

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

No. 13

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SCAR

SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH

BULLETIN

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NORWAY SOUTH AFRICA UNITED KINGDOM
UNION OF SOVIET SOCIALIST REPUBLICS
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SCAR BULLETIN

No. 13, JANUARY 1963

SIXTH MEETING OF SCAR, BOULDER

20 TO 24 AUGUST 1962

Present:

President: G. R. Laclavère.

Delegates: Argentina, R. N. M. Panzarini; Australia, K. E. Bullen; Chile, C. Lomnitz; France, C. Lorius; Japan, T. Nagata; New Zealand, W. H. Ward; South Africa, S. A. Engelbrecht; United Kingdom, G. de Q. Robin; United States, L. M. Gould; IUPAC, J. Bailar; IUGG, G. R. Laclavère.

Observers: CIG, M. A. Pomerantz; WMO, G. Cartwright; SCOR, C. Drake.

Advisers: Australia, F. Jacka, P. G. Law, J. M. Rayner; France, J. Alt, R. J. Bost, G. R. Laclavère, A. Lebeau, R. Schlich, A. Spizzichino, C. Taieb, J. Vaugelade, P.-E. Victor; Japan, M. Murayama, T. Tohmatsu, T. Torii; New Zealand, J. Lennox-King, G. W. Markham, W. F. Ponder; South Africa, E. Boden, P. H. Stoker; United Kingdom, S. Evans, V. E. Fuchs, J. M. Stagg; United States, D. K. Bailey, J. M. Jones, T. O. Jones, C. G. Little, S. Matsushita, J. Mooney, M. A. Pomerantz, F. Roach, S. Ruttenberg, H. W. Wells, H. Whitney, G. Wood.

Invited participants Working Group meetings: Canada, C. Collins and S. Chapman.

Matters arising from the Minutes of the Fifth Meeting

Membership of IUGS, IUPS and WMO. The Secretary reported that the Executive Board of ICSU had approved representation on SCAR of delegates from the IUGS and IUPS. IUGS representation was already effective, IUPS would be admitted if and when they apply for membership as decided at the Fifth Meeting of SCAR.

The Executive Board of ICSU had recommended the admission of a delegate from WMO when the necessary modification of the SCAR constitution has been approved.

Recommendation VI. General-1. That the constitution of SCAR (*SCAR Bulletin*, No. 1, 1959, p. 7) be amended as follows. Under "Nominations to the Committee": (p. 7) *replace (c) by (c)* The World Meteorological Organization is represented by a scientific delegate; insert as (d) the previous item (c).

The Executive Board of ICSU, at their 14th meeting in October, approved this alteration.

Register of scientists. It was reported that less than five applications from scientists who wished to serve with expeditions of other countries had been received since the last meeting, and that no notification had been received from National Committees that personnel had been accepted through the Register. It was agreed, however, that no action should be taken to terminate the Register.

Antarctic seismological data. It was reported that the United States Coast and Geodetic Survey had published the first quarterly bulletin of Antarctic seismological data in March 1962. The meeting expressed the thanks of SCAR to the Coast and Geodetic Survey for compiling and publishing the bulletin.

Communication schedules. Publication of communication schedules in *SCAR Bulletin* No. 10 was noted.

Finance Committee. In response to a recommendation of the Finance Committee at the Fifth Meeting, seven countries had agreed to increase their subscription to SCAR for 1963, and four voluntary increases, totalling \$1986, for 1962 had already been received. Dr Robin reported that these increases had enabled him to obtain the executive assistance of G. E. Hemmen.

National reports. The meeting decided that in future 18 copies should be sent to each National Committee.

Co-operation with SCOR. The Secretary had attended the meeting of the SCOR Executive in April 1962. As a result, a joint SCAR-SCOR circular had been sent to National Committees on oceanic and Antarctic research suggesting that joint Antarctic-oceanography working groups should be formed to determine problems in Antarctic oceanography which scientists in each country wished to study.

It was noted that four countries had now set up such working groups, and that two considered there was already effective liaison between their two relevant National Committees.

