Number 10

July 1962

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News Bulletin of The British Glaciological Society

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We are sorry to report the death, after a serious illness, of Professor Ukichiro Nakaya on 11 April 1962. He was born at Katayamazu in Japan on 4 July 1900. He became a research assistant at the Institute of Physical and Chemical Research in Japan, which post he left in 1928 to go to King's College, Cambridge, where he remained until 1930. On his return to Japan he was appointed Assistant Professor at the University of Hokkaido, and was promoted to the Professorship of Physics in 1932.

Nakaya's contributions to the knowledge of the origin and the development of snow crystals under every possible condition of temperature and humidity are classic, and are well known to glaciologists and meteorologists all over the world. A full account of his career and of his many other scientific achievements will be published in a forthcoming issue of the "Journal of Glaciology".

SNOW STRUCTURE AND SKIFIELDS. Mr. Seligman has now received sufficient promises of orders for this book to enable him to get it reprinted, with a small margin to hold in stock. After the order has been placed it will still take a few months to complete the reprinting, so that the book will not be ready for despatch until the autumn. The number ordered will be strictly limited so that there may not be copies available other than those for which requests have been received. The price is £3.5s.0d. (\$10.00).

Will anyone who wishes to have a copy of the work but who has not yet communicated with Mr. Seligman please send a postcard to him at Little Dane, Biddenden, Ashford, Kent, England immediately to ensure that they may receive a copy. Those people who have ordered copies will receive a further notice from Mr. Seligman later.

COVER PHOTOGRAPH. We are grateful to M. André Roch for the use of his photograph of snow needles for the current cover of "Ice". The needles are 10 - 20 cm long, and the photograph was taken in the month of February after a long period of good weather at a height of 2650 m on a south slope, just below the Eidg. Institut für Schnee- und Lawinenforschung on Weissfluhjoch.

THE SOCIETY'S COLLECTION OF BOUND VOLUMES. There are now 76 volumes of glaciological papers in the Society's library. Will every member who publishes papers in any journal other than the "Journal of Glaciology" please send reprints to Mr. Seligman, Little Dane, Biddenden, Ashford, Kent, so that this unique collection may be kept fully upto-date. Duplicates of these papers are offered to members, and a list of them is issued twice a year. These lists can be obtained from Mr. Seligman.

ARCTIC INSTITUTE OF NORTH AMERICA. In its 1960-61 Annual Report, published early in 1962, the Institute makes an appeal for contributions of unrestricted funds to finance much needed research of its own choice. The Institute is devoted to the promotion of fundamental research in natural and social sciences in the polar regions. It is the only independent private non-profit organization in North America solely dedicated to carrying on research work in the polar regions. Most of the funds for this research come from contracts with various agencies of the Canadian and United States governments or from grants for specific purposes received from those governments. Much worthwhile work is done on this basis, but there is inevitably a limitation on the kind of work done and on the amount of money available, and often there is a delay between the outlay of funds by the Institute and their recovery from the government agency. There is therefore a great need for unrestricted funds which will be readily available to finance work of the Institute's choice. Further details about the Institute may be obtained from the Montreal office: 3458 Redpath Street, Montreal 25, P.Q., Canada.

Field Work

ALASKA.

Several expeditions have worked in Alaska during the past year. The sketch map on the inside front cover of this issue shows the areas studied. Some of the field studies are annual programmes carried out by various agencies; others are special programmes. Pressure of space prevents the publication of a résumé of all the studies: "Glaciological Notes" number 9, January 1962 (I.G.Y. World Data Center A Glaciology, c/o American Geographical Society, Broadway at 156th Street, New York 32, N.Y., U.S.A.) gives summaries of work on several expeditions carried out in 1961. We publish here summaries of the work on three expeditions: University of Alaska Gulkana Glacier Expedition, Icefield Ranges Research Project, and the Michigan State University summer field camp on the Juneau Icefield.

UNIVERSITY OF ALASKA GULKANA GLACIER EXPEDITION 1961. Glaciological studies initiated during the summer of 1960 on Gulkana Glacier, 135 miles S.E. of Fairbanks, in the central Alaska Range by members of the Department of Geology, University of Alaska, were continued during the summer of 1961. The program is being supported by a gram from the National Science Foundation awarded to Troy L. Péwé, project supervisor and head, Department of Geology.

Two 2-man field parties, each led by a graduate student of the University of Alaska, were in the field from 1 June to 1 September. The two field parties were involved, respectively, in a detailed ablation study and a surface motion study. Liberal helicopter support was furnished by the U.S. Army, Fort Greely, Alaska. The U.S. Air Force Arctic Aeromedical Laboratory, Fort Wainwright, Fairbanks, the Civil Engineering Department and the Geophysical Institute of the University of Alaska, the U.S. Geological Survey, Fairbanks, and the U.S. Weather Bureau, Anchorage, Alaska generously provided scientific equipment.

Ablation and meteorological studies:

Larry Mayo led a party which concentrated on detailed mapping of ablation and accumulation and recording local weather and net total radiation. 79 ablation poles and 25 snow pits were used to measure ablation and accumulation on the $3\frac{1}{2}$ mile long glacier. Continuous weather observations were made for 3 months. The main weather station was located near the center line of the glacier at an elevation of 4,800 feet. Every 12 hours measurements were made of wind, precipitation, and ablation on snow, ice and morainal surfaces. Continuous records were made of temperature, humidity, and net total radiation. A Suomi type net total radiometer and a Brown recording potentiometer were powered by a Universal 1.5 KW portable gasoline generator. A second weather station for continuous temperature measurement was established at an elevation of 5,600 feet on the glacier.

Motion Studies:

75 of the ablation stakes were used in the surface motion study. This part of the program was led by Eugene Moores and consisted of the following:(1) an overall program of weekly, bimonthly, and monthly stake locations of the 75 stakes, (2) short interval studies consisting of daily observations of 7 stakes and two-day observations of 32 stakes, (3) the transverse profiles established in 1960 were resurveyed, (4) the triangulation net was extended, and (5) stakes were located in the tributaries feeding the main ice streams. The short interval studies concentrated on an area below the ice fall extending across the width of the glacier, including two stakes on different blocks at the top of the ice fall. Differential motion between ice streams was also considered.

Geophysical Measurements:

Gravity measurements were made along one longitudinal and three transverse lines on the glacier. The measurements were made by Paul Sellmann, Department of Geology, University of Alaska, with the cooperation of Ned Ostenso, University of Wisconsin.

(Contributed by Troy L. Péwé)

ICEFIELD RANGES RESEARCH PROJECT. The project is sponsored by the American Geographical Society and the Arctic Institute of North America, under the leadership of Walter A. Wood. In 1961 an air-supported reconnaissance was carried out as a preliminary to a long-term project which has as its broad objectives the stimulation of studies of temperate glaciers in North America, the encouragement of recruits to glaciology, and the study of a glaciated area in terms of its total environment. It is hoped to establish a fully equipped research station.

The area selected for study is part of the Icefield Ranges, St. Elias Mountains, Alaska-Canada. The reasons for selecting this area were as follows: (a) The mountains are the most extensively glacierized mountain province in continental North America, and thus give a wide choice for the selection of a suitable area for the concentrated studies. (b) There is a diversity of glacier types. (c) Extremes of environment offer scope for studies of glacier regime and the effect of these mountains as climatic frontiers. (d) In addition to snow and ice studies, other disciplines may be studied close to the glacierized highlands. (e) Logistics are made comparatively easy by the existence close to the area of the Alaska Highway and the chain of airfields on the Northwest Staging Route.

In 1961 the following glaciological work was completed by Richard H. Ragle, assisted by Robert W. Mason and Ralph H. Lenton. Pit studies, for thermal and density profiles, revealed that annual accumulation layers are about 4 metres thick. Observations on a 10metre core during the whole field season showed that the snow became isothermal to a depth of $2\frac{1}{2}$ metres but that the dissipation of the winter cold wave did not progress beyond -5° C. at a depth of about 5 metres. Snow accumulation was measured by markers on a 15-mile traverse across the divide, the markers being fixed for subsequent readings in 1962. A barometric and trigonometric survey was made of the area covered by the glaciological stations, with fixes on to points of the International Boundary Survey-141st meridian. The 1962 programme will include both new and continuing studies.

