

NUMBER 31

DECEMBER 1969

# ICE



## **GLACIOLOGICAL SOCIETY**

### **EVENTS 1970**

#### **7 & 8 MAY: ANNUAL GENERAL MEETING & CONFERENCE**

The Society's Annual General Meeting will take place on Thursday 7 May at 6.30 p.m. at the University Centre, Cambridge, England, and will be followed by a dinner at 7.45 p.m.

On Friday 8 May there will be a one-day conference, with short papers giving news and results of recent field and laboratory research.

Full details will be sent to all members later.

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#### **MID-JUNE: JOINT MEETING WITH THE ICELANDIC GLACIOLOGICAL SOCIETY**

This one-week meeting was announced in the last issue of ICE and further details are given on page 5 of this issue.

Immediately following the joint meeting there will be a separately organized excursion to south-east Iceland, lasting one week. This excursion will be limited in numbers. Further details are given on page 7.

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All enquiries from members of the Society who wish to attend these meetings should be addressed to:

The Secretary,  
Glaciological Society,  
Cambridge CB2 1ER,  
England.

# ICE

## NEWS BULLETIN OF THE GLACIOLOGICAL SOCIETY

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NUMBER 31

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**1970 DUES.** Subscription reminders and forms have been sent to all members who do not pay by a Banker's Standing Order. We shall appreciate prompt payment of your dues, for then we do not have to spend time and money on reminders, later in the year.

**THE SOCIETY'S LIBRARY.** The reorganization resulting from the move of the library from Kent to our Cambridge office is almost complete. We are able to offer once again to members of the Society reprints and reports which we have received in duplicate. A list of these duplicates has been compiled and is available upon application to the Secretary. If you are interested, please apply soon. We shall not begin the actual distribution of duplicates immediately: we shall allow a lapse of time sufficient to give those members who live at the other side of the world equal opportunity with those who work near to the Society's library. The offer is restricted to members of the Glaciological Society.

**80th BIRTHDAY GREETINGS.** We offer our congratulations to Professor N. N. Pal'gov, Academician of the Kazakhstan Academy of Sciences, Doctor of Geographical Science, on the occasion of his 80th birthday, 10 December 1969.

**COVER PICTURE.** S. S. Manhattan in the Northwest Passage, October 1969. The ship was on charter to the Humble Oil and Refining Company to test the commercial feasibility of carrying oil from Prudhoe Bay in Alaska to the U.S. east coast. Photograph by C. W. M. Swithinbank.

## FIELD WORK

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The Editor will be pleased to receive reports of 1969 field and laboratory work as soon as possible. The reports will be published in the April and August 1970 issues of ICE. Southern hemisphere reports for the 1969-70 season will be published in the August issue. The dead-line for the April issue is 15 February, and for the August issue 15 June.

## ANNUAL GENERAL MEETING 1969

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### MINUTES OF THE ANNUAL GENERAL MEETING OF THE GLACIOLOGICAL SOCIETY, 11 SEPTEMBER 1969 AT THE UNIVERSITY CENTRE, CAMBRIDGE, ENGLAND

The President, Dr J. F. Nye, was in the Chair.

1. The Minutes of the 1968 Annual General Meeting, published in ICE No. 27, August 1968, were approved, and signed by the Chairman.

2. The President gave his report for 1968-69. It is customary at the Annual General Meeting of the Society for the President to make a report to its members on its state, its fortunes and its prospects, and to place on record the events of the past year. I have now had the honour of serving as your President for a three-year term and this will therefore be my final report to you. The period has seemed to pass quickly, but even in such a short time one can see the growth and evolution of the Society. Always an independent organization, it has grown steadily since its inception in 1936, until today it has the support of nearly all the people who study the many scientific aspects of snow and ice. It has been interesting, for example, to see in this week, during the Symposium of the Hydrology of Glaciers, which we have organized here in Cambridge, that 80% of the participants are members of the Society. Of the remaining 20%, two-thirds are from countries with currency-exchange problems, which make membership of foreign societies difficult. Our membership today stands at 860, in 34 countries. In addition, our Journal and News Bulletin are purchased by 600 libraries all over the world and are given free, in exchange for periodicals of glaciological interest, to another 30 libraries. Our publications thus have a circulation of nearly 1500 copies, increasing year by year. Later in my report I will give the exact figures for May 1969 so as to facilitate comparison with previous years.

This past year has been the first in which the Journal of Glaciology has been under the senior

editorship of John Glen, who took over upon Gerald Seligman's retirement early in 1968. Dr Glen, Dr Adie and Miss Johnson have continued their excellent work for the Journal and I again wish to express to them on your behalf our most grateful thanks and appreciation. Recently, the Council appointed Dr Charles Swithinbank an editor of the Journal, and we give him also our warm thanks for his willing help. The Editorial Advisers and the anonymous referees continue to give the Journal help that is greatly appreciated and that is essential for the maintenance of high scientific standards. The Journal has continued to grow: in 1968, 534 pages were published, compared with 493 in 1967.

For the fifth year running we needed no external financial support in the form of a grant, in spite of rising costs of printing. Our income has risen by a greater amount, as the Treasurer will be telling you, and so we had no need to place a financial limit on the size of the Journal. The size of the Journal has in fact always been determined by the volume of high-quality material available rather than by costs, and we hope this state of affairs will continue, for we regard the dissemination of the results of glaciological research as one of our most important functions.

We believe it is also important that the Society should provide a focal point for glaciologists from all countries. We hold lectures and conferences in Britain and North America, where we have branches of the Society. These meetings seem to be appreciated as opportunities to hear of recent work and to hold informal discussions with colleagues. In the near future we hope to extend these activities to two other countries, where the local groups have invited us to join them for meetings. Although our Council meets 2 or 3

times a year in Britain, because our headquarters are there, we try to hold at least one other Council meeting in another country, to ensure the participation in person of as many Council members as possible. In 1968 we held a Council meeting in Hanover, New Hampshire, USA during the Symposium on Antarctic Glaciological Exploration. We also try to send our more permanent officials as ambassadors of the Society to glaciological meetings arranged by other organizations. From their visits we hope to gain new members, to learn of suggestions and criticisms, and to provide a personal link between members and the headquarters of the Society. In 1968, Dr Glen, our senior editor, attended a symposium on the Physics of Ice, in Munich, Germany, and our Secretary attended the Antarctic symposium in New Hampshire and one on glacier surges at McGill University, Montreal, Canada.

Since I reported to you in May 1968, much of our attention has been focussed on the Symposium on the Hydrology of Glaciers. The organization of this meeting, which is jointly sponsored by the Commission of Snow and Ice, has been done by the Glaciological Society. (It is our second Symposium—the first being in 1962 on mass balance of glaciers). The members of the Papers Committee and of the Local Organizing Committee of the Symposium deserve our thanks for the arduous work they have done. The heaviest work in connexion with the Symposium has fallen on the Secretary who has responded to the challenge with unflagging enthusiasm. The preparations have taken up an increasing amount of time and space in our office, with additional clerical staff competing for space with extra files, boxes of summaries, maps for the tours, piles of plastic portfolios and all the other appendages of a conference. We are grateful to the Royal Society for their financial help in the organization of the Symposium, which means that we have not had to dig too deeply into our savings.

The normal work of our Secretariat has increased once more, as a result of the growth in circulation and size of the Journal. During the twelve months May 1968—May 1969, we have had 72 new members—slightly more than in the previous period. Resignations, deaths and cancellations of membership through non-payment of annual dues make the final figure for May 1969 822, compared with 797 in 1968. The circulation of the Journal of Glaciology is of course greater than this because it goes not only to members of the Society, but also to subscribers, mostly libraries. The number of such subscribers to the Journal rose slightly over this same period, from 590 to 598. As payments from members and subscribers are our only certain income, I urge you all to try to bring in new members each year and to persuade your university and departmental libraries to subscribe to the Journal and also to Ice, which provides regular information about

recent field work, conferences of interest to glaciologists, and news, including items from the Commission of Snow and Ice, which we are pleased to help in this way. Once more it is a pleasure to thank the Director of the Scott Polar Research Institute for continuing to provide us with office space for our headquarters and for our library. We value this generosity very highly.

Members will already know that the Society has set up a Research and Education Fund. The fund is initially designed to help the individual research worker or project and the student seeking glaciological training. To raise money for the fund an illustrated brochure has now been prepared and is in press which will enable us to launch a world-wide appeal. The production of the brochure has been difficult and consequently it is appearing later than we had wished. In order to get donations from organizations and firms as well as from individuals, so that the fund is really useful, a list is being compiled of names and addresses of organizations, firms and individuals that are considered suitable for an approach. Every member can help by sending suitable names and addresses to the Secretary and we are grateful to those who have already done so.

At the end of this three-year term I can report that the Society is in a strong position. It is truly international, it is lively and it is effective. Its main strength is the belief among its many firm friends that it is performing a necessary and central service in the international organization of glaciology and that it is performing it well. I am most happy to know that in leaving office I am handing over to Valter Schytt whose name has been put before you by the Council for election at this meeting. Under his guidance, and that of the new Council, there is every reason to hope that the Society will continue to prosper, not for its own sake, but in order to carry on this essential work of promoting new knowledge in our science.

3. The Treasurer, Dr T. E. Armstrong, presented the accounts for 1968. He explained that although he had expected income and expenditure to be roughly in balance, there was a surplus of nearly £1700. This was due to the most welcome increases in income—partly through growth in membership, which was very encouraging, and partly through larger sales of back numbers and contributions to publication costs. This surplus enabled us to increase the honoraria paid to the Editors of the Journal. The Treasurer was again hoping that the Society would break even in 1969.