Co-operation with COSPAR. At a meeting of COSPAR held in May 1962, COSPAR were informed that the following aspects of their activities were of interest to SCAR:

- (1) Information from meteorological satellites on cloud distribution, radiation balance and distribution and movement of sea ice, with possibly some indication of ice thickness.
- (2) Navigation satellite which would assist in navigation to and from the Antarctic as well as within the Antarctic.
- (3) Geodetic satellite to obtain absolute geodetic positions in the Antarctic.
- (4) The study of the upper atmosphere.
- (5) The study of particle radiations.

The following points were made in response to SCAR's request for advice on the possibility of using artificial satellites to obtain absolute geodetic positions in the Antarctic:

- (a) Due to the high elevations in the Antarctic, such positioning would have to be three-dimensional if it was to be of value.
- (b) To be observable from all parts of the Antarctic, a 1000 km. altitude satellite would have to have an inclination of at least 80°.
- (c) A satellite of these orbital specifications was also desirable for gravitational studies.
- (d) Excellent positions adequate to control medium-scale mapping would be obtained if it were possible to make photographic observations during the Antarctic night.
- (e) Surveying experience in northern Alaska indicated that optical equipment, such as theodolites, could be operated at very low temperatures, but there were problems associated with photographic emulsions, and, in the Antarctic, bad weather.

- (f) If weather compelled the observing to be done in the summer, it is doubtful whether good elevations could be obtained by Doppler radio tracking.
- (g) It was also of interest to scientific geodesy to obtain a geodetic connexion from Antarctica to South America.

An extract from the minutes of the meeting recorded that:

"The Committee gave particular attention to the need for co-ordination of measurements in south polar as well as north polar regions. It is important that a comparison of absolute measurements in both regions be made with particular reference to phenomena related to radiation belts in which significant differences between the two regions may be expected.

The coverage of the south polar region is very difficult in relation to that of the north, and it is recommended that COSPAR should urge all countries at high southern latitudes to make every effort to perform experiments on polar events with sounding rocket balloons and ground experiments. These should be co-ordinated through this committee and the information about facilities should be expanded to include facilities on the south polar region."

Proposed geology symposium in 1963. It was noted that the Working Group on Geology was still in favour of a geology symposium in 1963. S. A. Engelbrecht informed the meeting that South Africa wished to invite SCAR to hold the symposium in South Africa in connexion with the Seventh Meeting of SCAR. The Working Group on Geology should determine details of the programme.

World Data Centres. S. Ruttenberg informed the meeting that it was necessary to prepare final catalogues of IGY-IGC data held in the World Data Centres for publication in one of the final volumes of the *Annals of the IGY*. Some data was still outstanding from most Antarctic stations. Steps should be taken to ensure that all material be sent to the World Data Centres, or at least some information be provided concerning the availability of data not deposited in the centres. It was agreed that this matter should be referred to the proposed *ad hoc* working group of delegates for examination, and all working groups be requested to submit a recommendation to the final plenary session.

Recommendation V1. General-2. That National Committees belonging to SCAR make every effort to accomplish, by 31 October 1962, the submission of the still outstanding data to World Data Centre A or, alternatively, to one of the other World Data Centres, in which case World Data Centre A should at the same time be notified of such submission.

In the event that submission of outstanding IGY/IGC data to the World Data Centres is not possible by 31 October 1962, the National Committees or otherwise responsible national organizations should notify World Data Centre A by 1 October 1962 of the status of the outstanding data, i.e.

- (1) that the data exist and will be sent to the WDCs according to a definite schedule;
- (2) that the data exist and will not be sent to the WDC's but will be copied upon request of an interested scientist;
- (3) that the equipment did not operate or that for some other reason there are no data or the data are unsatisfactory.