MICHIGAN STATE UNIVERSITY SUMMER FIELD CAMP, JUNEAU ICEFIELD. The work at the camp was run as part of the Juneau Icefield Research Program. The camp, part of a Michigan State University Summer Institute of Field Sciences, and the Research Program are jointly sponsored by the Foundation for Glacier Research. The 8 weeks course was organised by Maynard M. Miller, with Edward Andress, T.R. Haley, K.A. Henderson and E. L. Keithahn as staff. The field work responsible for the Cordilleran glaciation of the Northern Boundary Range of Alaska, British Columbia and the Yukon Territory. Particular attention was given to the broad high-level crestal névés of present glacierization and to the lower zones of restricted and former glaciation below the regional névé line. 5 weeks were spent on the main ice field in the region of the Taku-Llewellyn Glacier system, with side trips to Glacier and Yakutat Bays and to the area from Taku Fjord to Berners Bay. Permanent camps and field facilities, previously constructed at various elevations, were used, and air support was given by the Alaskan Air National Guard. The program will be continued in 1962 with an enlarged staff and more students.

SOVIET ANTARCTIC ACTIVITIES. During the southern winter of 1961 the Soviet expedition manned three stations: Mirny, "Vostok" and "Novolazarevskaya". The main inland traverse of the 1961-62 summer season was made round the triangle "Komsomol'skaya -"Sovetskaya" - "Vostok" - "Komsomol'skaya", from mid-November to mid-January. The scientific group, led by G. Lazarev, made geodetic (altitude), gravimetric, magnetic and glaciological measurements.

The seventh Soviet Antarctic expedition, led by A.G. Dralkin, arrived at "Novolazarevskaya" on 22 December in the "Ob". The ship moved on to Enderby Land at the beginning of January. Here, with the help of two aircraft, a summer geological camp was set up on shore at "Alasheyev Bay". Some of the personnel for this new station were flewn out from "Vostok", which was then closed for the 1962 winter season. The new station was given the name "Molodezhnaya" and is situated on rock in a small valley, at lat. 67° 48'S., long. 46° E. Construction will be undertaken next season, for the station was evacuated when the "Ob" left for "Novolazarevskaya" on 31 March.

Heavy ice was encountered in the approaches to "Novolazarevskaya" and the station could only be reached by air. Two light aircraft aboard the "Ob" were dismantled and taken to an iceberg 250 miles from the station, and from here they flew to the station. 23 winterers, including 3 Czechs, remained at the station. The "Ob" left for home at the end of April. 1961 SOUTH GREENLAND EXPEDITION. The 3-man expedition from the United Kingdom spent 18 weeks studying glaciology, glacial geology, botany, geology and meteorology on glaciers draining into Tasermiut Fjord (61° N., 41° 30' W.); Sermitsiaq Glacier was studied in detail. Work here and on the mountains around linked up with that on two previous expeditions, in 1957 and 1960. M.R.Kelly and M.D.Rhodes studied movement profiles, accumulation and ablation, ogive characteristics and physical details such as crevasse patterns and morainic features. On other glaciers work was restricted to recording type, extent, firm line and morainic features. The Sermitsiaq Glacier was surveyed to make a map on a scale of 1:10,000, and the whole area visited was surveyed generally. Comparison with vertical aerial photographs indicates that all the glaciers are retreating.

CAMBRIDGE EXPEDITION TO NAGIR, KARAKORUM, 1961. The expedition spent 6 weeks working in the vicinity of the Minapin Glacier, which is situated in Nagir to the NE of Rakaposhi. The main investigation was the glacier itself and consisted of basic movement and ablation measurements, and studies of special features and areas, particularly in the snout region, where a large-scale map was made. Glacial moraines and other geomorphological features were investigated. The party consisted of 8 graduates and undergraduates, under the leadership of J.Staley; the glaciologist was P.Gamble, assisted by W.Graham. A copy of the general report of the expedition, with sketch maps and photographs, is in the Society's library, and gives full details of the work on the glacier.

FRENCH GLACIOLOGICAL WORK IN THE ANTARCTIC. In the season 1960-61 a traverse was made from Dumont d'Urville in Terre Adélie. There were 4 men in the party, led by C.J. Lorius. On the 35 km traverse the following studies were made: accumulation, pit and core analyses, crevasse sampling on the Astrolabe Glacier, and ice deformation near the coast. Measurements were made at the station of the deuterium content in water samples. One of the members of the party, G.Ricou, stayed at the station for the winter to work on a programme drawn up by C.J. Lorius, including a study of the characteristics of ice bubbles and measurements of the CO₂ content of ice. Work in Terre Adélie is sponsored by Expéditions Polaires Françaises.

Studies were also made in Terre Adélie, in conjunction with the Commissariat à l'Energie Atomique, on the determination of deuterium concentrations and their application to methods of dating Antarctic snow and firn, and on the development of equipment to collect gas from firn and ice samples and to measure CO₂ concentration.

On the IIe de Kerguelen and the IIe de la Possession glaciological work is sponsored by the Comité National Français des Recherches Antarctiques, national committee of SCAR (Scientific Committee for Antarctic Research). In the 1961-62 season the first phase took place of the programme to study the glaciation of the islands. Under the leadership of A. Bauer, with the help of helicopters, a geodetic survey of the IIe de Kerguelen was made; general observations were made on the number and size of glaciers, and many photographs taken. A short visit to the IIe de la Possession confirmed that there are no glaciers on the island now and that there is no evidence of former glaciation.

Work on the mainland of Antarctica, in Terre Adélie, and in the sub-Antarctic islands, Archipel de Kerguelen and Archipel de Crozet, are administered by the Terres Australes et Antarctiques Françaises (TAAF), formed in 1955 under the Ministry of State. TAAF publishes a bulletin which is obtainable from Documentation Françaises, 14 rue Lord Byron, Paris 8e, France.

(Contributed by A. Bauer and C. J. Lorius)

A TUNNEL PROJECT IN KEBNEKAJSE, SWEDISH LAPLAND. The research carried out by the physical section of the Geography Department, University of Stockholm, has for many years been mainly devoted to glaciology and glacial morphology. As a link in this research a tunnel has been dug along the bottom of Isfallsglaciären, close to the Tarfala station in the Kebnekajse massif. The main object has been a study of the transition zone between the glacier ice and its bed; special attention has been paid to the transportation and deposition of morainic material and particularly to the formation of "fluted moraine" surfaces. This actual locality has been described by V.Schytt in "Geografiska Annaler", Bd. 35 (1953), h.2.

The field project started when most of the stores left Kiruna on 16 January. Weather was favourable, i.e. with few blizzards but low temperatures, and though there is not much light at this time of the year at lat. 68° N., about 20 tons of equipment and food had been brought to the station (1130 m above sea level) before 1 February. The equipment included

an Atlas Copco CT4Dd air compressor (4.5m³/min) as power supply.

The actual tunnel digging started on about 5 February and went on for four weeks. Most of the work was done with air-driven chain saws and jack hammers. Some blasting had to be used. The tunnel section varies appreciably but averages about 2×2.5 m. It is just over 50 m long and runs along the bottom its full length.

On 1 March the scientific work began. All moraine features were carefully mapped and described (by G. Hoppe and V. Schytt) and the greatly varying ice structure was studied (by E. Palosuo and V. Schytt). About 1 ton of ice samples with varying moraine content and $\frac{1}{2}$ ton of frozen ground moraine has been brought to Stockholm for detailed laboratory studies during next winter. Further tunnel observations are planned for the first half of May and for shorter periods in July and August, although the more interesting part of the tunnel may be flooded.

The tunnel project has been the first large project carried out after the completion of the new station in the Tarfala valley. With its 38 beds, and good mess, laboratory and workshop facilities the station has proved comfortable and practical even at the height of the winter.

G. Hoppe and V. Schytt share the scientific responsibility for the project and S. R. Ekman has been in charge of the practical work at the station.

(Contributed by Valter Schytt)

UNIVERSITY OF MICHIGAN EXPEDITION TO THE ROSS ICE SHELF 1961-62. A 3man expedition organized by the Glacial Geology and Polar Research Laboratory, University of Michigan, flew from New Zealand to NAF McMurdo on 14 October 1961 in a U.S. Air Force C-124 "Globemaster". Members were Charles W. M. Swithinbank, glaciologist, Thomas E. Taylor, surveyor, and Arthur S. Rundle, assistant glaciologist. The object of the expedition was to continue measurements begun in 1960-61 of the rate of movement of the principal valley glaciers flowing into the west side of the Ross Ice Shelf. For part of the season the party worked together with a geophysical team from the University of Minnesota led by Edward Thiel. Thiel was killed in the crash of a U.S. Navy P2V Neptune at Wilkes Station on 9 November.

Byrd Glacier was visited on 23 October, using 2 HUS helicopters. A Worden gravity meter was read at four places on a line across the glacier. The party was flown to Nimrod Glacier from NAF McMurdo in 2 R4D aircraft on 30 October. Ten gravity readings were made at ice movement stakes planted the year before, and the rate of movement was determined at 7 points spaced across the glacier between Cape Lyttleton and Cape Wilson.