4. Election of auditors for the 1969 accounts. Dr T. E. Armstrong proposed and Dr R. J. Adie seconded that Messrs Peters, Elworthy and Moore, of Cambridge, be elected auditors for the 1969 accounts. This was carried unanimously.



5. Elections to the Council 1969-72.

After circulation to all members of the Society of the Council's list of nominees, no further nominations had been received. The following people were elected unanimously:

<i>President</i>	V. Schytt
<i>Vice-Presidents (2)</i>	M. de Quervain W. F. Weeks
<i>Elective Members</i>	C. S. Benson A. Higashi L. Lliboutry J. F. Nye

6. Dr J. F. Nye handed over the chairmanship of the meeting to the new President, Dr V. Schytt. Dr Schytt said that it was with humility that he took over the Presidency from Dr Nye. "I feel very honoured and very pleased, but I also feel that it will take me a considerable time to become familiar with all the various aspects of Glaciological Society business and can act properly. After a year or two I may even be able to take a few initiatives myself.

"I have always been a great admirer of this Society, or rather of the relatively small group who have run this Society from its Cambridge headquarters. I was not entirely happy when the British Glaciological Society turned into the Glaciological Society, because I thought it could not be better run than it was and because I was somewhat afraid of more administration, more bureaucracy and less efficiency. But I was wrong. The Society kept all its good characteristics. The membership increased and the Journal became better and better; many non-British officers and council members made real contributions to the continuing success of the Society—and still the old Cambridge team, gradually modernized, went on running the daily business in their usual efficient *and* friendly way.

"It is to this Cambridge team (and by 'Cambridge' in this connexion I really mean all the United Kingdom) that I want to pay my great respects on this occasion. I particularly want to thank Dr Nye, on behalf of the whole Society, for everything he has done during the last three years as President of the Society. He has, in accordance with his whole personality, been a *working* President, engaged in all Society affairs, and at the end of his term he can feel great satisfaction in the knowledge that the Society is larger, healthier and more active than ever before.

"I hope I will be excused from stating a policy for the future work of the Society at this meeting: the new Council has not met. The general policy developed during the last few years has proved very successful. But, as in every learned society, we must maintain a continuous input of fresh, good ideas—about meetings, publications, and other activities. We have to keep the Society's standards and reputation so high that it becomes—or rather stays—the international body for snow and ice research. For this purpose the best possible co-operation with the Commission of Snow and Ice is necessary, a co-operation of which we see a good example in this week's jointly sponsored symposium, and which should be relatively easy to continue, since almost all the officers of the Commission are, or have recently been, members of the Society's Council.

"Considering the blessed slow turnover we have in our Staff, including Secretariat, Treasurer and Editors, and the fact that only one-third of the Council members retire each year, I think we can feel confident in the future of the Society—in spite of occasional changes of President."

7. Appointments to Posts and Committees.

Under Rule 10 of the Constitution, the Council of the Society had made the following appointments, subject to the approval of the Annual General Meeting:

Special Post of Founder: Gerald Seligman

Awards Committee (for Seligman Crystal and Honorary Membership): H. C. Hoinkes, M. F. Meier, the President (ex-officio), the Secretary of the Society as secretary.

1969 Symposium—Local Organizing Committee: T. E. Armstrong, J. F. Nye, C. W. M. Swithinbank, W. H. Ward (representing the Commission of Snow and Ice), the Secretary of the Society as secretary.

Library Committee: J. W. Glen, B. B. Roberts, the Treasurer (ex-officio), the Secretary of the Society as secretary.

Research and Education Fund Committee: Sir Vivian Fuchs, J. F. Nye, H. Röthlisberger, A. L. Washburn, the President (ex-officio), the Treasurer (ex-officio), the Secretary of the Society as secretary.

The appointments were confirmed unanimously.

**GLACIOLOGICAL SOCIETY**  
**JOINT MEETING**  
**WITH THE**  
**ICELANDIC GLACIOLOGICAL SOCIETY**

Organized by Dr S. Thorarinsson  
(Circular issued to members of the Glaciological Society  
January 1970)

There has been a good response to the first notice about this meeting, published in ICE no. 31, August 1969. Because accommodation in Iceland and seats on aircraft are in great demand at that time of year, it is now essential to make firm bookings. Those members of the Glaciological Society who plan to attend the meeting are therefore asked to complete the attached form and send it with a deposit to the Secretary **before 1 March 1970**.

The maximum number of participants who can be accommodated is 63, provided that most people share a double room. The bookings will be accepted in order of receipt, up to that limit, and then the remaining names will be put on a waiting list. (This circular is being sent by air mail to all members of the Society outside Britain, so that everyone may have the same opportunity to make an early booking.)

**MAKE SURE OF YOUR PLACE—BOOK TODAY!**

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**SUBJECTS FOR THE MEETING**

Those aspects of glaciology which are relevant to conditions in Iceland: for example, the special problems of glaciers in volcanic areas, the dating of ice cores in Iceland, sea ice problems near Iceland.

**SUBMISSION OF PAPERS**

A summary (maximum length 3 pages) should be sent to the Secretary of the Glaciological Society **by 1 March 1970 at the latest**. Authors will be informed of the decision of the Papers Committee by 1 May. Further information about the presentation of papers will be circulated later. The members of the Papers Committee are: V. Schytt (chairman), J. F. Nye, R. O. Ramseier, the Secretary of the Glaciological Society as secretary.

**PUBLICATION**

No publication of the entire proceedings is planned. A summary of the meeting will be published in the Journal of Glaciology. Papers may be submitted to the Journal and they will be subject to the Journal's normal system of refereeing and editing. It will be clearly indicated on those papers accepted for the Journal that they were presented at this meeting.

**BOOKING PRIORITIES**

Because of the restriction on numbers, booking priority will be given to those members whose papers are accepted for presentation at the meeting. Anyone who intends to submit a summary before 1 March may make a provisional booking now, as we realise that financial support for attendance at meetings is sometimes dependent upon the acceptance of a paper for that meeting.

**DATES**

The departure from Reykjavík for Skógar will be on the afternoon of **19 June**. Arrival in Reykjavík may be that morning or the previous day, according to the schedules of flights from North America and Europe. The return to Reykjavík will be on the afternoon of **25 June**, in time for flights that night or the following day.

**MEMBERS FLYING FROM NORTH AMERICA TO ICELAND**

Daily overnight flights New York/Reykjavík by Loftleidir arrive in Reykjavík at 10 a.m. Cost=approx. US\$215.00 (21-day excursion fare). Loftleidir's address is Rockefeller Center, 650 5th Avenue, New York, N.Y. 10020, U.S.A. (Tel. 974.8585.) Please make your own reservations.

Cost of accommodation and transport in Iceland (including the nights of 18 and 25 June)=approx. US\$110.00. If you do not require accommodation for the nights of 18 and 25 June, please indicate this in the appropriate space on the booking form: an adjustment will then be made to your final bill.

**MEMBERS FLYING FROM EUROPE TO ICELAND**

(a) We have made block bookings at party rates for 30 participants, flying from London. (Members should make their own arrangements for travel between London and other places in Europe.) The outward journey will be from London on 18 June at 12 noon, arriving in Reykjavík the same afternoon. The return journey has alternative dates: 26 June direct to London, and 27 June via Glasgow to London (with a change of planes in Glasgow). Please mark your choice on the booking form. (If you choose the later flight, the cost of accommodation and food for the extra day will be additional to the total cost for the week of the meeting quoted below.) Total cost, for this special group (a) only, of transport between London and Iceland return and accommodation and transport in Iceland=approx. £95.

(b) If you prefer to travel independently, please make your own arrangements and indicate on the booking form that you are doing so.

Cost of accommodation and transport in Iceland=approx. £45.

**ACCOMMODATION & TRANSPORT IN ICELAND**

Block bookings have been made for the maximum number of participants, but we need to know your times of arrival in and departure from Iceland. We can then make any necessary adjustments to the bookings for the nights of 18 and 25 June in Reykjavík.

## DEPOSITS

The following deposits should be paid to the Glaciological Society by 1 March 1970 at the latest. The deposits will be refundable if notice of cancellation is received by the Secretary before 1 May 1970. Deposits may be paid by personal cheque (payable to the Glaciological Society) or by Giro transfer (to Giro Account No. 240 4052) or by Bank transfer to National Westminster Bank, Ltd., City Centre Branch, 67 St. Andrew's Street, Cambridge (Account No. 54770084).

**Deposit for members travelling via London under our special party arrangement=£20/US\$48.00** (this will form part of the total cost of all travel and accommodation).

**Deposit for members travelling independently** (from Europe or N. America)=£10/US\$24.00 (this will form part of the cost of accommodation and transport in Iceland).

## PROGRAMME

(Arrival on morning of 1st day, or previous day.)

19 June — depart Reykjavík by bus in the afternoon — Thingvellir — Skógar.

Stay 5 nights in Skógar. Bathing suits optional (Artificially heated pool in Skógar, natural heated pool 10 miles west of Skógar.)

20—23 June — programme flexible (subject to weather conditions):

Meetings in Skógar on two days, plus excursions on two days.

Excursion (a): Skógar—Skeidarársandur—Skógar.  
Study: Sandurs and glacier burst areas; Laki lava flow (biggest on earth); bird cliffs of Portland.

Excursion (b): Skógar — Thórsmörk — Skógar.  
Study: Gígjökull, which calves into a lake, the canyon of Stakkholtsgjá, which has a huge rockslide (1967).

24 June — Excursion (c): Skógar — Jökulheimar, via the inland desert to the glaciological station at the western edge of Vatnajökull.

Stay 1 night in Jökulheimar.

