because the Institute is not a degree-granting department, students in polar sudies are usually registered in the appropriate departments on campus. A few are students at other universities. Support for the students is in the form of research assistantships on Institute projects, and fellowships, and teaching and research assistantships in cooperating departments.

Although many polar courses, such as glaciology, lichenology, and polar soils, are given in cooperating departments, the only course offered by the Institute is an annual seminor in Polar and Alpine Studies. Begun in 1962, it provides an opportunity for students and researchers to become familiar with fields auxiliary to their specialities. Scheduled participants for the 1969 seminar include: P. Ogden, M. J. Dunbar, W. C. Hanson, F. Loewe, R. L. Nchols, N. A. Ostenso, W. O. Pruitt, W. J. L. Sladen and W. E. Taylor.

Graduate students interested in studying with the Institute should first request application materials for entrance to the Graduate School from The Ohio State University, Admissions Office, 190 North Oval Drive, Columbia, Ohio 43210, USA. Information on departmental fellowships and assistantships should be requested from the appropriate department, mentioning the interest in polar studies. A copy of the letter of request should be sent to the Director of the Institute. Post-Doctoral Fellowships are also tenable at the Institute.

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THE GLACIOLOGICAL SOCIETY

c/o Scott Polar Research Institute, Lensfield Road, Cambridge, England

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Secretary: Mrs. H. Richardson

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I C E

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