Using Eliason and Polaris motor toboggans, the party set out for NAAF Beardmore on 5 November. The 174-mile journey along the foot of the mountains was completed on 13 November. En route, five ice movement markers established the previous year were found and resected. Four days later the party traversed the 27 miles to the mouth of the Beardmore Glacier with a single motor toboggan. Twelve ice movement stakes were re-surveyed and 14 gravity stations were established on a line between Mount Hope and Airdrop Peak. The party returned to NAAF Beardmore on 22 November, where it remained until 7 December owing to lack of available air support.

On 7 December Swithinbank, Taylor and Rundle were flown east along the Queen Maud Range in an R4D aircraft piloted by Lt. James Weeks, U.S.N. An intended landing at Robert Scott Glacier was prevented by bad weather. After a reconnaissance of the glacier the party was landed together with two motor toboggans, food for six weeks, fuel for 320 miles, camping, glaciological and survey equipment, on the ice shelf 30 miles off the mouth of Amundsen Glacier. The 82 miles to Mount Hamilton on Robert Scott Glacier were covered in 4 days. This journey was particularly trying for the motor toboggans. Over much of the distance the surface consisted of rough, hard sastrugi up to 3 feet high. Despite occasional capsizes, the vehicles survived the ordeal without visible damage. Both machines were driven on this journey and throughout the season by remote control. Ropes are led from the toboggan's steering skis to a helmsman following 60 feet behind. All men are on skis, so that the whole sledge train could fall into a crevasse without risking life or limb of its driver or passengers. This method of driving is safer and more comfortable in the crevassed terrain characteristic of the mouths of the great valley glaciers. Moreover it lessens the wear and tear on the vehicles compared with riding on them.

At Durham Point the party found a cairn erected on 29 November 1934 by the Queen Maud Geological Party of the second Byrd Antarctic Expedition. Inside was a note signed by the three men, and beside the cairn was a stadia rod, plane table tripod, 2 ice axes and 2 pairs of crampons.



Sledge team under way on Beardmore Glacier. 21 Nov. 1961. Photo: C. W. M. Swithinbank

Resorting to man-hauling at Mt. Hamilton in an attempt to cross the rough bare ice of the glacier, the Michigan party was forced by severe crevassing to return after only 4 miles to the safer ice at the foot of the mountain. Without flagged stakes planted across most of the width of the glacier, it was still possible to make ice movement measurements by using moraine boulders and conspicuous crevasses as survey markers. Points were fixed by conventional triangulation, using a theodolite at each end of a baseline established on the mountain. Considering that camp at the foot of Mt. Hamilton was nearly 3000 feet above sea level and within 300 miles of the South Pole, the air temperatures encountered were remarkably warm for the latitude. Day temperatures were consistently around $+20^{\circ}$ F. Ice temperatures, which below the level of seasonal fluctuations are known to lie close to the mean annual air temperature, suggested that this kind of weather was probably quite normal for the area. The ice temperature at a depth of 33 feet was -1° F, whereas an average figure for this latitude would be around -20° F.

Returning once more to the ice shelf on 24 December, the party made a long detour to avoid extensive bare blue ice at the mouth of Robert Scott Glacier, before heading into the coast at O'Brien Peak. The 90 miles to the foot of Amundsen Glacier were covered in $3\frac{1}{2}$ days, in spite of a further detour made necessary by a dangerously crevassed area at the edge of the ice shelf. An attempt was made the following day to cross to the left bank of the glacier to plant survey markers and to make gravity measurements. But after seven miles the party was brought to a halt by severe and extensive crevassing, and reluctantly beat a retreat. Movement measurements were made, as they were at Robert Scott Glacier, by using boulders and crevasses as targets for angle measurements.

Leaving Amundsen Glacier on 15 January, one motor toboggan covered 95 miles in two days. Much of this distance was again accounted for by a wide detour on to the ice shelf to avoid the disturbed area at the mouth of the glacier. A brief stop was made at Mount Betty, where Amundsen's cairn, erected almost exactly 50 years before, was found still intact and still containing a full 5-gallon can of kerosene. Fifty yards away was a cairn erected on 28 December, 1929, by the Geological Party of the first Byrd Antarctic Expedition. Inside was a note by Laurence M. Gould, Leader of the party, together with a large assortment of clothing, some first aid supplies, radio parts, dog harnesses, and Gould's geological hammer. A broken Nansen sledge and a camera tripod were lying against the outside of the cairn.

Nine days were spent at Liv Glacier. A complete traverse was made, in which 9 gravity stations and 7 ice movement markers were set up. Returning to the ice shelf, the party was flown out in two R4D loads to NAAF Beardmore and thence to NAF McMurdo on 1 February. In addition to the ice movement work, positions were determined by sun observation at each glacier visited. Three baselines were measured and all visible peaks intersected. Taylor completed a reconnaissance triangulation network covering about 150 miles of the mountain range. Ice temperatures were observed in a drill hole at each glacier, and routine weather observations were made throughout the period.

The party was carried in two HUS helicopters to Mulock Glacier on 10 February. Eight

ice movement markers established the previous year were re-surveyed and 8 gravity observations were made in a line across the glacier. The helicopters reappeared on 13 February and returned the party to McMurdo. In all, successful movement measurements have now been made on 7 of the 8 principal valley glaciers in 650 miles of mountain range. The gravity measurements will give a first approximation of the depth of ice on each glacier. Actual movement figures have not yet been computed; but it appears that Byrd Glacier is the fastest moving and Liv is the slowest of the glaciers visited. In the course of the season, one motor toboggan covered a total of 723 miles hauling an average load of 1500 lbs., while two others each covered around 575 miles. Fuel consumption on the 300 miles journey along the Queen Maud Range averaged 12 miles per gallon for each vehicle.

After further ice movement studies in the McMurdo Sound area, the members of the party returned separately to New Zealand between 18 February and 11 March.

(Contributed by Charles Swithinbank)

UNIVERSITY OF WISCONSIN INVESTIGATIONS IN ANTARCTICA, 1961-62. During the 1961-62 summer field season six groups conducted various geophysical, glaciological, and geological investigations in the Antarctic.

A seven man traverse party, including men from Ohio State University, the U.S. Coast and Geodetic Survey, and the U.S. Geological Survey, travelled 1700 km through largely unexplored territory from the George Bryan Coast eastward into the base of the Antarctic Peninsula. Seismic, gravity, magnetic, elevation, and meteorological studies were carried out, and the stratigraphy, density and temperature of the firn investigated. The positions of a large number of peaks in this mountainous area were determined. Party members included J. Behrendt, leader and geophysicist, P. Parks, geophysicist, H. Shimizu and J. Molholm, glaciologists, P. Wasilewski, geomagnetician, C. Merrick, topographic engineer, and L. Kreiling, traverse engineer.

On Roosevelt Island, a party of 9 men began a several year program to investigate the regime of this small ice cap. Several reconnaissance traverses were run to give the outline of surface and bedrock topography, and to determine the geographical position of the island. A network of 35 stations was accurately surveyed for future measurement of strain rates. Several glaciological pits were examined, poles for accumulation measurements laid out, experiments to determine the applicability of aerial photogrammetry to the area conducted, and various seismic, gravity, magnetic, and meteorological measurements completed. The party included M. Giovinetto, leader and glaciologist, M. Hochstein, J. Clark, and W. Unger, geophysicists, J. Clapp and W. Heilman, civil engineers, H. Kieffer, general assistant, R. Logie, traverse engineer from the Antarctic Division, New Zealand Department of Scientific and Industrial Research, and for a few weeks Dr. C. Benson, glaciologist from the University of Alaska.

At South Pole Station a two-phase program was carried out. Seismic reflection and refraction shooting and gravity measurements were completed to determine ice thickness, wave velocities in the ice and subglacial rock, and to study the propagation of acoustic energy in ice at very low temperatures. At the same time, a canvas and aluminium garage was erected and then used for the repair and modification of the oversnow traverse vehicles stored at the station. These vehicles, two model 843 Tucker Sno-Cats and one model D-742-AN Sno-Cat, required a considerable amount of reconditioning after the trip from McMurdo Sound, but are now ready for the 1962-63 field season. J. Weihaupt and J. Tomei, geophysicists, and J. Long and J. Fibert, traverse engineers, took part in the work. The program of accurate determination of the difference in gravity between McMurdo,

The program of accurate determination of the difference in gravity between McMurdo, Byrd, and Pole Stations to search for possible effects due to motion of the latter two sites was continued. In addition, a number of new gravity stations, largely in the ice free regions around McMurdo Sound, were established. J.Sparkman was the observer.