Note — this excursion (c) is only possible if the majority bring sleeping bags for the night in Jökulheimar.

25 June — return to Reykjavík in the afternoon. Night in Reykjavík, or departure.

26 June — breakfast in Reykjavík. Departure.

## BOOKING FORM

Please return this form with your deposit to the Secretary, Glaciological Society, Cambridge CB2 1ER, England before 1 March 1970.

A Are you submitting a summary of a paper? .....  
(To be received by the Secretary before 1 March 1970)  
Is your attendance at the meeting dependent upon the acceptance of your paper? YES/NO

If YES, is this booking for attendance at the meeting a provisional one only? YES/NO

B (This section to be completed by all applicants, whether provisional or firm bookings are being made.)

Do you intend to bring a member of your family? YES/NO  
(Please note that family members will have their own excursions from Skógar.)

Name of family member .....

Travel: Route.....—Reykjavík/Reykjavík—.....

Date ...../...../.....

Time of arrival...../Time of departure.....

Do you wish to be included in the special party booking from London on 18 June? YES/NO

Do you wish to be included in the special party booking to London on 26 June? YES/NO  
or on 27 June? YES/NO

Accommodation: Do you require accommodation in Reykjavík for the night of 18 June?

YES/NO

— for the night of 25 June? YES/NO

— for the night of 26 June? YES/NO

If you require accommodation for 26 June, do you wish us to book this? YES/NO

(The appropriate deductions or additions will be made to the basic price, according to your travel plans. The meeting officially includes accommodation for the nights of 18 and 25 June in Reykjavík.)

Do you prefer a single room, if possible? YES/NO

C I enclose a deposit of £...../US\$..... (see text of circular, **DEPOSITS**) per person.

Signed ..... Family member .....

Address .....

.....

..... Date .....



## GLACIOLOGICAL SOCIETY EXCURSION TO SOUTH-EAST ICELAND

This separately organized excursion will take place after the end of the Joint Meeting. It will start from Reykjavík on 26 June and end there on 3 July.

Leader: Dr R. J. Price (University of Glasgow)

Assistant Leader: Dr P. J. Howarth (McMaster University)

Dates: 26 June—3 July—starting from and returning to Reykjavík.

Approximate cost (travel, acc., food): £46, including hotel accommodation in Reykjavík for one night at the end of the excursion (the cost of the night of 25/26 June is included in the total cost of the Joint Meeting).

Number of participants: 15 maximum.

### Programme:

**26 June** — Fly from Reykjavík to Fagurhólsmyri. By road to Breida Hut. Set up camp.

**27 June** — A traverse will be made from the Breida Hut northwards across the proglacial area of Breidamerkurjökull. Moraines, eskers, abandoned channels and sandurs will be examined. An ascent of the ice surface will be made to examine medial moraines, supraglacial streams, dirt cones and ice structures. Walking distance: 13 km.

**28 June** — A succession of moraines, channels, sandar and kame and kettle areas will be visited N.E. of the Breida Hut. The proglacial lakes and associated channels leading to the Jökulsárlón will be visited. If visibility is good there will be an opportunity to photograph a calving ice front. The stratigraphy of the proglacial deposits will be examined. Walking distance: 16 km.

**29 June** — A visit to the eastern ice edge to examine eskers in the process of formation. The stratigraphy and morphology of the proglacial deposits will be examined. Walking distance: 13 km.

**30 June** — A journey along the south coast west of Breidamerkursandur visiting several glaciers en route to Skaftafell. Subject to good weather there will be opportunities for photographing spectacular scenery and a wide variety of ice fronts, and glacial landforms. The tephra deposits of the area will also be examined.

**1 July** — The south-western margin of Fjallsjökull will be visited to examine moraines in the process of formation. Buried ice and very dirty basal glacier ice can be observed. A traverse across the glacier surface will be made. Walking distance: 15 km.

**2 July** — Return to Reykjavík by air.

**3 July** — Departure Reykjavík.

**Arrangements at the Breida Hut:** The Breida Hut will provide an adequate if primitive base. Sleeping accommodation will be in the following forms: 6 wooden bunks; tentage to accommodate 8; the remainder on the floor of the hut. The Breida Hut is divided into two sections. The smaller one contains 6 bunks. The larger section will be used for cooking, eating and, for some unfortunates, for sleeping. Food is being sent out from Glasgow. There will be no fresh vegetables or fresh meat. Milk and bread will be delivered at unknown intervals so there may be periods when powdered milk and biscuits will have to be used as replacements. For each meal, members of the party (on a rota system) will be asked to help with the preparation, serving and washing up. A field assistant will be available to take the overall responsibility for organizing the meals. Water will have to be fetched daily but a land-rover will be available to make this task easier. Toilet facilities are very primitive. There is no running water or electricity at the Breida Hut. **Each participant will require sleeping bag and air mattress.**

**Weather** Typical temperatures: min. 3°C, max. 16°C. It would not be unusual if it rained on every day during the stay at the Breida Hut. During dry periods there is a tendency for strong winds to occur.

### Reference:

Price, R. J. 1969 Moraines, Sandar, Kames and Eskers near Breidamerkurjökull, Iceland. Trans.Inst.Brit.Geogr. No. 46, pp. 17-43.

Welch, R., Howarth, P. J. Photogrammetric measurements of glacial landforms. Photogram.Rec. 6(31), pp. 75-96.

Participants will be provided with a field guide, aerial photographs and maps.

**MEMBERS WHO WISH TO TAKE PART IN THIS EXCURSION SHOULD WRITE IMMEDIATELY TO DR PRICE (DEPT. OF GEOG., GLASGOW UNIV., GLASGOW, W.2., SCOTLAND) ENCLOSING A DEPOSIT OF £20. CHEQUES SHOULD BE MADE PAYABLE TO: R. J. Price, 1970 Iceland Account.**

R. J. Price



**AKIRA HIGASHI**

Akira Higashi was born in January 1922 in Tokyo, Japan. Even as a child he showed enthusiasm for snow and mountains, and at school his main interests were in the physical sciences. He studied as an undergraduate at Hokkaido University, gaining his B.S. in physics in 1945, and remained there as a research student. His doctoral work on the thermal conductivity of frozen soil was completed under the guidance of Professor U. Nakaya, and he obtained his Ph.D. in 1950.

Higashi became first of all a lecturer in the Department of Physics, Hokkaido University, and then, in 1952, was appointed assistant professor in Nakaya's laboratory within that Department. After several years' field work on snow survey methods, he went to the U.S.A. and worked at the U.S. Army's Snow, Ice and Permafrost Research Establishment from 1955 to 1958, as a contract scientist. There, his major subject of research was experimental studies on frost heaving, but he also co-operated with Dr A. E. Corte from Argentina in experiments on desiccation cracks in soil. This was part of model studies of patterned ground, and he is still proud of his original method of tackling the problem, and of the co-operation of two scientists from such widely separated countries.

In the latter period of his stay in SIPRE, Higashi carried out experiments on the creep of polycrystalline ice, and this led to his extensive work on the plastic deformation of ice single crystals. Encouraged by Dr Nakaya's work on these crystals at SIPRE, he organized an expedition to Alaska from Hokkaido University. The 7-member expedition, with Higashi as project leader, went to the Mendenhall Glacier in 1960 and successfully collected good quality ice single crystals from icebergs in the Mendenhall Lake. A second expedition took place in 1964. Possession of these crystals made it possible to carry out extensive research on their mechanical properties, and the experimental results were interpreted by dislocation theories. Higashi's research group has also observed the existence and behaviour of dislocations in ice crystals from etch pits and X-ray diffraction topography. For his achievements in this research on ice crystals he was awarded the Academic Prize of the Japanese Society of Snow and Ice in September 1968 and a Prize from the Yamaji Foundation for the Promotion of Natural Sciences in March 1968.

The Department of Applied Physics was established in Hokkaido University in 1965, and Higashi, who had been made a Professor in 1964,

was elected to a chair of solid state physics. He took all the members of his laboratory to the new department and worked towards bridging the gap between technological and scientific problems. His talents as a good organizer were much in evidence in the establishment of his new department, which was finally completed in 1967. He shows the same eager enthusiasm about solid state studies of ice in the laboratory as he does about glaciological field research, and in both his abilities as leader and organizer are readily seen. He is a keen mountaineer and skier and an active member of the Academic Alpine Club of Hokkaido.

Some of his latest work is concerned with the investigation of the mechanical properties of deep core ice from Antarctica, in conjunction with the problem of the flow of the ice sheet. With such wide knowledge and experience in glaciology, he is one of the most active members of a committee for glaciological research in Hokkaido University and is trying to promote some research projects in Antarctica.

Higashi's name has been well known internationally since he worked at SIPRE. In addition to his expeditions to Alaska, he has visited North America and Europe for international conferences,

and has made friends in many countries. His international contacts are further strengthened by his policy of inviting foreign scientists to work in his laboratory. In 1966, during the Symposium on the Physics of Ice held in Sapporo to celebrate the 25th anniversary of the Institute of Low Temperature Science, Hokkaido University, several visitors from overseas spent delightful evenings in the Higashi home. His charming wife and two pretty daughters did much to enhance not only those evenings but also the well organized programme for the wives of participants.

Higashi has published many scientific papers in English and in Japanese. He also has a talent, probably inherited from Professor Nakaya, for writing scientific essays and introductory books of science for the general public and students. His most recent book, published in 1967, is "Hyoga" (Glaciers), which describes his two expeditions to Alaska and his subsequent laboratory work on the mechanical properties of ice single crystals.

Under Higashi's leadership, his group of able scientists has stimulated interest throughout the world in ice physics. They are assured of a warm welcome on their visits abroad.