Finance Committee

L. M. Gould, S. A. Engelbrecht (in absence of M. M. Somov)

The balance in hand on 31 December 1961 was \$888.68. A deficit of \$1000 was expected by 31 December 1962. At the request of the Treasurer of ICSU, an additional expenditure of \$3000 would be included in the estimates for 1963 and 1964 to meet the expenses of SCAR delegates to IQSY and other committees. This would require an increase of subscriptions to SCAR in 1964 in addition to that to be recommended for 1963. Should these increases be approved the deficit should be paid off by 31 December 1964.

The Committee supported the proposed establishment of an ICSU special fund for the support of IAAC, and suggested that one trustee of the fund should be nominated by ICSU and one by SCAR. Formal applications for support would then be sent jointly by the organization and IAAC through the Secretary of SCAR to the trustees, a procedure which would require the agreement of all the parties concerned.

Recommendation V 1. F-1. That, in accordance with Recommendation V. F-2 of the Finance Committee, the Sixth Meeting authorizes that SCAR contributions be increased so as to total \$12000 in 1963 in accordance with the formula for such increases approved by the first meeting of SCAR.

Recommendation V 1. F-2. That in order to meet additional costs of SCAR representation at other meetings, the Finance Committee recommends that the income of SCAR be increased to \$15000 during 1964, the increase to be obtained by increasing the dues in accordance with the approved formula. A decision on this matter will be taken at the Seventh Meeting of SCAR.

Second Consultative Meeting of Antarctic Treaty
[*Polar Record*, Vol. 10, No. 73, 1962, p. 465-69]

Recommendation V 1. General-4. That attention of National Committees be drawn to Recommendation 11-1, and to the fact that the implementation of this will require effective support and provision of facilities for reduction and analysis of scientific data.

Recommendation V 1. General-5. That attention of all Permanent Working Groups be drawn to the need for consideration of the preservation of natural conditions in Antarctica in fields in addition to biology, and to invite them to submit proposals for any such measures they feel desirable for furthering their scientific programmes.

Reports of permanent Working Groups [see Annex 1].

The reports and recommendations of the Working Groups on Geomagnetism, Logistics and Upper Atmosphere which met during the Sixth Meeting of SCAR were accepted. The reports of the permanent Working Groups not meeting during the Sixth Meeting of SCAR were discussed by the SCAR delegates and thanks were expressed to their secretaries.

Supply of information to Secretariat on Antarctic stations

A number of proposed activities were reported:

- (1) An Australian two-month expedition to Heard Island in January-February 1963 to undertake research in vulcanology, biology and geology.
- (2) A New Zealand-United States expedition to the Auckland Islands in December 1962 for approximately four weeks' biological work.
- (3) The New Zealand intention to establish a new summer station on Cape Royds in 1962.
- (4) The examination by South Africa of the possibility of establishing a station on Bouvetøya in October 1962, with ionospheric, cosmic ray and airglow observations being made during the voyage.
- (5) Individuals and organizations in Switzerland, West Germany, Poland and Italy were considering or making plans for Antarctica expeditions.
- (6) Temporary Soviet meteorological stations operated for short periods during the summers of 1959-60 and 1960-61 at lat. 71° 40' S., long. 90° 32' E.; lat. 70° 47' S., long. 5° 49' E.; lat. 72° 03' S., long. 1° 16' E.; and during the winter of 1961 at lat. 64° 39' S., long. 98° 54' E.; lat. 65° 45' S., long. 92° 28' E.; lat. 66° 43' S., long. 86° 24' E.
- (7) The Argentine station "Ellsworth" will not be in operation during 1963.
- (8) An "all-sky" camera, and possibly an ionospheric sounder, is to be set up at "General Belgrano" station by the Instituto Antártico Argentino for use in 1963.

Recommendation V 1. General-3. That when changes are to be made to the published programmes of establishing and closing Antarctic stations, the Secretary of SCAR should be informed as early as possible; if prior notification is impossible, they should be notified by cable. The Secretary will inform other National Committees of such changes by circular. Any site which will be continuously occupied for two months or more is understood to be an Antarctic station for the purpose of the above Recommendation.