The investigation of patterned ground in the McMurdo Sound region was continued. This project involves the determination of the growth rate of ice and sand wedges and their use as a measure for dating past advances and retreats of the ice fronts. Climatic factors are being studied to determine their effect on the growth rate and the type of wedge filling present. Other patterned ground features are also being investigated. R.Black, project director, T.Berg, and J.Sullivan conducted the field investigations.

Working with the Chilean Antarctic Expedition in the northern Antarctic Peninsula, another geological party studied the sedimentary and tectonic history of an argillaceousarenaceous sequence of rocks in the vicinity of "Base O'Higgins", and the relationships between the intrusive and extrusive igneous rocks in the vicinity of sub-base "Yelcho". In addition, a gravity survey between and around the Chilean Antarctic stations was carried out, and the Antarctic stations tied in "Punta Arenas" to the world gravity network. In the field this season were R.Dott, project director, M.Halpern and K.Scott, geologists, and T.Cohen, geophysicist.

(Contributed by Charles Bentley)

Current research on snow and ice

2. SWITZER LAND

1. The yearly measurement of the positions of glaciers fronts continues under the leadership of Professor A. Renaud. In the year ending September 1960 56 glaciers were in retreat and 7 were advancing; amongst the latter was the Allalingletscher, which has recommenced the advance interrupted in the previous year. Since it has been found that small glaciers react more positively than large ones to short-term changes in climate, the balance of a small glacier in the Valais (Plan-Névé) is being studied in detail.

2. Ice cavern on the Jungfraujoch: The various researches undertaken regularly for the last 10 years have now been discontinued, including the studies carried out on the compression of ice samples from the walls of the cave. Measurement of snow depth continues on a line of stakes on the surface of the ice cap, and due to a severe storm in February 3 of these stakes have shown a net ablation by wind erosion; this suggests that occasional layers may be missing from firn profiles, as in the Antarctic. A current experiment is the study of rates of opening of growing crevasses, with the assistance of a newly developed ice clinometer, under the direction of Professor R.Haefeli.

3. Aletschgletscher: The study of the mass balance of the glacier continues under the direction of Dr. P. Kasser. A feature of the hydrological year 1960-61 was the very heavy snowfall at the beginning of the year, although the annual total corresponded to the long-term mean. This was in part due to a very warm autumn. At the end of the hydrological year there was an exceptional increase in the depth of the firn but a correspondingly heavy ablation on the lower half of the ablation zone. Therefore, although there was 15 m of ablation near the tongue, the firn line at the beginning of October was lower than the previous year. The Swiss Topographical Survey and the Department of Hydrology of the Federal University are continuing with the production of the map of the Aletschgletscher on a scale of 1:10,000, of which the first sheet appeared in 1960. The Swiss Glacier Commission is planning a survey of the rock base of the glacier between Jungfraujoch and the end of the tongue by seismic sounding.

4. Steingletschersee: Work carried on for the past 5 years on the lake below the Steingletscher, including ablation measurements on the submerged glacier tongue, has been described by Professor R. Haefeli in a publication by the Baudirektion of Canton Berne.

5. Snow cover and firn limits in the I.G.Y.: Dr. M. de Quervain and Dr. Zingg are making a special study of the glacier basins which were recorded by aerial photography during the I.G.Y., and a report on this work is nearing completion.

6. E.G.I.G.: Professor A. Renaud continues the study of ice samples taken from the Greenland ice cap in 1959. Dr. de Quervain and M. Kopp are studying continuous sections from samples taken from the top 7 m at Station Jarl-Joset. The metamorphoses of the surface layers were the subject of a special study at the Federal Institute for Snow and Avalanche Research. Professor R. Haefeli and Dr. F. Brandenberger are working out the mass balance and flow measurements of the field season 1959-60 (over-wintering). In order to clarify the processes of ice drainage from the ice cap, a model experiment has been evolved at the Hydraulic Laboratories of the Federal University (V.A. W.E. of the E. T.H.) following the method of Hele Shaw, and has shown positive results. The technique developed will help to elucidate the mechanics of stream flow in steady and non-steady state ice sheets.

7. Basic research on the properties of ice and snow: Under the leadership of Dr. M.de Quervain the Federal Institute for Snow and Avalanche Research has studied the electrical conductivity of snow as a function of snow type and temperature, using samples from Greenland firm obtained by E.G.I.G. M.C.Jaccard has been studying the theory of the thermal properties of ice and the preparation of the purest ice in order to study these properties.

Commission of Snow and Ice

(Int. Association of Scientific Hydrology of the Int. Union of Geodesy and Geophysics).

1) Symposium on the variations of the regime of existing glaciers, Obergurgl, September 1962 - extracts from the second circular (obtainable from Dr. W.H. Ward).

This second circular gives further details of the meetings, the excursions, and requests participants to submit registration and publication fees and to indicate their excursion requirements. It also gives details of the hotel and pension accommodation.

PLACE AND DATE: The Symposium will be held from Monday. 10 to Tuesday 18 September 1962 at Obergurgl, Austria. The meetings and discussions will take place in the hotel Edelweiss and Gurgl, with facilities for the projection of slides and 16 mm film.

The Working Group on Glaciology of the Scientific Committee for Antarctic Research (SCAR) will be meeting at Obergurgl on 19-22 September immediately after the symposium organised by the Commission. Members of this group are invited to attend the symposium and should register in the same way as other participants. Members of the Working Group will be accommodated in the bedrooms at the Bundessportheim during their meeting, and hold their meetings there. On 19 and 20 September they are proposing to hold open discussions on:-

1. The techniques of measurement of ice thickness in polar areas, with particular reference to the reliability of existing methods and to the possible development of new methods such as radio depth sounding and other electrical methods.

2. The application of isotopes to glaciological problems in polar areas (accumulation, movement, melting, climatology).

3. Measurement of net accumulation in polar areas.

These discussions will help the Working Group in drawing up plans for future glaciological research in Antarctica. The SCAR Working Group have invited those people attending the Commission's symposium who have special knowledge and experience of the above techniques to attend the discussion.

On 21 and 22 September the meeting will be limited to the members of the permanent working group who will discuss the long-term development of the SCAR programme in glaciology.

EXCURSIONS: (a) Before the symposium: Swiss glacier tour.

(b) During the symposium: The following excursions by bus will be arranged on days when the weather is fine.

A Ehrwald - Zugspitze (2964 m) (Germany)

- B Reschenpass Meran (South Tyrol, Italy) Jaufenpass -Brennerpass - Innsbruck
- C Reschenpass Sulden (Ortler Peak, South Tyrol, Italy) -Stilfserjoch - Reschenpass.
- D St. Moritz (Switzerland) Morteratschglacier.
- E Innsbruck (including guide)

(c) After the symposium: Two alternative excursions I and II, commencing on Wednesday 19 September and lasting two or three days, are being arranged after the symposium.

Visit to Gross Glockner (highest mountain in Austria), the Pasterze Glacier and to a large hydro-electric power plant at the invitation of Tauernkraftwerke.

II Visit on foot to the Hintereis, Kesselwand and Vernagt Glaciers.

BANQUET: A banquet with entertainment by Tyrolese singers and dancers will be held one evening.

PROCEEDINGS OF THE SYMPOSIUM: It is hoped that a volume containing the papers submitted for discussion will be printed and dispatched to participants before the symposium. Anyone requiring a copy of the Proceedings should complete the appropriate form and remit a sum of £2, 13s.0d. for each copy.

CORRESPONDENCE: All forms and remittances should be sent to the Secretary of the Commission (Dr. W. H. Ward), at 147 Rickmansworth Road, Watford, Hertfordshire, England, on or before 30 June 1962.

> W.H.Ward Secretary

LIST OF PAPERS accepted for publication and discussion at the Obergurgl Symposium.

AUSTRIA

1. H. Hoinkes and R. Rudolph. Variations in the mass-balance of Hintereisferner (Oetztal Alps) 1952-61, and their relation to climatic elements.

CANADA

2. F. Müller. Glacier mass-budget studies on Axel Heiberg Island, Canadian Arctic Archipelago.

FRANCE

3. L. Lliboutry, M. Vallon and R. Vivet. A study of three French alpine glaciers.

GERMANY

- 4. R. Finsterwalder. Measurement of glacier variations in the Eastern Alps, particularly in the Gurgl area.
- 5. W. Kick. Variations of some central Asiatic glaciers.

INDIA

- 6. N. Ahmed. Milam Glacier, Kumaun Himalayas.
- R. S. Jangpangi and C. P. Vohra. The Shunkalpa (Ralam) Glacier in Central Himalaya.
 T. K. Kurien and M. M. Munshi. Sonapani Glacier of Lahaul, Punjab.
 A. P. Tewari and B.S. Jangpangi. The retreat of the snout of the Pindari Glacier.