## MEETINGS

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### THE GLACIOLOGICAL SOCIETY

#### BRITAIN

"Gondwanaland ice surges and Carboniferous coal cyclothems" by J. T. Hollin (Princeton University)

SHEFFIELD — 13 November, Dept. of Geology, University.

NEWCASTLE UPON TYNE — 17 November, Dept. of Geology, University.

EDINBURGH — 18 November, Grant Institute of Geology, University.

GLASGOW — 19 November, Dept. of Geology, University.

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"Glacial flow for non-mathematicians"  
by J. F. Nye (Bristol University)

READING — 4 December, Geography Dept., University.

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### THIRD CANADIAN CONFERENCE ON PERMAFROST

A two-day conference on permafrost problems related to the mining and oil and gas production industries was held at the University of Calgary, 14 and 15 January 1969.

This meeting was particularly timely because of the current expansion of mining and oil activities in northern Canada. New mines are coming into production in this region and the recent oil discovery at Prudhoe Bay in northern Alaska portends potential production of oil in the North. This discovery is considered as important as that of the Texas oilfields; the geology of the Canadian arctic region suggests an oil reserve equal to that of the Middle East. The widespread interest in these developments and the attendant permafrost problems, which will have to be solved, was evidenced by the attendance at the Conference of about 370 engineers and scientists from across Canada and the United States.

The Conference was sponsored by the Associate Committee on Geotechnical Research of the National Research Council of Canada through its Permafrost Subcommittee. An official speech welcoming the delegates to the University of Calgary was given by President A. W. R. Carrothers. Mr C. B. Crawford, Chairman of the Associate Committee on Geotechnical Research, officially welcomed the meeting on behalf of the National Research Council of Canada and delivered a written message of welcome from Dr R. F. Legget, Director of the Division of Building Research and Past Chairman of the Associate Committee on Geotechnical Research, who was unable to attend the Conference.

Morning and afternoon sessions were held each day with a total of 15 papers being presented. The first day was devoted to papers dealing with permafrost aspects of the mining industry; the second day's papers dealt with permafrost aspects of the oil and gas production industries. The programme on both days closed with a showing of the black and white Russian film "Construction on Permafrost", the commentary for which had been translated into English. This documentary film was presented to the Division of Building Research by the Soviet Ambassador to Canada in 1966. It was made at two Siberian cities situated on permafrost, Norilsk and Yakutsk, and depicts construction problems and techniques employed in the USSR.

Permafrost problems and the methods used to deal with them were described for iron mining operations at Schefferville, PQ, gold mining at Yellowknife, NWT, and asbestos mining at Clinton Mine, YT, all of these mines being located in the discontinuous permafrost zone. An account of site investigations at two major mining developments in Northern Quebec and Baffin Island in the continuous permafrost zone was also presented. One of the major problems of mining in permafrost regions, that of blasting frozen ground, was discussed in a paper describing experimental investigations in Alaska. Various permafrost problems associated with oil and gas exploration and production were discussed on the second day of the Conference. Papers were given on thermal erosion and other problems in pipeline, drill rig foundations, and cementing. Heat

transfer and wave velocities in soil and rock were considered in relation to exploration and production in permafrost regions. An historical account of the United States Navy oil exploration operation in Northern Alaska from 1944 to 1953 completed the programme.

A full record of the meeting will be issued in 1969 in the form of a Technical Memorandum of the Associate Committee on Geotechnical Research. Requests for copies should be sent to Dr R. J. E. Brown, Division of Building Research, National Research Council of Canada, Ottawa 7, Ontario, Canada.

## **JAPANESE SOCIETY OF SNOW AND ICE**

Annual meeting of the Japanese Society of Snow and Ice was held in Toyama City, 7—9 October 1969. About 150 people were present and 82 papers were submitted. Papers were classified into several sessions, physics of ice and snow, snow engineering, avalanches, frost heaving, and polar and perennial snow. During this conference three symposia were held: 1) icing and snow accretion on power lines; 2) transportation and snow removal in snowy country; 3) polar glaciology. The main topics in the sessions of physics of snow and ice were: ultra-violet absorption of ice and supercooled water, migration velocity of dislocation etch pits in ice, creep of ice under repeated loading and unloading, electric resis-

tivity of highly densified snow, measurement of the specific surface area of snow grains by successive thin section method, measurement of free water content in wet snow by supersonic method. Three field investigations of avalanche damage which occurred last winter were reported. A frost heaving test of electric cable covered with a wavy polyethylene tube and measurement of bound water content in montmorillonite were reported in the frost heaving session. Several hydrological observations of perennial snow in the Japanese Alps, and two glaciological investigations of the Himalaya and Patagonia (South America) were reported.

Daisuke Kuroiwa

## **FUTURE MEETINGS**

### **NATIONAL RESEARCH COUNCIL, CANADA— WINTER CONSTRUCTION MEETING POSTPONED**

The meeting on Winter Construction Methods previously announced by DBR/NRC for Edmonton, from 3 to 7 February 1970, has had to be postponed due to circumstances beyond the Division's control. (This specialist meeting had been planned to precede the Annual Meeting

of the Canadian Construction Association, plans for which are unchanged.) It is hoped to hold the meeting in Ottawa, probably early in 1971. A full announcement will be issued as soon as possible.



**SYMPOSIUM ON SNOW REMOVAL AND ICE CONTROL RESEARCH**  
**8—10 APRIL 1970, HANOVER, NEW HAMPSHIRE, USA**  
**EXTRACTS FROM CIRCULAR ISSUED DECEMBER 1969**

The Symposium is sponsored by the Committee on Snow and Ice Control of the U.S. Highway Research Board with the co-operation of the U.S. Army Cold Regions Research and Engineering Laboratory and Dartmouth College. The program was developed by a special steering committee under the Chairmanship of L. D. Minsk, Research Physical Scientist, U.S. Army CRREL. The Symposium will provide a forum for discussions of the technical aspects of snow and ice control on roads and runways and suggest the course of future work in the field.

**Location**

The Symposium will be held in the U.S. Army Cold Regions Research and Engineering Laboratory building unless the number of pre-registration forms indicates attendance will exceed expectations. If so, the Symposium will be held in an appropriate Dartmouth College facility.

**Fee**

The registration fee for the Symposium is \$25.00. This includes a banquet and a copy of the conference proceedings. Personal accommodations and general meals are not included.

**Accommodations**

A block of rooms has been reserved in the Hanover Inn, Hanover, New Hampshire, U.S.A. The single rate for lodging and breakfast is \$14.00 per day and the double is \$10.00 per person per day. Single accommodations will be limited, and accepted in order of receipt to

capacity. A few additional units are available in two nearby motels if advance reservations are made. Accommodations must be reserved in advance by individual conferees. Accommodations in Hanover are limited, although additional space is available in other nearby towns for persons driving to the Symposium.

**Banquet**

A banquet will be held at the Hanover Inn on Wednesday evening, April 8th, at 7.30 p.m. The banquet will be preceded by a no-host social hour beginning at 6.30 p.m. The cost of the banquet is included in the registration fee. (Wives are welcome to attend the social hour and banquet. However, an additional charge of \$8.00 will be necessary.)

**Registration**

Hotel space is limited. Meeting space may be limited. **Therefore please write immediately for pre-registration cards and for further information to: L. David Minsk, Applied Research Branch, U.S. Army CRREL, Hanover, New Hampshire 03755, U.S.A.**

**Payment**

Payment for the conference may be mailed with the pre-registration card or registrants may pay upon arrival. All checks or money orders should be made payable to the "Highway Research Board". Final registration arrangements will be completed on Wednesday morning, April 8th from 8.00 a.m.

**PROGRAM**

**WEDNESDAY, 8 APRIL**

**Introduction (9 a.m.)**

Welcome—Lt. Colonel John E. Wagner, US Army CRREL.

Welcome—W. N. Carey, Jr., Executive Director, Highway Research Board.

"A short history of man's attempts to move through snow" by L. D. Minsk, US Army CRREL

**SESSION 1**

**Classification, measurement and detection of snow and ice**

S. Kinoshita and E. Akitaya

Classification of snow and ice on roads.

M. Inoue and K. Baba

A study of ice detection, prediction and warning system on highways.

C. Birnie, Jr. and W. E. Meyer

Prediction of preferential icing conditions on highway bridges.

J. L. Smith

The profiling radioactive snow gage.

## **SESSION 2 (1 p.m.)**

### **Icing on pavements and its control**

- H. H. G. Jellinek  
Survey of ice adhesion.
- R. P. Murrmann and J. W. Peek  
Ionic diffusion at the ice-solid interface.
- K. Itagaki and S. F. Ackley  
Ice adhesion studies: properties of defects in the interfacial region.
- P. A. Schaerer  
Compaction or removal of wet snow by traffic.
- K. Ichihara  
Skid resistance coefficient on snow or ice roads.
- Paul E. Cunningham  
Effect of salt on steel in roadway and bridge concrete.
- Keith Rosser  
Pavement heating.

## **THURSDAY, 9 APRIL**

## **SESSION 3 (9 a.m.)**

### **Part I— Icing on pavements and its control (continued)**

- L. H. Watkins  
Control of road snow and ice by salt and by electrical heating.
- D. A. Dunnery  
Chemical melting of ice and snow on paved surfaces.
- Richard F. Stratfull  
California's experience with all-weather roads.

### **Part II—Snow drifting and snow drift control**

- M. Mellor  
Review of snow drifting principles and research.
- Alfreds R. Jumikis  
Aerodynamic snow fences as a means of snow drift control on roads.
- Ralph A. Schmidt  
Snow drift control in mountainous terrain.
- F. H. Theakston  
Model technique in control of snow on roads and runways.