SCAR Programme Amendments

Glaciology [SCAR Bulletin, No. 3, p. 37-38]

Item (c) to be amended to:

- (c) Measurements of annual accumulation to establish climatologically significant records. Large numbers of stakes should be systematically spaced over the continent to measure current accumulation and, in addition, the record should be extended backward through the study of annual stratification in pits.

The following item to be added as (h):

- (h) Isotopic studies of stable elements and the use of radioactive isotopes for the study of snow accumulation, surface and subglacial melting, ice dynamics, climatic changes, and such other topics as may assist other disciplines.

Appointments

Vice-President. On the expiration of the period of office of Professor K. E. Bullen, Vice-Admiral R. N. M. Panzarini was elected Vice-President of SCAR for a term of three years.

Chairman of Logistics Working Group. On the resignation of Rear-Admiral D. M. Tyree, USN, P.-E. Victor was elected Chairman of the group.

Secretary of Logistics Working Group. The appointment of G. W. Markham as Secretary of the group was confirmed.

Secretary of Upper Atmosphere Physics Working Group. The appointment of F. Jacka as Chairman and Secretary of the group was confirmed.

Secretary of Geomagnetism Working Group. The appointment of Professor T. Nagata as Secretary of this group was confirmed.

SCAR correspondent to IQSY Committee. F. Jacka was appointed to this post, with M. A. Lebeau as alternative representative.

Message to Antarctic stations

The meeting approved the following message to be sent to all Antarctic stations:

SCAR at its Sixth Meeting in Boulder, Colorado, wishes to renew its whole-hearted appreciation for the sustained efforts of the scientific and technical personnel at Antarctic stations in the furtherance of international programmes of Antarctic research. It sends its greetings to the men at all stations and the expression of its gratitude for their contribution in maintaining international mutual understanding, goodwill and co-operation.—G. R. Laclavère, President, SCAR.

Acknowledgements

The President expressed the thanks of SCAR, and of the members of the Symposium on Antarctic Logistics, to the United States National Academy of Science's Committee on Polar Research, the University of Colorado, the National Bureau of Standards, the University Corporation of Atmospheric Research, and very many private persons for the admirable arrangements made for the meetings, and for the generous hospitality shown to delegates and observers.

Date and place of next meeting

An invitation for the next meeting to be held in South Africa was accepted, and 23 to 27 September 1963 was suggested. It was agreed that the Working Group on Geology should meet at the same time.

ANNEX 1

BIOLOGY

The Working Group on Biology did not meet during the Sixth Meeting of SCAR.

The Secretary presented a report on preparations for the Symposium on

[484]

Antarctic Biology to be held in Paris during 2 to 8 September 1962. [Abstracts of the papers read at the Symposium appeared in *SCAR Bulletin*, No. 12, and in the present issue]. The proceedings (papers and discussions) are to be published in co-operation with Expéditions Polaires Françaises.

COMMUNICATIONS

The Working Group on Communications did not meet during the Sixth Meeting of SCAR; the Chairman submitted a report for the period 1961–62.

Meteorological network

All Antarctic stations except Mirny and Mawson are now reporting to "McMurdo" in accordance with the revised schedule of meteorological transmissions prepared by the Working Group in Wellington during October 1961 (*SCAR Bulletin*, No. 10, p. 96–98). Mawson transmits the 12.00 GMT synop and 12.00 GMT upper air data at 15.30 because they are ready at that hour, and it is preferred not to delay three hours until 18.30 GMT. Mirny transmits to McMurdo at 02.40, 05.15 and 11.00.

Arising from Fourth SCAR Meeting

Message preamble. Member nations are requested to implement the agreed message preamble: Originator/Telegram No./date and time/addressee.

Communications supervisor at IAAC. It has not been found possible to implement this recommendation.

Arising from Fifth SCAR Meeting

Working Group Meeting. The meeting of specialists in Antarctic radio communication recommended in 1-x1 of the First Antarctic Treaty Consultative Meeting had not yet been called, but it was noted that in the Second Consultative Meeting, II–III, *Polar Record*, Vol. 11, No. 73, 1963, p. 467, it was again proposed for between 1 May and 31 August 1963.