ITALY

10. M. Vanni. Variations in Italian glaciers and the glaciological survey 1961.

NEW ZEALAND

11. A.J.Heine. Glacier changes on Mount Ruapehu, New Zealand.

SWITZERLAND

- 12. U. Eugster. Recent changes in small glaciers in the Pizol and the Sardona, (Low Alps of Eastern Switzerland).
- 13. R. Haefeli. The ablation gradient and the retreat of the glacier tongue.

UNITED KINGDOM

14. F.J.Fitch, D.J.J.Kinsman, J.W.Sheard and D.Thomas. Glacier re-advance on Jan Mayen.

U.S.A.

15. K. B. Bengtson. Recent history of the Brady Glacier, Glacier Bay National Monument, Alaska.

- 16. W.E.Davies and D.B.Krinsley. The recent regimen of the ice cap margin in North Greenland.
- 17. C.C.Langway. Some physical and chemical investigations of a 411 m deep Greenland ice core for climatic changes.
- J.B. Lyons and R.H. Ragle. Thermal history and growth of the Ward Hunt shelf.
 M.F. Meier and A.S. Post. Recent variations in mass net budgets of glaciers in western North America.
- 20. T. L. Péwé and R. Church. Glacier regimen in Antarctica as reflected by glacier margin fluctuations in historic time with special reference to McMurdo Sound.
- 21. R.P. Sharp and S.Epstein. Comments on annual rates of accumulation in West Antarctica.
- 22. W. Thompson. Preliminary notes on the nature and distribution of rock glaciers relative to true glaciers and other climageomorphic phenomena in North America.
- 23. J. Weertman. Catastropic glacier advances.

- 24. O. P. Chizhov and V. S. Kopyakin. Recent changes in the regime of Novaya Zemlya glaciation.
- 25. L.D.Dolguskin, S.A. Yevteyev and V.M. Kotlyakov. Current changes in the Antarctic Ice Sheet.
- 26. M.G. Grosswald and A.N. Krenke. Recent changes and the mass-balance of the glaciers on Franz Josef Land .
- 27. P. V. Kovalyov. The fluctuations of glaciers in the Caucasus.
- 28. K.G. Makarevich. The regime of glaciers in the Zailiysky Alatau in recent decades.
- 29. N.N. Pal'gov. The relation between glacier retreat and the position of the firn line with special reference to the Zentralny Tuyuksu Glaciers.
- 30. M.V. Tronov. On the role of summer snowfalls in the fluctuation of glaciers.

2) Circular letter to National Correspondents of the Commission of Snow and Ice

Dear Sir,

May 1962

At the meeting of the International Commission of Snow and Ice in Helsinki 1960 it was decided to organize within this commission a number of divisions, one of them being the: Division of Seasonal Snow Cover and Avalanches. Dr. M.R. de Quervain was appointed chairman of this division and he now wishes to organize its activity. First of all it seems useful and necessary to compile a list of those interested and active in research on the seasonal snow cover. When this document is complete it will be distributed to all those listed in it.

As a next step all those who are willing to co-operate in the division will be invited to submit their suggestions on subjects to be dealt with in the division, e.g. subjects for discussion at general assembly, symposia and topics for working groups. There are a number of subjects which can be mentioned immediately such as: experience with the International Snow Classification; experience with ablation and run-off formulae; avalanche classification etc. A symposium on avalanche problems of any kind should also be organized in the near future.

The National Correspondents of the Commission of Snow and Ice are kindly invited to compile the names and addresses of scientists interested in seasonal snow cover and avalanches, and give also details of their special field of interest within their countries, and to send the information to Dr. de Quervain.

Yours sincerely,

DR. M.R. de QUERVAIN

Director, Swiss Federal Snow and Avalanche Research Institute, Weissfluhjoch/Davos, Switzerland.

> DR. W. H. WARD Secretary, Commission of Snow and Ice

U.S.S.R.

3) Meetings in Berkeley, Calif., U.S.A., August 1963.

The Commission will hold meetings during the General Assembly of the International Association of Scientific Hydrology (International Union of Geodesy and Geophysics), 17 - 31 August 1963. The topics for the Commission meetings are:

1. The transfer of heat and mass in snow cover, ice cover, glaciers and frozen ground.

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- 2. New developments in methods and techniques.
- 3. Antarctic glaciology.

The provisional programme is as follows:

20 August	-	Opening meeting of the Union (morning).
•		Opening meeting of the Association (afternoon).
21 August		Commission of Snow and Ice (1st and 2nd meetings)
22 - 23 August	-	Commission of Snow and Ice (3rd - 6th meetings).
26 - 27 August	-	Commission of Snow and Ice (7th - 9th meetings).
29 August	-	General Assembly of the Association (morning).
31 August	-	Last meeting of the Union.

The Society's twenty-fifth anniversary

The celebrations took place on 5 - 7 January 1962 in Cambridge. On Friday evening, 5 January, there was a reception at the Scott Polar Research Institute. On the Saturday and Sunday, 6 and 7 January, a symposium on the problems of mass balance studies was held in the Geography Department. Papers read there, with the discussion of each paper, will be published in the October 1962 issue of the "Journal of Glaciology", Volume 4, number 33. This report of the symposium proceedings has been edited by Dr. J. W. Glen. On the Saturday evening, a Banquet was held in St. John's College: the beautiful Combination Room, lit by candles, helped to make the occasion memorable. Telegrams of good wishes were read from several people, including the staff of the Division of Building Research, National Research Council of Canada, and the President of the Commission of Snow and Ice, Professor P. A. Shumskiy. We publish here the texts of the two speeches made at the Banquet: the Lord Bishop of Norwich, Dr. W. L. S. Fleming, proposed the toast of the Society and Mr. Gerald Seligman replied. We also publish, for members' amusement, some of the photographs taken by candid cameras during the weekend.

At a general meeting, members unanimously approved changes in the Society's Constitution. The most important changes were those designed to give members a greater share in the election of the Council. The name of the Society was changed, dropping the 'British' which had been in the title since 1947.

The Lord Bishop of Norwich: Ladies and Gentlemen.

It is my duty and privilege to propose the toast of the British Glaciological Society. I regard the Society, and I do not believe I am alone in doing so, and its President as practically the same thing, and I feel it is a particular honour and particular privilege to propose a toast which is coupled with the name of Gerald Seligman, a friend of many years' standing.

Now of course, to look at him you might think what a gentle and rather retiring kind of person he must be; but of course you would be very much mistaken. There is a relentless streak about Gerald Seligman of such a kind that many of us have found ourselves being cajoled and persuaded almost without knowing it to bend to his wishes; but that is a false picture too, for in fact he would never have succeeded were it not for the fact that he is one of the kindest and most selfless of men, with the singular devotion to the science which he has done so much to foster.

I am in private duty bound, but I may say with ill-concealed pride, to record the fact that he was a member of Trinity Hall, Cambridge; but from his undergraduate days I want to jump to 1936, the year in which he published "Snow structure and Ski Fields", which was in fact the first comprehensive scientific work on the subject. In the same year he formed a British group called "The Association for the Study of Snow and Ice" and I can well remember the meetings of that association - I think we did rather well if we were about ten in number - and the duplicated Proceedings which were published two or three times a year. Two years later, 1938, he organized and led an expedition to the Jungfraujoch which undertook glaciological research which was different in kind from that which had preceded it at least from this country: namely, by being essentially on a physical basis whereas previously the study of glaciers had in the main been descriptive.

Immediately after the war, in 1945, Gerald Seligman was himself primarily responsible for re-organizing the Association for the Study of Snow and Ice into the British Glaciological Society, of which he was appointed President and of which he has been President ever since. Two years later, in January of 1947, the first number of the "Journal of Glaciology" was produced under his editorship. Now the Journal of Glaciology has run to 30 numbers; it has subscribers in 51 countries and it enjoys an international reputation, and the Society is unique, I think I am right in saying, in being the only Society solely concerned with glaciology and producing an international journal. I would like to say how particularly good it is that members of the Society from so many oversea countries are here this evening.

If I may mention one name, and I know that those of you from other countries will understand my selecting that one name, it would be that of Hans Ahlmann. What an honour and delight it is to see him here dining with us tonight. I would like to think that the study of glaciology has introduced into the rather phlegmatic ways of the British temperament a greater facility in foreign languages, but we have learnt some glaciological terms of which I think probably the foremost is "Skal".