## **SESSION 4 (1 p.m.)**

### **Equipment for snow and ice control**

- K. Croce  
Principles of snow removal and snow removal machines.
- Y. Tanaka  
Snow removing performance of snow plow trucks.
- C. J. Posey  
Plow clean without scraping.
- E. C. Bain  
Engineering studies for snow removal.
- R. Tsuchiya and M. Inoue  
Current research activities on snow removal and ice control on roads in Japan.
- Panel discussion on experiences with snow removal and ice control tests during 1969/70 winter.

## **FRIDAY, 10 APRIL**

## **SESSION 5 (9 a.m.)**

### **Economics of snow and ice control**

- E. L. Miller  
A model for predicting snow removal costs and chemical usage.
- Tour of Cold Regions Research and Engineering Laboratory

## GLACIOLOGICAL TRAINING COURSE

The second Unesco/IHD training course will be held at Tarfala, Swedish Lapland, and will start on 26 July (leaving Kiruna on the 25th) and continue until 12 August (arriving Kiruna at noon on the 12th). The course will include mass balance, heat balance and run-off studies. Applications should be made to Dr V. Schytt, Department of

Physical Geography, Box 6801, 113 86 Stockholm, Sweden, not later than 1 March 1970. A copy of the application should be sent to Mr J. A. da Costa, Chief, Office of Hydrology, Department of Advancement of Science, UNESCO, Place de Fontenoy, Paris 7, France.

## SYMPOSIUM ON ANTARCTIC GEOLOGY AND SOLID EARTH GEOPHYSICS OSLO, 6—15 AUGUST 1970

A symposium on Antarctic geology and solid earth geophysics, sponsored jointly by the Scientific Committee on Antarctic Research and the International Union of Geological Sciences, will be held in Oslo, Norway, during the period 6—15 August 1970.

The symposium will be held at the new campus of the University of Oslo at Blindern, where there are adequate auditorium facilities. Cafeteria facilities are also available nearby.

Arrangements have already been made for accommodation at the Summer Hotel at Oslo Studentby (Sogn), which is located about 15—20

min. walking distance from the symposium auditorium building. More luxurious accommodation is also available in downtown Oslo, but it should be remembered that Oslo is a particularly busy city during the summer period and it is necessary to make early bookings for such accommodation.

The second circular has been distributed. Copies of this and further information may be obtained from Dr R. J. Adie, Secretary, SCAR Working Group on Geology, Geology Department, University of Birmingham, Box No. 363, Birmingham 15, England.

## THE INTERNATIONAL ASSOCIATION FOR HYDRAULIC RESEARCH—IAHR SYMPOSIUM ON ICE AND ITS ACTION ON HYDRAULIC STRUCTURES

The Symposium, organized by the IAHR Committee on Ice Problems, will take place in Reykjavík, Iceland, 7—10 September 1970. An excursion is planned after the Symposium. The purpose of the Symposium is to unite for the first time, under the auspices of the IAHR, engineers and scientists interested in furthering the field of ice engineering by providing a forum for reporting and discussing recent original research from the laboratory and the field.

The Directing Committee invites contributions to the following:

1. Classification of river and lake ice, ice terminology and ice surveys.
2. Heat exchanges and frazil formation.
3. Ice cover formation and associated hydrodynamic effects.
4. Ice break-up and control.
5. Forces exerted by ice on hydraulic and marine structures.

6. Ice modeling and its application to hydraulic engineering.

Those people who are interested in attending the Symposium should write immediately to: Mr S. Freysteinnsson, Chairman of the Organizing Committee, IAHR Ice Symposium 1970, Verkfraedistofa, Sigurdur Thoroddsen Sf, ARMULA 4, Reykjavík, Iceland.

The final programme will be distributed in May 1970.

Summaries of up to 4 pages including figures and references should be submitted by 1 May 1970 to: Prof Bernard Michel, President of the Directing Committee IAHR Ice Symposium 1970, Civil Engineering Department, Université Laval, QUEBEC 10, P.Q., Canada.

The Directing Committee will invite authorities in various branches of the subject to address the Symposium. The proceedings of the Symposium will be published as a special volume of the IAHR.

## IAPSO/SCOR/IABO/CMG OF IUGS JOINT OCEANOGRAPHIC ASSEMBLY, TOKYO, 1970

A Joint Oceanographic Assembly will be held in Tokyo between 14 and 25 September 1970 sponsored by the International Association of Physical Sciences of the Ocean (IAPSO), the Scientific Committee on Oceanic Research (SCOR), the International Association of Biological Oceanography (IABO) and the Commission on Marine Geology of the International Union of Geological Studies (CMG of IUGS).

Certain symposia will be organized in co-operation with the International Association for Geochemistry and Cosmochemistry (IAGC) which is meeting in Tokyo on 7—12 September 1970, and with SCAR.

The scientific sessions, collectively titled "The

Ocean World", will consist of interdisciplinary symposia of interest to several associations, specialized symposia of the individual associations, and sessions of miscellaneous contributions. In addition, each participating organization will have its own business meeting and a general session is planned for discussion of the future organization of marine science affairs within the International Council of Scientific Unions.

It is expected that SCAR, in concert with IAPSO, will be mounting a one-day symposium on some aspect of Antarctic oceanography during the meetings.

Particulars may be obtained from Secretaries of the organizations concerned.

## INTERNATIONAL UNION OF GEODESY & GEOPHYSICS (IUGG)

The XV General Assembly of the Union will take place in Moscow, USSR, from 28 July to 14 August 1971. The First Circular, dated July 1969, has now been received, giving general information. The Second Circular and Registration Forms will be mailed direct to participants by the Soviet Organizing Committee. **It is therefore essential for those who wish to attend the conference to write to their National Committees indicating their interest.** Unless their names have been sent by their National Committees to the Soviet Organizing Committee, they will not receive the Second Circular. (For example, British scientists should write to the Executive Secretary, Royal Society, 6 Carlton House Terrace, London S.W.1.)

The sessions of the Assembly will be held in Moscow State University. The registration fee for delegates is US\$22.00. Participants will be accommodated in hotels. A programme of social events will be arranged, including receptions, theatres, museums, sporting events and sightseeing tours of Moscow. Excursions within the USSR will be offered.

The member of the Soviet Organizing Committee responsible for the local arrangements of the Commission of Snow and Ice is Dr V. M. Kotlyakov (Institute of Geography of the Academy of Sciences of the USSR). (See Glaciological Diary, p. 16 of this issue of ICE, for titles of symposia planned.)

### 1970

### GLACIOLOGICAL DIARY

#### 9—13 March

Symposium on the use of isotopes in hydrology. Vienna, Austria. (International Atomic Energy Agency.) (J. H. Kane, Division of Technical Information, US Atomic Energy Commission, Washington, D.C. 20545, USA.)

#### 5—7 April

10th Annual North American Snow Conference, Boston, Mass., USA. (General Chairman, North American Snow Conference, APWA, 1313 E. 60th Street, Chicago, Ill. 60637, USA.)

#### 8—10 April

Symposium on snow and ice control on roads and runways. Hanover, New Hampshire, USA. (See p. 12 of this issue of Ice.)

#### 20—23 April

American Geophysical Union, annual meeting, Washington, D.C. (AGU, 2100 Pennsylvania Ave. NW, Washington, D.C. 20037, USA.)

#### 18—25 June

Icelandic Glaciological Society and Glaciological Society, joint meeting. (See page 5 of this issue of Ice.)

#### 26 June—3 July

Glaciological Society excursion, south-east Iceland. (See page 7 of this issue of Ice.)

## 1970

15—23 July

Symposium on the world water balance. Reading, England. (Unesco/IASH.) (Professor R. G. Sutcliffe, Department of Geophysics, University of Reading, Building No. 2, Earley Gate, White-nights Park, Reading, RG6 2AU, England.)

26 July—12 August

Glaciological Training Course (Unesco). Kebnekaise, Sweden. (Dr V. Schytt, Dept. of Physical Geography, Box 6801, 113 86 Stockholm, Sweden.)

7—15 August

SCAR Geology, Oslo, Norway. (Dr R. J. Adie, Geology Department, Birmingham University, P.O. Box 363, Birmingham 15, England.)

7—10 September

Iceland IAHR, Reykjavik, Iceland. (Mr S. Freysteinnsson, Chairman of the Organizing Committee, IAHR Ice Symposium 1970, Verkfraedistofa, Sigurdur Thoroddsen Sf, Armula 4, Reykjavik, Iceland.) (See p. 14 of this issue of Ice.)

14—25 September

"The Ocean World", joint oceanographic conference, Tokyo, Japan. (Prof. K. Yoshida, Secretary, Japanese Organizing Committee for IAPSO, Science Council of Japan, Ueno Park, Tokyo 110, Japan.) (See p. 15 of this issue of Ice.)

11—13 November

Geological Society of America, annual meeting, Milwaukee. (GSA headquarters, Box 1719, Boulder, Colo. 80302, USA.)

## 1971

5—9 July

International Conference on Crystal Growth, Marseille, France. (Secretariat ICCG-3, Faculté des Sciences, Marseille St. Jérôme, 13-Marseille-13<sup>e</sup>, France.)