General

The United States are studying the provision of reliable and positive two-way communications for small field parties working in mountainous areas, up to 1000 miles from home bases. Mobile high-frequency single-side hand receivers have increased reliability to some extent, and new aerials are being designed.

GEODESY AND CARTOGRAPHY

There was no meeting of the Working Group on Geodesy and Cartography during the Sixth Meeting of SCAR. The Secretary of the working group submitted a report listing the mapping activities of member nations during the period 1961–62, outlining proposed activities for 1963 and listing cartographic material received since the Fifth Meeting of SCAR. Diagrams showing this information were included in the report.

[485]

Arising from Fourth SCAR Meeting

Distribution of map catalogues. These were distributed to members of the working group in November 1961 and have since been kept up to date by periodical lists of amendments and additions.

SCAR topographic map symbols. These draft symbols, which were confirmed at the Fifth Meeting, have been published in booklet form and issued to members.

Arising from Fifth SCAR Meeting

Use of artificial satellite observations for determinations of absolute geodetic position. A report on the IAG/COSPAR Symposium on this subject would be distributed to members.

Ice markers. Details of the types of icemarkers used by Expéditions Polaires Françaises and the United States have been distributed to members.

Electronic distance measurement. Reports have been distributed to members on practical experience gained in the use of this equipment in polar conditions.

SCAR topographic map symbols. A copy of these had been sent to each of the official publishing agencies of the countries adhering to the International Map of the World on the Millionth Scale. Other copies were sent to the Executive Secretary of the United Nations Technical Conference on the International Map of the World being held in Bonn in August 1962, and the conference accepted the symbols for use.

Other action taken between Fifth and Sixth Meetings

Diagrams had been distributed to members showing mapping activities (a) carried out in the Antarctic during 1960-61, and (b) planned for 1962-63.

A list of the latest values of geographical co-ordinates of Antarctic stations had been distributed to members.

Progress of work

Members were asked to submit brief details of their national mapping activities (a) completed during 1961, (b) begun during 1962, (c) projected for the remainder of 1962, and (d) planned for 1963.

GEOLOGY

The Working Group on Geology did not meet during the Sixth Meeting of SCAR. The Chairman of the group submitted a report on matters arising from the various recommendations made at the Fifth Meeting.

The report on the previous season's geological work, the list of translations of Russian geological papers and the agreed list of basic symbols which were recommended in SCAR V.G-1-3 respectively, are in hand, but not yet complete.

Formation names (SCAR V.G-5). The Commission for the *International Stratigraphic Lexicon* is prepared to accept the working group's offer to undertake the compilation of the Antarctic section of the *International Stratigraphic Lexicon*. Member nations should forward to the Chairman all new strati-

graphic names, with descriptions and definitions as used in the *International Stratigraphic Lexicon*.

Absolute ages of Antarctic rocks (SCAR V.G-6). The compilation has been made and is to be published in the *New Zealand Journal of Geology and Geophysics* in November 1962. It will be supplemented in a later issue by a further list now being compiled.

Symposium on Antarctic geology. It is proposed to hold this in 1963, in conjunction with the Seventh Meeting of SCAR. Suggestions for subjects for discussion are invited.

GEOMAGNETISM

T. Nagata (Chairman Secretary), E. Boden, S. Matsushita, J. M. Rayner, S. Ruttenberg, R. Schlich, J. M. Stagg.

IQSY programme

The working group endorsed the CIG-IQSY recommendations relating to the Antarctic:

(1) That continuous observations of geomagnetic variations by means of standard variographs should be carried out at the existing network in the Antarctic during the IQSY period. Also that standard magnetographs should, wherever possible, be supplemented by storm magnetographs.

(2) That it is noted with concern that the stations "Base Roi Baudouin" and "Syowa" have been closed for at least a year, and that plans are being considered for the ending of magnetic observations at Macquarie Island in November 1962. It recommends that the two closed stations should be re-opened and magnetic observations continued at Macquarie Island for at least the duration of the IQSY.