Gerald Seligman has himself contributed nearly 200 articles and notes and reviews relating to snow and ice and skiing and it really was from his skiing that I understand his original interest took shape. But much more significant has been the pioneering influence that he has had on the development of glaciology as a science. He has in particular drawn in the physicists. The only qualifications that I would have to the enthusiasm that I otherwise show for this is that in consequence he has made glaciology in some ways too difficult, for physicists can never resist the temptation, just as you begin to think you are understanding what they are saying, to soar into the higher flights of mathematical formulae. The trouble really is that then you discover that the more incomprehensible parts of their theories are in fact shown to be true, and I suppose that this is where the physicist and the theologian might be said to have a common link. He has also won the support and the inter-

theologian might be said to have a common link. He has also won the support and the interest of geographers, of geologists, of meteorologists, and of a great many other people, and has done a great deal to stimulate research and interest which has brought results of both an academic and also a practical kind. To all of this, and not least as editor of this Journal, he has given a great deal of time, a great deal of money, and most of all a great deal of meticulous and painstaking and persistent care.

We hope, and I know that you will understand that I am addressing my remarks almost solely to our President, we hope that he may have some cause for real pride and satisfaction in the very remarkable results which his work over these past 25 years has achieved, and we would like to congratulate him and to thank him and to honour him as we drink the toast which presently I am going to ask you to drink with me, and ask him to drink with us to the British Glaciological Society, and for its success and prosperity in the future.

Ladies and Gentlemen -

The British Glaciological Society.

Gerald Seligman: Ladies and Gentlemen,

I have to thank you, my Lord Bishop, on behalf of the Society for the eloquent way in which you have proposed the health of our organization and incidentally myself.

Some people, like you, my Lord Bishop, have been kind enough to say that I have played an important part in the success we have achieved, but I do not really think I deserve much praise. Even though I may have had the idea of bringing together a small band of enthusiasts in this country, I never visualised a body as large or as keen as we were to become; but really the impetus originally came from my late colleague, J. E. Church, who was at that time Chairman of what was then "The International Commission of Snow". In the middle 1930's he invited me to become Chairman of a British group within the Commission which, as you have heard, in due course changed into the Association for the Study of Snow and Ice, and then into the British Glaciological Society; but nothing would have come from these early ventures but for the help and support I have received from so many of you who are here tonight, not forgetting my wife, who in early days and also now stays me with sound advice and sound judgement. Help and encouragement also came from several noted members of our Society who are no longer with us, and this must never be forgotten. We in this country have suffered particularly in the last year in the way of casualities and in particular I must mention the name of Vaughan Lewis who died so tragically last year.

I agree with the Bishop that the issue of the "Journal of Glaciology" is the most important function of our Society. It was started as he has said in January 1947. The "Zeitschrift für Gletscherkunde" had ceased publication during the war and its successor the "Zeitschrift für Gletscherkunde und Glazialgeologie" did not come into being until a few years later. Now we have the co-operation from many authors from all over the world, and the Journal goes to something like 50 different countries, as the Bishop has said. In one country alone, the United States, it goes to 41 of its component states. It even goes in quite goodly measure to communist China. The membership and subscription lists of the Society are now approaching a total of a thousand, which I think should be considered satisfactory.

As for the Journal itself, in early days when I handled it alone, it was a very small task, and if I can interpret the extremely tactful suggestions of some of my present colleagues it was not done according to the very rigid rules of editorship we now lay down. Today I am pleased to say that my own task is a complete sinecure. I decline to handle anything that is difficult and hand it on to my editorial colleagues, Miss Doris Johnson, Dr. Glen or Dr. Adie, and as such items now constitute the majority of the Journal I have a delightful time sitting back evading all major issues and reaping entirely undeserved approbation. I do not think that there are many officials of a scientific society who have had the opportunity to make so many personal friends from all over the world as I have been privileged to do, and in this, too, I have been the gainer.

To sum up, if I may be allowed to give my own views on the position we occupy today, views which, My Lord Bishop, are just a little different from yours, there are two reasons: first that we have clearly satisfied a real want - the conversion of glaciology into an accepted science by capitalizing a series of progressions which have been accumulating for a very long time: from the early works of such pioneers as Forbes, Tyndall and Heim in the last century, to those of much later dates such as Sebastian Finsterwalder, Wright and Priestley earlier in this century, and to Professor Ahlmann and Mr. Field in still more recent years. We are privileged to have both these gentlemen with us here today. There are many other names; these are only a few that I have given to you, but they are too numerous to detail.

The second reason, in my opinion, is the encouragement and help we have received from the many sponsors of our work, of whom I also see so many here tonight. In particular I should mention the fact that after we changed our headquarters many years ago from the Royal Geographical Society in London, where we had received much help from its then President, Lord Rendle of Rod, we have been allowed to establish our headquarters in the Scott Polar Research Institute in Cambridge, through the good offices of its directors, including you, My Lord Bishop, and your successors, Colin Bertram and Gordon Robin. Credit for our success must also be given in large measure to the energy and enthusiasm of our secretary, Mrs. Richardson, who has donc a perfectly wonderful job, and I may say the organisation of this particular Congress has been absolutely beyond praise.

The Society has now really arrived, and the future, if we all continue to pull together, is entirely rosy.



Petr Aleksandrovich Shumskiy

Petr Aleksandrovich Shumskiy was born on 31 December 1915 in Niezhin, the Ukraine. While still at school he became interested in glaciers, as a result of excursions to the glaciers of Kazbek in 1929, and almost every year he goes to the Caucasus and the Khibiny (Kola Peninsula) for climbing and skiing. From 1932 he studied glaciology and Quaternary geology at the geographical faculty of Leningrad University, and took part in scientific expeditions to the Kola Peninsula, the Kara Sea and Franz Josef Land. He joined the Arctic Institute, Leningrad, and in 1937 visited the De Long Islands, to which his first published work is devoted. In 1937-38 he participated in the drift of the "Sedov" in the Arctic Ocean.

From the spring of 1941 Shumskiy worked as a geologist in the Pamirs for four years. After returning to the Arctic Institute he wrote a monograph about Arctic glaciers and in 1947 was awarded the degree of Doctor of Science. His theoretical work on "Glacierization energy and life of glaciers" was published at this time.

There followed a period during which he became interested in applying petrographic methods to the study of ice, beginning with work on glaciers in Franz Josef Land. As a result of this his work "Principles of structural glaciology", a primary reference on the petrology of ice, was written; it was published in Russian in 1945 and has since been translated into French and English.

On the invitation of Academician V.A. Obruchev, Shumskiy went in 1950 to work for the Permafrost Institute of the USSR Academy of Sciences, with the object of applying petrographical methods to the fossil ice of Siberia. He soon found that this fossil ice is not buried remnants of a continental ice sheet or snow fields but was formed in frost cracks in the ground. He developed a classification and a theory of formation of all known types of ground ice, published in 1959 as a monograph, "Principles of geocryology".

From 1954-55 Shumskiy was in charge of glaciological studies on expeditions to the North Pole, Franz Josef Land, Severnaya Zemlya and Novaya Zemlya, and from 1955-58 on the first and second Soviet Antarctic Expeditions. On his return to Moscow he has occupied since 1958 the post of Director of the Permafrost Institute. He has been working on a theory of glacier movement and variations. In 1960 he was elected to the Presidency of the Commission of Snow and Ice of the International Association of Scientific Hydrology. His energetic and forthright methods have been very successful in furthering glaciological investigations both within the USSR and in other regions where Soviet glaciologists have been active.

The Society's Library

Works received for the Society's library since November 1961.

We thank the following authors or donors of papers and pamphlets and regret that it is impossible to acknowledge them individually. The glaciological works, with their complete references, will be listed in the "Glaciological Literature" at the end of the "Journal of Glaciology" and bound in the Society's collection of glaciological papers.

Ahlmann, W.W:son	Holmes, C.D. (2 items)	Müller, F.
Ambach, W. (2 items)	Kuhn, W.	Nichols, D.R. (2 items)
Bauer, A.	LaChapelle, E.R. (4 items)	Nobles, L.H.
Bergdahl, A.	Lag, J. (6 items)	Nusser, F. (2 items)
Blake, Weston Jr. (2 items)	La Grange, J.J. (2 items)	Nye, F.J.
Davidsson, J.	Lamb, H.H. (2 items)	Østrem, G. (2 items)
Fristrup, B. (2 items)	Legget, R.F. (9 items)	Paschinger, H. (2 items)
Gage', M.	Lliboutry, L. (3 items)	de Quervain, M.
Gold, L.W. (6 items)	Lorenzo, J.L.	Renaud, A. (2 items)
Haefeli, R. (2 items)	Lovenbury, H.T.	Roethlisberger, H. (2 items)
Hamelin, LE. (2 items)	Magnani, M.	Schwarzbach, M. (4 items)
Hattersley-Smith, G. (4 items)	Mattsson, J.O.	Thompson, W.F. (3 items)
Heinsheimer, G.J.	Meier, M.F. (4 items)	Wright, H.E., Jr. (3 items)
Hoinkes, H. (6 items)	Miller, M.M.	Weertman, J.