28 July—14 August

XVth General Assembly of IUGG, Moscow, USSR. (See p. 15 of this issue of Ice.) Joint symposia planned:

- (a) Interdisciplinary studies of snow and ice in mountain regions. Organized by CSI, local convener V. Kotlyakov, Moscow; co-sponsored by IAMAP. A first circular will be issued shortly. (Dr W. H. Ward, 147 Rickmansworth Road, Watford, Herts., England.)
- (b) Air-sea interactions with floating ice. Organized by IAMAP; co-sponsored by CSI, IAPSO, SCAR. (Secretary, IAMAP, Dr R. E. Munn, Meteorological Office, 315 Bloor Street West, Toronto 5, Ont., Canada.)
- (c) Energy fluxes over polar surfaces. Organized by Commission on Polar Meteorology of IAMAP; co-sponsored by CSI, IAPSO, SCAR. (Prof. S. Orvig, Department of Meteorology, McGill University, Montreal 2, P.Q., Canada.)

18—27 August

Pacific Science Association, congress, Canberra, Australia. (Geography Chairman: Akira Watanabe, Dept. of Geography, Ochanomizu Univ., Bunkyo-ku, Tokyo, Japan. Meteorology 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 } Both in Montreal, Canada, on successive weeks.  
International Geographical Union Congress }  
(Secretariat, 22nd International Geographical Congress, P.O. Box 1972, Ottawa, Canada.)

7—14 September

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.)

## 1973

(date not fixed)

International Union for Quaternary Research, congress, New Zealand. (Dr E. A. Francis, Dept. of Geology, Univ. of Newcastle upon Tyne, Newcastle upon Tyne, England.)

## 1975

(date not fixed)

International Union of Geodesy and Geophysics, general assembly, France. (Prof. G. D. Garland, Geophysics Lab., Univ. of Toronto, Toronto 5, Canada.)



# COMMISSION OF SNOW AND ICE

## (International Association of Scientific Hydrology)

REPORT OF MEETING OF OFFICERS OF THE COMMISSION WITH THE SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH WORKING GROUP ON GLACIOLOGY AND THE UNESCO/IHD SECRETARIAT AT UNESCO HOUSE, PARIS, 3—5 SEPTEMBER 1969

### 1. Present

Chairman	M. F. Meier (USA) G. A. Avsiuk (USSR) H. C. Hoinkes (Austria) V. Schytt (Sweden) M. de Quervain (Switzerland) P. Kasser (Switzerland) F. Müller (Canada) E. R. Pounder (Canada) G. Østrøm (Norway)	}	Representing CSI
Secretary	W. H. Ward (UK)		
	U. Radok (Australia) C. R. Bentley (USA) G. Robin (UK) C. Lorius (France) Y. Yoshida (Japan)	}	Representing SCAR Working Group on Glaciology
	L. J. Tison (Belgium) L. Serra (France) (part time) E. M. Fournier d'Albe (part time) N. A. Bochin		
			Representing IASH Representing COWAR Representing Unesco Representing Unesco/IHD Secretariat

### 2. Final draft of IHD Technical Paper on "World inventory of sea, lake and river ice"

Subject to minor amendments the final draft was approved and recommended for publication as a Unesco/IHD Technical Paper in Hydrology. A vote of thanks was passed to E. R. Pounder (Canada) (Chairman), L. S. Peschansky (USSR), J. A. Heap (UK) and W. F. Weeks (USA); members of the drafting group.

### 3. Current hydrological glossaries

The status of the two glossaries containing snow and ice terms in current preparation (the WMO/Unesco multilingual glossary of hydrology and the glossary of river and lake ice terms prepared by Mr Fremling) was reviewed in relation to the Scott Polar Research Institute (SPRI) "Illustrated Glossary of Snow and Ice". The Commission was of the opinion that the glossary of river and lake ice terms was complex and did not represent common usage, and that it should not therefore be included as a part of the WMO/Unesco glossary without extensive revision. The Commission expressed a wish to comment collectively on the current version of the WMO/Unesco glossary before it was published, agreed that the authors of the SPRI glossary and other experts be asked to assist them in this task, and indicated that all comments

and corrections be sent to the Secretary before 1 March 1970.

### 4. Report on current progress by director of Permanent Service on Fluctuation of Glaciers

Ing. P. Kasser reported that he had begun the draft of the next report of the Fluctuation of Glaciers, the first to be issued by the Permanent Service. This would cover the period 1964 to 1968 inclusive and would be completed in June 1970. It was agreed that the survey should be extended to include the Arctic and Antarctic as data become available and that his first report should include a list of references from 1960 to 1968 already published for these areas. Contributions should be sent to Ing. Kasser by 31 March 1970.

It was further agreed to recommend to FAGS that all reports of the Permanent Service should be published regularly at four-yearly intervals by IASH in a special series.

### 5. Unesco/IHD Technical Papers on snow and ice

Unesco/IHD distributed proof or manuscript copies of the following technical papers for final correction: (i) perennial ice and snow masses; (ii) seasonal snow cover; (iii) variations of existing glaciers (part only); (iv) Antarctic glaciology in the IHD; (v) combined heat, ice, and water balances (Part I).

Unesco/IHD reported that 3000 copies of each technical paper were to be published in time for the Mid-Decade Conference in December 1969 and that copies would be sent to all National IHD Committees. It was agreed that the Commission should issue notices of the availability of these technical papers in suitable journals.

#### **6. Publication of Proceedings of IS-AGE**

Dr Robin reported that the proceedings of the International Symposium on Antarctic Glaciological Exploration, Hanover, 1968, had been edited by the CRREL staff with the help of Dr Radok and the SPRI and that they would be printed in Cambridge with funds provided by SCAR. They would be published in the IASH series and should be available by the end of 1969. The Commission welcomed this arrangement.

#### **7. Discussion on new techniques for snow and ice hydrology applicable to IHD projects**

The following topics were discussed:

- a) Developments in the use of radar for detecting quantity and type of precipitation.
- b) Efforts to make use of radio-echo sounding in temperate ice by Dr Evans and Dr Østrem in Norway, Dr Goodman in Canada, and Dr Thyssen in Germany.
- c) Confirmation of estimated radar di-electric absorption in Greenland ice by Dr Goodmansen in Denmark.
- d) The use of passive microwave imagery on snowfields, glaciers and floating ice to detect snow and to measure its wetness.
- e) The need to improve boring techniques in cold ice.
- f) Developments in the use of Philberth probes for temperature measurements and the need to reduce costs.
- g) The development in the UK of a small bore-hole TV camera which would be useful in glacier studies.

#### **8. Arrangements for Second Unesco/IHD Field Training Course in Glaciology, Tarfala, August 1970**

Dr Schytt reported that there were 8 or 9 applicants already, mostly from developing countries, and that he would shortly fix firm dates for the course. He would like to see approximately equal numbers of candidates from developing and from other countries. The Commission expressed a wish that Unesco should make their funds available at an early date in order that arrangements and facilities could be organized by Sweden in good time.

#### **9. Report on technical mission to Turkey in preparation for a long-term programme of snow and ice investigations**

Dr Østrem circulated copies of his report and gave a verbal summary. Turkey and many other countries in the Middle East depend almost exclusively on melting snow cover for water supply,

irrigation and hydro-electric energy, and they need technicians to be trained to study the water balance of snowy catchment areas. The Commission endorsed the recommendations in the report for Unesco to organize a field training course in Turkey which could be open to other Middle East countries and hoped that a formal request would be forthcoming.

A similar situation for water supply appears to exist in parts of S. America, especially in certain areas in Argentina and Chile. Prof. Tison drew attention to a letter he had recently received from FAO which showed interest in the problem in Chile and Dr Schytt reported that he had recently helped a group from Argentina to prepare a programme of work to study the mass and heat balance of a glacier on Tronador in the Argentinian Andes. Dr Meier reported interest in such work in Peru.

It was agreed that there was a need to hold a future field training course in S. America and that individuals should continue to develop interest in snow and ice studies in that area in the hope that a request for a course would be stimulated.

#### **10. International Antarctic Glaciological Project and other future glaciological work in the Antarctic**

Dr Radok reported on Antarctic glaciological activities in the foreseeable future.

The Commission expressed its considerable interest in the International Antarctic Glaciological Project (IAGP) in which Australia, France, USA and USSR are planning to collaborate in East Antarctica. Other Antarctic programmes by these nations and by other countries such as UK, Japan and Belgium were described.

#### **11. Implications in Antarctica of work proposed in IHD Technical Papers on Snow and Ice**

##### **(i) Inventory of perennial snow and ice masses**

In the light of the discussion under item 10, it was agreed that work at present envisaged in Antarctica would improve our knowledge of the main mass of the Antarctic ice from an accuracy of around 10-15 per cent to perhaps 7.5 per cent by the end of the Decade, and that the inventory methods described in the technical paper were of limited applicability to the main mass. However, it was considered valuable to apply the inventory methods to sample areas at the fringes of the Antarctic continent, e.g. in the Antarctic Peninsula and the dry valleys. It was noted that about two-thirds of the non-glaciated fringe areas had been covered by aerial photography.

##### **(ii) Seasonal snow cover**

It was decided that there was little point in pursuing measurement of variations in the seasonal snow cover in the Antarctic continent, since the areas involved were extremely small and insignificant in relation to the perennial mass. However, it was considered important to study the snow cover as a measure of precipitation.

### **(iii) Variations of existing glaciers**

It was pointed out that the time scales of the variations range from thousands of years in the case of the main Antarctic ice sheet to a few years in the case of small glaciers. Hopes were expressed that by the end of the Decade it would be possible to estimate the trend of the balance of the main Antarctic ice mass. It was noted that, although measurement had been made of the discharge from the ice shelf areas, the discharge through the remaining two-thirds of the periphery had not been measured. Data on discharge variations through the ice shelves as well as the mean discharge through the unmeasured periphery are vitally needed.