(3) That magnetic stations at Gough Island and at Marion Island would fill serious gaps in the existing network of such stations and urges that the Republic of South Africa should do everything possible to establish such stations.

The working group added the following comments to these recommendations:

(a) Geomagnetic variations and micropulsations should be observed at least to frequencies as high as several cycles per second. It is suggested that instruments be used with sensitivities of at least 10 milligamma at 1 c/s. Attention is called to the need for timing accuracy of approximately 0.1 sec. for intercomparison of records of phenomena in the 1 c/s. frequency range, and workers are urged to obtain calibration of their equipment and to publish or make available the characteristics of their detecting, amplifying and recording system (i.e. sensitivity, frequency response, phase response).

(b) It noted with satisfaction that efforts were being made to resume operations at "Base Roi Baudouin" and "Syowa", and that it is the intention to continue operations at Macquarie Island, at least throughout the IQSY.

(c) It noted with satisfaction that plans are under consideration for installation of magnetic stations at Marion and Gough Islands.

(d) It wishes to stress the high importance of speedy submission of basic tabular materials and copies of magnetograms ("year books"). The publication of reduced data and copies of magnetograms should in no way be adversely affected by the additional requirement of sending copies of magnetograms to World Data Centres.

Conjugate points

The working group was associated with the Working Group on Upper Air Physics in *Recommendation VI. UA-1* on this matter (p. 493).

New stations

A magnetic station is to be installed on the Îles Crozet by the French, and another by the United States at "Eights" station, in lat. 75° S., long. 77° W.

World Magnetic Survey (WMS)

In view of the increased interest in WMS data in the Antarctic which has resulted from the recent discovery of the anomalously large secular change there, and the decision of CIG to include WMS data in the data collection system of the World Data Centre, the working party suggests that, in order to meet the needs of research workers, the International Association of Geomagnetism and Aeronomy (IAGA) should be invited to provide a mechanism for rapid collection and dissemination of absolute magnetic measurements made in the Antarctic at stations, on traverses, and by air or ship surveys. In view also of the importance of geomagnetic data collected by ships operating in the Antarctic area, it is suggested that the collaboration of SCOR is invited in connexion with the collection and dissemination of magnetic data.

Close-spaced stations

The working group encourages magnetic observations to be made in stations close together (200 to 500 km.); permanent or temporary stations close together should carry out co-ordinated magnetic observance.

Annual Report on progress in geomagnetism in the Antarctic

Each member nation is to supply to the Secretary, three months before a scheduled meeting, a report containing information on (a) stations operated and dates of work and types of instruments, (b) published data, and (c) published research work.

Organization of a permanent working group

The Working Secretary, T. Nagata, who had convened this first meeting of the group, explained that he had proffered his resignation to SCAR as the Japanese programme had been temporarily halted. He was successfully urged to continue the secretaryship of the group on account of his interest and scientific contribution to the subject.

Date of next meeting

This was provisionally arranged for August 1963 during the time of the next meeting of IAGA, at the XIIIth General Assembly of the IUGG at Berkeley, California.

GLACIOLOGY

The Working Party on Glaciology did not meet during the Sixth Meeting of SCAR. The Secretary submitted a report listing the activities of member nations during the year and plans for 1963.

[488]

Next meeting of working group

A meeting of the Working Group on Glaciology was arranged for 19 to 22 September at Obergurgl, following the Symposium of the International Commission of Snow and Ice.

LOGISTICS

Rear-Admiral D. M. Tyree, USN (Chairman), and in his absence G. W. Markham, S. A. Engelbrecht, V. E. Fuchs, J. M. Jones, T. O. Jones, P. G. Law, Contralmirante R. N. M. Panzarini, Commander J. Lennox-King, RNZN, G. W. Markham, J. Mooney, M. Murayama, W. F. Ponder, T. Tonii, M. J. Vaugelade, P.-E. Victor.

*Symposium on Antarctic Logistics, 1962 [p. 506-9]**General*

Recommendation V1. L-1. That the deliberations of the SCAR Symposium on Antarctic Logistics and the recommendations of the working group be brought to the attention of their respective governments by National Committees in the hope that the findings therein will be of assistance to the governments in their consideration of logistics problems.