Academy of Sciences of the U.S.S.R. (10 items) Acta Geographica Universitats Łodz American Geographical Society Cold Regions Research and Engineering Laboratory, U.S. Army (14 items) Centre de Pesquisas de Geografia do Brazil. Centre National de Recherches Polaires de Belgique (2 items) Comitato Glaciologico Italiano Defence Research Board, Canada (7 items) Expéditions Polaires Françaises (9 items) Foundation for Glacier Research, Incorporated. Geographical Branch, Department of Mines and Technical Surveys, Ottawa. Instituto Nacional del Hielo Continental Patagonico National Research Council, Canada Ohio State University Research Foundation (2 items) Österr. Alpenverein-verwaltungsausschuss, Innsbruck Quartermaster Research & Engineering Command, U.S. Army Société Hydrotechnique de France Swiss Foundation for Alpine Research The Royal Society (2 items) Union Géodesique et Géophysique Internationale (7 items) World Data Center "A", Washington Institute of Polar Studies, Ohio State University (3 items)

OTHER BOOKS RECEIVED

Theoretical geomorphology. Adrian E. Scheidigger. Berlin, Springer-Verlag, 1961. 333 p., illus., 24 cm.

Descriptive Palaeoclimatology. A.E.M.Nairn, (Ed.) London and New York, Interscience Publishers, 1961. 380 p., illus., 80s.

The journals of Captain Cook on his voyages of discovery. J.C.Beaglehole (Ed.) Vol.2, The voyage of the "Resolution" and "Discovery", 1772-75. Cambridge University Press (for the Hakluyt Society), 1961. clxx, 1021 p., illus., maps, 25 cm. 120s.

Das Klima der Vorzeit - Eine Einführung in die Paläoklimatologie. Stuttgart, Ferdinand Enke, 1961.xi, 275 p., illus., 25 cm. DM 57.00.

Northwest by sea. Ernest S.Dodge. New York and London, Oxford University Press, 1961. 348 p., 22 cm. 45s.

Geology of the Arctic. Gilbert O. Raasch (Ed.) Canada, University of Toronto Press, 1961, Vol. 1 and 2 (and maps). 1196 p., illus., 26 cm. £10.4s.0d.

Mesures en météorologie. A. Perlat and M. Petit. Paris, Gauthier-Villars & Cie., 1961. 393 p., illus., 24 cm. NF 55.00. (Monographies de Météorologie, collection publiée sous la direction de A. Vaiut, Directeur de la Météorologie Nationale.).

Neiges et glaciers. Jean Corbel. Paris, Collection Armand Colin, 1962. No.361 Section de Géographie, 224 p., 17 cm. NF 5.70.

Discovery - developments in science. Granada TV Network. London, Methuen & Co., 1961. 144 p., illus., 20 cm. 12s.6d. (Includes articles by G. Manley, "The earth's climate", p. 87 - 97).

Reviews

PHYSICAL GEOGRAPHY OF GREENLAND. 19th International Geographical Congress, Norden 1960, Symposium SD2. Børge Fristrup (Comp.)

Folia Geographica Danica, Tome 9, 1961. (Københavns Universitets Geografiske Institut, Publication No.32), 234 p., illus., maps. £1.15s.0d.

This work publishes in full a number of papers which had not been printed at the time of the Symposium, and gives abstracts and detailed summaries of those which had already appeared. In all, 33 papers are recorded, of which more than half are of glaciological interest and have been contributed by well-known glaciologists. But all are pertinent to the surface and geological structure, to the geophysics and the climatology of Greenland.

The book is very well printed and the whole work reflects great credit on its compiler, Dr. Børge Fristrup. It can be obtained from the Royal Danish Geographical Society, Copenhagen, or from the Publishers, C.A. Reitzels Forlag, Nørregade 20, Copenhagen K., Denmark.

G. Seligman

A GEOGRAPHY OF THE U.S.S.R. J.P. COLE and F.C. GERMAN. London, Butterworth & Co. (Publishers) Ltd., 1961. 290 p., maps. £2.10s.0d.

The purpose of this book is to provide an account of the U.S.S.R. based on the extensive use of recent statistical sources. Emphasis has been placed on economic geography. The physical background is therefore considered mainly in so far as it affects agriculture, transportation and other activities.

SEARCH IN THE NORTH. GUY BLAUCHET. The Macmillan Company of Canada, Ltd., £1.1s.0d.

An account of an expedition in northern Canada under charge of the author and the search for and rescue of Colonel MacAlpine's party.

I.G.Y. THE YEAR OF THE MOONS. J.TUZO WILSON. London, Michael Joseph, 1961. 352 p., illus., 23 cm. £1.10s.0d.

This is a description of the author's travels during the I.G.Y. He covered over 100,000 miles visiting installations all over the world. In addition to reports covering every aspect of I.G.Y. researches - sun, cosmic rays, the upper atmosphere, the aurora, the Earth's magnetic field, work in New Zealand, in the Soviet Union and China, and the world's weather, there are chapters on "Greenland and the World's ice, Antarctica and the frozen seas". There are some excellent photographs of the scientific apparatus used, and of many snow and ice scenes. The book is a general record of the author's travels and scientific experiences, and not a scientific record, but it should interest everyone who wants a picture of what went on during the I.G.Y.

CLASSIFICATION GÉNÉRALE DES GLACES FLOTTANTES. L-E HAMELIN. Naturaliste Canadien, Vol.87, No.10, 1960, p.209-27.

Of making many classifications there is no end. It is an absorbing pastime, but it is also useful. Monsieur Hamelin of the Université Laval, Québec, has produced the fullest one yet in the field of floating ice. By comparison with the World Meteorological Organisation's "Abridged international ice nomenclature" (1957), and the official Soviet terminology (1954), he has not only further refined the minor subdivisions, but has added new major headings, and fitted in a number of associated terms and ideas. He has been at pains to preserve the same general structure as most of his predecessors, so that the terminology minded can find their way about quite easily.

Much of the work is primarily linguistic, and here it is improper for any with less than perfect command of the language to comment. But perhaps an Englishman may be allowed to express admiration for and envy of the author's introduction of a new adjective "glaciel", to refer to floating ice as "glaciaire" does to land ice. The whole list will be most useful to the searchers for linguistic equivalents who are not just terminology specialists, but who are trying to study the ice formation in any French document. By reason of its size, this classification will be the richest source. Some words and phrases are hallowed by long usage (as "bourguignon"), while others are introduced by the author. The question of which are in which group will perhaps be clarified by the "Dictionnaire franco-anglais des glaces flottantes" which the author promises us shortly.

T.E.Armstrong

THE EARLIEST SNOW CRYSTAL OBSERVATIONS. J.NEEDHAM and LU GWEI-DJEN. Weather, Vol. 16, No. 10, 1961, p. 319-27.

In this interesting article Dr. Needham and Miss Lu review the earliest systematic studies of the form of snow crystals in Europe and Asia. The six-pointed symmetry of snow flakes seems to have been generally known in China since about 135 B.C., and numerous references are given to Chinese works which mention it through the subsequent centuries, though there was in all this time very little development of the idea and no attempt at explanation. European recognition of the symmetry of snow crystals came much later -Kepler in 1611 was the first western scholar to emphasize the hexagonal form - but the study soon made great advances; before the end of the eighteenth century data were available on the meteorological conditions at the time of collection of specimens and experiments had been made on nucleating agents. At that stage eastern work received further stimulus from the beginning of serious Japanese study of snow, study which was a worthy predecessor of the modern Japanese school of snow research. This short article, tracing as it does the historical development of snow study in both East and West, deserves to be well known to all glaciologists who have any interest in the fascinating history of their subject.

J.W.Glen

President's Report

MAY 1962

(delivered at the Annual General Meeting)

When I made my annual report last year I said that matters of unusual importance were in progress. I am glad to say that I believe that the aims we had in view at that time have largely been achieved. We had, for some time, realised that our membership was spreading over the whole world, and we felt that it was desirable to give all our members an equal voice in the direction of our Society. We, therefore, drafted a new Constitution to implement this.

The new Constitution was passed at a General Meeting held in Cambridge in January of this year, at which many oversea members were present. It seemed appropriate to us, indeed necessary, in our aim to internationalize the Society, to drop the word "British" from our title, and for it to be known as "The Glaciological Society". The Council of the Society, as we can see from the names up for election today, is gradually becoming more representative of our international membership. Our headquarters however will remain in England, in view of the considerable organisation we have built up here over many years. In the new Constitution we have made provision for the establishment of branches in different countries within the Society, and we hope that if any members are interested in this they will send us their proposals for consideration.