In fringe areas fresh aerial photography or ground surveys of selected areas are needed to estimate changes in length where glaciers terminate on land. Variations in ice thickness and speed must be measured where small glaciers calve or have floating termini. Work of this nature was being contemplated by the UK in the Antarctic Peninsula and it was agreed that it should be encouraged.

### **(iv) Combined balances**

The Commission and the SCAR Working Group noted with much interest that the British Antarctic Survey was planning to set up a station in South Georgia and in Alexander Island as part of the North-South chain and hoped that the necessary funds would be forthcoming. Other stations in the Antarctic Peninsula as well as Kerguelen Island are needed as well.

### **(v) Sea ice**

There is only limited information in both Arctic and Antarctic regions on the average ice thickness and the average fraction of the seas which are ice covered at different seasons. The extent of ridging and the quantity of ice stored in ridges are virtually unknown. The principal effort in sea ice studies in Antarctica should be to determine the areal extent of the pack regularly from satellite images. Extensive programmes costly in manpower and money, to determine more of the internal properties of the pack ice are probably not justified at present in view of extensive work planned for the Arctic.

## **12. Implementation in other areas of work proposed in IHD Technical Papers**

### **(i) Inventory of perennial snow and ice masses**

Dr Østrem reported that the Norwegian Water Resources and Electricity Board had commenced a glacier inventory of Norway and distributed copies of a preliminary document covering part of Southern Norway.

Prof. Avsiuk reported that the USSR would complete the 100-volume inventory of glaciers in their territory in 1971; 40 volumes were already printed or in the press. The Commission noted this progress with much interest and hoped that it would stimulate interest in other territories.

Major potential problems in data handling and analysis were discussed, and the Commission noted with interest the preliminary work of Dr Müller on this subject. This discussion pointed up the importance of a technical secretariat for several of these projects (see item 15).

### **(ii) Variations of existing glaciers**

The Commission noted the importance and economic value to populated areas of glacier variation measurements, and urged that more nations should undertake studies. The Commission regretted that sufficient communication to the Permanent Service has not yet developed from many nations.

### **(iii) Seasonal snow cover**

In view of the difficulties of making regular measurements on the ground, except in inhabited areas, the Commission urged that all nations with seasonal snow cover should make full use of satellite images which are freely available. Obscurity due to clouds could often be overcome by using successive images.

It was noted that it should be possible to see snow on the ground through cloud cover by means of passive microwave scanning and also that the proposed EROS satellite (USA) using multispectral sensors would be of value in snow surveys.

Effort should be concentrated first on the extent and duration of the snow cover, particularly in the Arctic and Sub-Arctic areas, and secondly on its total mass and its distribution. Nevertheless it was very important to check satellite studies by means of ground measurements of water equivalent at every opportunity.

### **(iv) Combined balances**

It was again noted that there was an urgent need to set up stations in S. America to fill important gaps in the North-South chain. Additional stations in other areas are needed as well, especially in the Himalayas, Africa, the Middle East, and West Iran.

### **(v) Sea ice**

A major study of the pack ice in the Arctic Basin is planned for the next few years, involving many new techniques and instruments. The Commission noted that the results of this study will have important applications to Antarctica as well (see item 11-v).

## **13. Combined heat, ice and water balances at selected glacier basins, Part II**

Dr Meier presented a further draft of this Technical Paper and stressed the difficulties he had had in formulating completely acceptable recommendations for heat balance measurements. He agreed to circulate copies for comment to well-known meteorologists working in this field. Comments from participants to the meeting were requested by 1 November 1969.

#### **14. Arrangements for forthcoming symposia and the next IUGG General Assembly**

Prof. Müller reported an invitation for the preparation of a paper on the inventory of perennial snow and ice masses at the Symposium on the World Water Balance, Reading, September 1970. The Commission welcomed the news.

The Commission hoped that one or more papers on glaciated or snowy catchment basins would be presented at the Symposium on the Results on Representative and Experimental Basins to be held in New Zealand in December 1970, and that one or more papers on glacier and snow hydrometry would be presented at the Symposium on Hydrometry to be held in Koblenz in September 1970. Prof. Tison reported that there was to be a Symposium on Isotopes in Hydrology organised by Unesco/International Atomic Energy Agency in Vienna in 1970.

The Commission expressed a wish to accept the Russian proposal to hold a special symposium on "Inter-disciplinary investigations of snow and ice in mountain regions" at the General Assembly of the Union of Geodesy and Geophysics in Moscow 1971.

Dr Pounder reported that a Symposium on the Role of Snow and Ice in Hydrology would be held at Banff on 7-14 September 1972. This was a joint WMO/Unesco/IASH meeting and was being organized locally by the Canadian IHD Committee and the National Research Council. The Department of External Affairs would like to have a formal letter from IASH (Prof. Tison) indicating its agreement on co-sponsorship. It was hoped that the proceedings would be published by IASH. Prof. Müller is Chairman of the programme committee, and Prof. Pounder is the designated representative of the Commission to the planning committee.

#### **15. Relations between COWAR and CSI in respect to the resolutions of the 1968 CSI officers meeting on: technical project secretaries and proposed hydrological balance of Arctic catchment**

This matter was discussed with Mr L. Serra and Prof. Tison. The Secretary explained that the report of the previous meeting had been submitted to COWAR but that no reply had been received. Since COWAR is the committee through which the Commission can communicate with the Co-ordinating Council of the IHD and with ICSU, the Commission considered that efficient communication was very essential. Snow and ice interests are no longer represented in COWAR and the Commission requested ICSU to consider representation in COWAR, perhaps by enlarging COWAR to include a representative of the SCAR Working Group on Glaciology. It was understood that Mr L. Serra and Prof. Tison would raise the matter of the two Commission resolutions at the forthcoming meeting of the Bureau of IASH in

Ghent, in the hope that it would also be considered by COWAR at their next meeting.

#### **16. Avalanche classification**

Dr de Quervain proposed that his working group should comprise E. LaChapelle (USA), L. de Crécy (France), K. S. Losev (USSR), M. Shoda (Japan). The Commission accepted this proposal. A first working document had been circulated to the group and was distributed to the officers of the Commission for information. Dr de Quervain thought that the final classification would be ready in time for the General Assembly in 1971.

#### **17. Interim CSI statutes**

Dr de Quervain was appointed to form a committee to prepare an interim set of statutes for the Commission to serve as a basis for operation during the General Assembly in 1971. These are to be presented to the next meeting of the officers of the Commission and after approval to be submitted to the National Correspondents for comment. It is intended that a permanent set of statutes will be prepared after 1971 when the new IASH statutes are finalised.

#### **18. Unesco Annual Summary of Information in Natural Disasters**

Dr Fournier d'Albe explained that Unesco wished to expand their Annual Summary on Natural Disasters and were considering the inclusion of information on avalanches and glacier surges. He sought the view of the Commission on whether this was desirable and, if so, how necessary information could be collected on a regular basis.

The Commission charged the Working Group on Avalanche Classification to consider whether the proposal as regards snow avalanches was useful and feasible and, if so, to propose a scheme of operation. The Commission requested Unesco to provide funds and facilities for the working group to meet in Paris at about the time of the next officers meeting in 1970 to discuss both the classification and the disaster aspects of avalanches.

The Commission pointed out that glacier surges did not often give rise to disasters but that glacier outburst and glacier lake floods have, in the past, caused catastrophies. The Commission noted that the reporting of dangerous situations was appropriate to both the Inventory of Perennial Snow and Ice Masses and to the Permanent Service on the Fluctuations of Glaciers. Prof. Müller was asked to form a committee to define the problem, to consider whether it was worthwhile to collect the information, and, if so, how this might be accomplished. The committee should report to the next meeting of the Commission's officers.

Dr Fournier d'Albe further explained that if these projects were worthwhile the Commission's



committees might also consider whether it was desirable to send special field missions to collect technical and scientific information on very large disasters. This information would need to be sought quickly following the incidents and lists of suitable operators should be established immediately.

#### 19. Nomination Committee

It was agreed that the President, Vice-Presidents and Secretary of the Commission should form a committee with Dr Hoinkes as Chairman to prepare a tentative slate of new officers.

#### 20. Future work of Commission

It was agreed that all Commission representatives present at the meeting should submit to the President and Secretary their proposals for the future work of the Commission in time for circulation before the next meeting of officers. When the proposals are agreed upon, it was suggested that they should be sent to National Correspondents for comment.

#### 21. Date of next meeting

It was agreed that the next meeting, lasting 3 days, should be held in Paris on either 28/30 April or 5/7 May and should fit in with a possible annual meeting of the Glaciological Society. It was also agreed that the SCAR Working Group on Glaciology be invited to send a representative.

#### 22. Important tasks for the second half of the Decade

In response to a question on this subject from the IHD Secretariat, the Commission noted that the following projects need to be started or strengthened, the first one being of greatest importance:

- a) Establishment of Technical Secretariats for each project, under the direction of competent scientists in each field, to imple-

ment the Decade programmes especially in regard to data handling and analysis. The Commission hopes that Unesco will be able to provide funds for the Secretariats and for the publication of results.

- b) Establishment of more combined balance stations (and other Decade projects as well) in S. America and the Antarctic Peninsula. Additional stations elsewhere in the world, especially in tropical regions, are also needed. Special stations equipped to do modern heat balance studies are urgently needed anywhere in the world.
- c) The important field training course in Tarfala, Sweden, should be repeated. Similar courses should be started in other areas, such as the Middle East (Turkey) and S. America (Argentina, Chile, or Peru).
- d) In the Arctic, major effort is needed on variations in the seasonal snow cover and sea ice. In the Antarctic, principal emphasis is desired on the mass balance of the main ice sheet.
- e) Increased use of satellite data to make synoptic measurements of the extent of seasonal snow and sea ice is desired.
- f) Appreciable snow and ice occurs in certain countries which have not yet responded to some of the IHD snow and ice projects. These countries are urged to do so as soon as possible, especially in regard to the Inventory and Glacier Fluctuations programmes.