Recommendation V1. L-2. That, in the future, meetings of the group should be held at which special attention should be given to informal discussion of specific subjects with technologists expert in the specific subjects present. These meetings would not necessarily be held every year.

Recommendation V1. L-3. That as far as possible members of the working group will undertake to investigate the matters raised and to report back to SCAR. While specific members have been asked to study various problems, information from other sources will be welcomed.

Science and logistics

Recommendation V1. L-4. That to enable technical research on logistic problems to be intensified, more precise guidance be given to the working group as to what the scientific requirements might be in five to ten years, and more specifically in the next solar maximum (1968-70).

If the scientists are unable to make such a forecast it should be realized that the logisticians themselves will have to estimate the requirements, resolve the problems, and prepare to meet the needs in the most efficient ways open to them. To facilitate this a higher degree of co-operation between logistic organizations is desirable.

Air operations

Recommendation V1. L-5. That a standard method for the marking of airstrips be studied and promulgated for universal Antarctic use.

Recommendation V1. L-6. That the application of hovercraft for use in the Antarctic be studied and that the results be distributed.

Buildings

Recommendation V1. L-7. That the SCAR working group study the formation of a design group to establish: (a) building standards, (b) common modular co-ordination, (c) direct research into more profitable channels, e.g. materials most likely to be of use in the Antarctic, (d) design recommendations.

Recommendation V1. L-8. That further research be initiated on (a) stressed skin panel construction with the object of reducing weight and thickness and improving fire rating, and (b) fire precaution methods.

[489]

Recommendation V1. L-9. That further investigation is necessary into water supply sources in the varying types of conditions experienced in the Antarctic.

Recommendation V1. L-10. That waste disposal methods should be reconsidered. The method now employed by Australia, which has been operating for eight years deserves study.

It was agreed that the difficulties of practical implementation of these recommendations appeared insurmountable unless a special meeting of experts could be held for the purpose.

Recommendation V1. L-11. That a special recommendation should be passed to the World Health Organization (which is to discuss health problems in polar areas (held at Geneva late in August) pointing out the concern felt at the risks of site contamination at Antarctic bases in continuous operation.

Land vehicles

Recommendation V1. L-12. That in view of the number of different types of vehicle in use and being considered, it is recommended that the SCAR Working Group on Logistics prepare a plan for the establishment of a uniform system of testing and reporting of tests and for the exchange and discussion of results.

[To implement this recommendation each participating country is invited to send to the Secretary of the working group—for circulation and agreement—its proposed standard format of vehicle tests, with its views on how the tests should be applied. In addition, the countries should supply information on tests already run by them on specific vehicles, giving the circumstances in which the tests were conducted.]

Antarctic provisioning

Although no conclusions or recommendations were contained in this section of the Symposium's report, the working group considers the papers and discussions were a valuable contribution.

Field operations

Recommendation V1. L-13. That all nations should encourage research into the factors affecting antennae laid on snow, and that this problem should be referred to the SCAR Working Group on Communications.

Recommendation V1. L-14. That field parties of all nations be equipped with the ICAO ground/air signal card since, generally, all aircraft operating in the Antarctic adhere to this procedure.

IQSY

Recommendation V1. L-15. That an early decision be taken by SCAR nations on which stations are to be opened, or re-opened, for the IQSY to enable adequate logistic preparations to be made.

METEOROLOGY

The Working Group on Meteorology did not meet during the Sixth Meeting of SCAR. The Chairman submitted a report summarizing recent developments in Antarctic meteorology. Recommendations to the final plenary session were made on administrative matters by an *ad hoc* working group of SCAR delegates.

Relations with the World Meteorological Organization (WMO)

At the 14th session of WMO, held in May 1962, it was decided to set up a Panel composed of Experts on Antarctic Meteorology designated by the permanent representatives of those members of WMO who are operating meteorological programmes in the Antarctic. The Secretary-General was directed to negotiate with SCAR with a view to co-ordinating the Executive Panel on Antarctic Meteorology, to invite SCAR to designate a representative to the panel and to designate a WMO representative to SCAR.