The General Meeting to which I have referred was held at a reunion to celebrate the 25th Anniversary of our Society. We were delighted to welcome to it members from Austria, Canada, Denmark, France, Germany, Sweden, Switzerland and U.S.A. Several of those then present have written to me to say how useful and pleasant they found this gathering. As part of the celebrations a Symposium was held, the subject being "Problems of Mass Balance Studies." Eleven papers were read at the three sessions of the Symposium, and several of these will be published in the October issue of the "Journal of Glaciology" together with a detailed report of the proceedings by Dr. J. W.Glen. The Symposium, under the Chairmanship of Dr.Gordon Robin, was considered a great success by all who attended, and it might be a good idea to hold a similar Symposium once every three years, perhaps during the year following the triennial meeting of the I.U.G.G.

The past year has been one of a considerable increase in our membership - there have been more new members than at any previous period.

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I hope that it will be agreed that these figures are eminently satisfactory, but we are still very anxious further to increase our list of members and subscribers. May I, therefore, earnestly ask all our members to take every opportunity to invite those who are, or could become, interested in our work, to join us.

In spite of these encouraging accessions to our strength we have in recent times lost several members including some young and promising British and American glaciologists through accidents, largely in the field. The most serious loss has been that of W. Vaughan Lewis, an original member of the Society and one of the most active supporters of its work.

Another great loss to us was the death in his 73rd year of Sir James Wordie, a Vice-President and another of our great helpers.

The "Journal of Glaciology" has also prospered; the October 1961 issue was by far the largest we have ever published. During 1962 we shall have published three issues instead of the usual two. This appears, so far as we can tell at this stage, to have been accomplished without more than a very small reduction in the number of pages published per annum, compared with 1961, which was a year more than usually abundant in the number and length of articles, and well above the average of past issues. I am not sure yet whether we shall go to four issues a year, as I suggested in my report last year - it rather depends on several problems which are, at the moment, still be considered.

The success of the Journal is due to the immense amount of time and thought devoted to it by Drs. Glen and Adie, and Miss Johnson, and naturally, of course, to the excellent and many contributions we receive for publication. I sincerely hope that now that the I.G.Y. is over the number of these will not fall off. My own task is now a very small one.

An Editorial Board for the Journal will shortly be appointed by the Council under the new Constitution, and will consist of Editors and Editorial Advisers. The majority of the Advisers will come from oversea.

Some support for the increased cost of the Journal has come from the subscriptions of new members; a larger share has come from page charges where organisations have been able to pay for articles written by members of their staffs. (I must emphasise here that the article has first to be accepted by us on its merits.) We have also been fortunate in receiving, for the calendar year 1962, an outright grant for the Journal from the National Science Foundation, for which we are most grateful. All this means that the Society, and its Journal, are on a much firmer and more business-like footing than before and that the Council can plan for the future with more confidence.

Since my last report was made eight lectures have been given before the Society, rather fewer than during the last period, but this by no means implies that our activities are dying down, as is evidenced in other ways.

The last report published by the Glaciological Research Sub-Committee. was issued in June 1961 in the Journal of Glaciology, and there was also a meeting at the time of the Anniversary Celebrations last January, at which very useful discussions were held. Not only is the Society in heavy debt to Dr. Glen for his activities in connexion with our Journal, but also for his Chairmanship of this Sub-Committee. I hope we shall see some good results accruing to glaciological research, and further encouragement given to potential research workers in the coming year.

The task of our Secretary, Mrs. Richardson, has become so great that during the past year she has had to appoint an Assistant Secretary to help her. The hours a week done by her assistant are now the same as those worked by Mrs. Richardson when she first took over the secretaryship $8\frac{1}{2}$ years ago - a further evidence of the growth and success we have achieved.

I think that that is all I have to say, except that this is almost the last Report that I shall be presenting to you of the Society's activities, for I shall be resigning the Presidency at this time next year. The new President, and all future holders of the Office, may, perhaps, have a less onerous task than mine if aggregated over all these years, in that, according to our new Constitution, they will only hold office for three consecutive years. This is a good plan, for it will spread the burden wider.

In conclusion I cannot refrain from referring to a meeting in London, in 1936, of the twelve members of our forerunner, the British Group of the International Commission on Snow, and to say with what pleasure I reflect that, in contrast to the rather mute discussions we held at that time, these words of mine can now be read all over the world.

New Members

New members of the Society since January 1962 are: Ainardi, Vernon R., Apt.5, 3241-16W., Seattle 99, Wash., U.S.A.

Cronk, Caspar, 114 East Maynard Avenue, Columbus 2, Ohio, U.S.A.

DenHartog, Stephen L., Geophysical and Polar Research Center, 6021 South Highland

Road, Madison 5, Wis., U.S.A. Evenden, R.J., 19 Alexandria Road, Walthamstow, London E.17, England.

Faidutti, Mme. Anne-Marie, Hôtel des Ingénieurs, Saint Auban, Basses Alpes, France.

Gillett, Miss Teresa A., Girton College, Cambridge, England. Gränicher, Dr. W.H. Heini, Laboratory of Solid State Physics, E.T.H., Gloriastrasse 35,

Africa.

Zürich 7/6, Switzerland. Howard, Richard C.E., Pennell House, Eastbourne College, Eastbourne, Sussex, England. Knight, Dr. Charles A., P.O. Box 86, Morrison, Colo., U.S.A. Kraus, David, 3810 W.Street, S.E., Washington 20, D.C., U.S.A. Kuroiwa, Dr. Daisuke, 67 School Street, Lebanon, N.H., U.S.A.

Lustig, Lawrence K., 25 Bromfield Street, Watertown, Mass., U.S.A.

McGregor, V.R., 58 Campbell Road, Onehunga, Auckland S.E.5., New Zealand.

Mayhew, John W.F., 60 Dunedin Road, London E.10, England.

Morgenstern, N., Department of Civil Engineering, Imperial College of Science and

Technology, Exhibition Road, South Kensington, London S. W. 7, England Prof. W. Nowacki, Abteilung für Kristallographie und Strukturlehre, Mineralogische-

Petrographische Institut, Sahlistrasse 6, Bern, Switzerland. Nutt, David C., Department of Geography, Dartmouth College, Hanover, N.H., U.S.A

Pert, G.J., 72 Highland Road, Norwich, Nor., England.

Slover, Miss Nancy L., Code L 61, Polar Division, Naval Civil Engineering Laboratory, Port Hueneme, Calif., U.S.A.

Smith, Stanley, 129 Ramsden Road, Wardle, Rochdale, Lancs., England. Snead, Rodman E., Department of Geography, Clark University, Worcester 10, Mass., U.S.A.

Stirling, John Laing, 60 Harrow View, Harrow, Middx., England. Swanston, Douglas N., Glaciological Institute, c/o Department of Geology, Michigan State

University, East Lansing, Mich., U.S.A. Tangborn, Wendell V., 1307 55th Avenue, N.E., Puyallup, Wash., U.S.A. von Brunn, Geology Department, University of Cape Town, Rondebosch, C.P., South

Wilson, Charles R., Box 104, College, Alaska, U.S.A. Wyness, Robert, Capt. R.E., 76 Lovel Avenue, Welling, Kent, England.

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SEEN AT THE SOCIETY'S 25TH BIRTHDAY CELEBRATIONS







THE GLACIOLOGICAL SOCIETY

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

President: G. SELIGMAN

Secretary: MRS. H. RICHARDSON

DETAILS OF MEMBERSHIP

Membership is open to all who have scientific, practical or general interest in any aspect of snow and ice study. Members receive the *fournal of Glaciology* free. Forms for enrolment can be obtained from the Secretary. No proposer or seconder is required. Annual subscription rates are as follows:

Private members-	Sterling: U.S. dollars:	£2 0s. 0d. \$6.00
Junior members (under 23)	Sterling: U.S. dollars:	15s. \$2.40
Institutions, libraries-	Sterling: U.S. dollars:	£4 0s. 0d. \$12.00

(The dollar rates include Bank conversion charges)

Further details may be found in the *Journal of Glaciology*, published in February, June and October.

ICE

Editor: MRS. H. RICHARDSON

This news bulletin is issued free to all members and subscribers of The Glaciological Society, and is published in January and July. Contributions should be sent to Mrs. H. Richardson, c/o Scott Polar Research Institute, Lensfield Road, Cambridge, England, to arrive not later than the 15 November and 15 May.