#### 23. Vote of thanks

A vote of thanks was accorded by the Commission's officers to the representatives of the SCAR Working Group on Glaciology for their attendance, because this made the meeting most profitable. Special thanks were also given to Unesco for their support and for the facilities they provided.

## NEWS

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### NEW QUATERNARY ASSOCIATION

The American Association for Quaternary Environment (AMQUA) was organized in 1969 and is planning its first national meeting in 1970. A. Lincoln Washburn, University of Washington, is the first president. Other officers are Joseph H. Hartshorn, Robert R. Curry, Margaret B. Davis, secretary, Robert V. Ruhe, treasurer, and 15 members of the council. Dues were set initially at \$2 per year.

AMQUA also announced plans for publication of a new journal, *Quaternary Research*. Editing will be done through the Quaternary Research Center, University of Washington, Seattle, Wash. 98105, U.S.A.; publication and circulation will be handled by Academic Press, Inc., 111 Fifth Avenue, New York, N.Y. 10003 U.S.A. A. L. Washburn and Joe S. Creager will be co-editors.



## ZEITSCHRIFT FÜR GLETSCHERKUNDE & GLAZIALGEOLOGIE

Prof. Kinzl and Prof. H. Hoinkes are now joint editors of the Zeitschrift für Gletscherkunde und Glazialgeologie. Heft 1 of Band VI is due to appear in the Spring of 1970 and two issues a

year are planned for the future. Articles, short contributions and reviews will be accepted in German, English, French, Italian and Spanish.

## SOVIET ANTARCTIC EXPEDITION

The Soviet Antarctic Expedition was organized in 1955 in connexion with Soviet participation in the Antarctic programme of the International Geophysical Year. It was planned to be a continuing effort of exploration and scientific investigation and is still in progress. Six Soviet Antarctic stations carry out systematic observations in geology, glaciology, hydrology, geomagnetism, ionospheric physics, telluric currents, aurorae, cosmic radiation, seismology, meteorology, actinometry and aerology. In addition, extensive multidiscipline oceanographic investigations are carried out every year in the Southern Ocean.

Much new and valuable data have been collected by the Expedition, and much has been initially published in the Russian language in a series of Information Bulletins. These bulletins have been translated into English and edited, and are now being published; three volumes have appeared so far. The work was begun by the Geophysical and Polar Research Center of the University of Wisconsin, and has been continued by the staff of Scripta Technica, Inc., Washington, D.C. It is published by Elsevier Publishing Company, Postbox 211, Amsterdam, Netherlands.

## CANADIAN ARCTIC

The following short extract summarizes a statement made on 23 October 1969 in the Canadian Parliament:

"The Government will encourage the development of the polar regions". Much of this development would undoubtedly occur on the islands of the Canadian Archipelago, or in the adjoining

Continental Shelf whose resources, under international law, Canada had the exclusive right to explore and exploit. In addition the Government would introduce legislation setting out the measures necessary to prevent pollution in the Arctic Seas. It was also considering other methods of protecting Canada's ocean coasts from pollution.

## COORDINATION OF ARCTIC RESEARCH IN THE USA

To improve the coordination of basic, unclassified research conducted in the Arctic under the auspices of US Government agencies, an Inter-agency Arctic Research Coordinating Committee was established in 1968.

The committee members represent 12 Government agencies, with Dr T. O. Jones, Director of the Division of Environmental Sciences, National Science Foundation, as chairman.

The Committee is concerned with: the compilation, on an annual basis, of federal, unclassified research in the Arctic; the promotion of cooperative use of available logistics among research groups; the maintenance of a current survey of foreign arctic research efforts; the identification of scientific problems to determine the

scope and costs of recommended efforts; the identification of potential cooperative ventures in field work, data exchange, and research analyses between the United States and other nations doing arctic work; the encouragement of useful international meetings of scientists whose work is oriented to the Arctic; and the coordination of research in both polar areas to effect a better understanding of significant related problems and to effect economies of operation through the coordination of logistic support.

As a further aid to Arctic research coordination, the National Science Foundation has expanded its clearinghouse for Antarctic information to a polar information service. The availability of funds and manpower will determine the rate of progress of the Arctic portion of this service.

## INTERNATIONAL ANTARCTIC GLACIOLOGICAL PROJECT

At a meeting held at the Institut Géographique National in Paris on 27—29 May 1969 the outline of an International Antarctic Glaciological Project (IAGP) was laid down. Representatives from Australia, France, USA, USSR and from SCAR (Scientific Committee on Antarctic Research) were present.

**Outline of the Project.** The logistically accessible area of Antarctica approximately bounded by longitudes 60 and 160 East and latitude 80 South has been chosen for a concentrated programme of collaborative studies, to be known as the International Antarctic Glaciological Project. This has the aims of determining the glaciological regime and processes and of deducing some of the history and future of a sizeable part of the East Antarctic ice sheet. As a record of precipitation this ice contains unique information on the terrestrial and extra-terrestrial environment; it also plays an important boundary role for the atmospheric and oceanic circulations.

**Aims.** The broad aims of the programme are to clarify the relationships between the size, shape, and glaciological regime of the ice sheet; to reconstruct various stages of its development, their causes, and their effects on the atmosphere and the world ocean; to assess the relationships between the ice sheet and changes in climatic conditions; and to trace events of human and natural origin recorded in the ice.

To achieve these aims it is necessary to carry out the following specific studies:

- a) surveys of the ice surface and base rock topographies;
- b) determinations of the three-dimensional fields of all relevant parameters (such as density, temperature, velocity, strain rates, crystal structure, chemical properties of the ice and its inclusions);
- c) measurements of the mass and energy exchanges at the ice boundaries;
- d) observations of changes at the ice margins;
- e) surveys of evidence for the extent and age of previous glaciations.

This programme is in line with general recommendations made by SCAR for Antarctic glaciological research. The Project exemplifies the spirit of co-operation in science among nations signatory to the Antarctic Treaty.

In view of the magnitude of the Project it is essential that nations with interests in the study area should collaborate in this work. While each nation will choose its principal area for the field studies to be carried out by its own specialists, a number of the specific field projects, laboratory investigations, and theoretical studies call for exchange scientists. Such international collabora-

tion is especially necessary to ensure that the Project will provide complete and comparable results for testing the best theoretical ice sheet models which can be devised at the present time. **Procedures and programme.** The main participants in IAGP will be, in alphabetical order, the expeditions of Australia, France, the USA and the USSR. The Council of the Project will consist of two members from each of the four countries, one being a prominent Antarctic glaciologist and the other a logistics expert. The selection of these representatives will be the responsibility of the relevant national authorities. SCAR will nominate one representative.

The programme is envisaged in several phases. The first of these consists of projects and activities already under way or due to begin shortly. The second contains operations which have been approved in principle and are in the planning stage. The third phase will contain a number of projects and operations which seem essential but have not yet received official support at this time. Beyond that there lies a very important fourth phase when many of the original measurements must be repeated, in order to provide the answers sought by the programme.

Detailed time tables and outlines of measurements to be made, including suggestions for other projects that might be carried out simultaneously, have already been prepared by the four nations. There is a need for a programme of preliminary studies designed to ensure that every participating expedition in its specific projects will undertake a range of measurements regarded by the Council as essential, with techniques giving compatible and comparable results. These "standardisation" studies must cover the following broad fields.

- seismic and radar sounding of ice thickness and ice structure;
- glaciological observations on traverses and at stations;
- glacio-geomorphological observations at the ice margins;
- aerial observations (visual and photographic);
- geodesy;
- gravimetry;
- deep drilling;
- core analysis;
- astronomical, navigational, and satellite observations;
- theoretical studies.

These preliminary studies could be organized through national committees, through international ad hoc working groups of specialists, or by collaboration of individual scientists. Each of

these arrangements may have advantages over the others in the context of special national and scientific environments concerned. Initially these studies should be carried out on national basis and be completed by the end of 1969. In addition to a standardisation of measurements and techniques an important aim of the preliminary studies should be to suggest procedures to be followed in the data reduction and analysis, as well as specific arrangements for cooperation between scientists of the participating nations at all stages of the work, from preparations through field work to the preliminary studies. Their conclusions might be embodied in a series of manuals for the programme and are to be reported as soon as possible to one of the regular meetings of the Council.

All results of the Project are to be exchanged after the first reduction of the data has been

carried out; however, in some contexts an earlier exchange of data needed for special purposes will be open for discussion between the parties concerned. The publication of the results of the Project is to be made through existing national facilities and in the language of the country primarily concerned, with extended abstracts in the languages of all other participating nations. Reprints of all reports should be available for possible reissue under a cover specifically designed for the Project.

**Next meeting.** France has accepted the responsibility for coordinating moves to bring about the first meeting of the definite Project Council in May 1970 or in conjunction with the SCAR meeting in Norway during August 1970. The Project Council is expected to devise its own rules and procedures for the Project.

## NEW MEMBERS

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# THE GLACIOLOGICAL SOCIETY

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

President: Dr V. Schytt

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 *Journal of Glaciology* free. Forms for enrolment can be obtained from the Secretary. No proposer or seconder is required. Annual subscription rates are as follows:

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	U.S. dollars:	\$8.00
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(under 25)	U.S. dollars:	\$3.00
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	U.S. dollars:	\$16.00
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Further details may be found in the *Journal of Glaciology*,  
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## ICE

Editor: Mrs. H. Richardson

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