Recommendation V1. M-1. That SCAR notes with pleasure the resolution of the 14th Session of the WMO Executive Committee relating to Antarctic meteorology, and welcomes the continued interest of WMO in the Antarctic.

Meeting of ad hoc working group of delegates and others

International Antarctic Analysis Centre (IAAC)

The policy statement of the Joint Working Party responsible for the centre, together with the report to them of the leader of the IAAC, was considered. This stated that the minimum routine analysis programme which should be maintained by the centre was:

Surface synoptic analysis of the Southern Hemisphere south of lat. 30° S. once daily.

Synoptic analysis for 700, 500 and 300 mb cp surfaces for the above area once daily.

In addition, competent and experienced analysts were required to carry out development and research work. Since the conception of the centre the professional staff had barely been sufficient to meet the minimum routine analysis programme and the centre could not continue on the existing basis without a definite promise of increased professional staff. Unless sufficient help was forthcoming, the Joint Working Party would recommend that the basic concept of an international centre should be radically re-examined.

The report of the Leader of the IAAC to the Working Group on Meteorology was also noted. It was agreed that, as IAAC was a SCAR concept, SCAR should do everything in its power to encourage an improvement in the staff position at IAAC.

Recommendation V1. M-2. That the Secretary of SCAR should immediately request the Executive Board of ICSU to set up a special fund for an initial period of five years to assist the operation of IAAC in various ways, and to suggest that ICSU should seek support from WMO.

[The Executive Board of ICSU, at their 14th Meeting in Prague in October 1962, agreed to set up the above fund, and to grant the fund a loan of \$10,000 on the understanding that financial support for the fund will be sought.]

Recommendation V1. M-3. That SCAR draws the attention of National Committees to the difficulties confronting IAAC due to shortage of staff and urges them to assist the centre by every possible means, especially by seconding staff to the centre and financial support of the proposed ICSU special fund.

Recommendation V1. M-4. That non-SCAR nations be asked to consider seconding staff to the centre.

Recommendation V1. M-5. That SCAR, realizing the difficulties in operating IAAC, wishes to express its appreciation and admiration for the efficient manner in which the centre has been run, and to express their thanks for the value of the analyses produced. The Secretary is asked to convey these views to the Australian Bureau of Meteorology, the Australian Academy of Science and the staff of IAAC.

It was noted that there had been a marked improvement in the operation of IAAC since the Fifth Meeting of SCAR, though the original communications and staffing difficulties had not yet been overcome.

The working party reviewed the WMO report arising from United Nations Resolution 1721, which contains a plan for the establishment of World and Regional Centres in connexion with the development of atmospheric science. The future of IAAC might be affected by the way in which this plan developed; a "World Centre" could take over the routine analysis functions of IAAC, leaving it to concentrate on research aspects of Antarctic meteorology.

OCEANOGRAPHY

There was no meeting of the Working Group on Oceanography during the Sixth Meeting of SCAR. The Secretary presented a general report on activities during the period and plans for 1962-63.

SOLID EARTH GEOPHYSICS

There was no meeting of the Working Group on Solid Earth Geophysics during the Sixth Meeting of SCAR. The Secretary presented a report giving the composition of the group which has been established since the Fifth Meeting of SCAR in 1961:

Argentina, S. Gershanik; Australia, K. E. Bullen; France, M. G. Jobert; Japan, T. Hagiwara; New Zealand, E. I. Robertson (Secretary); Norway, M. Sellevoll; South Africa, A. L. Hales; Great Britain, R. Stoneley; USA, G. P. Woollard; USSR, Y. D. Bulanzhe. Nominations from Chile and IUGG have not yet been received.

Antarctic Seismological Bulletin

The first of this series, for January, February and March 1962, has been published by the US Coast and Geodetic Survey; the offer to produce this bulletin was accepted at the Fifth Meeting of SCAR.

Recommendation V1. SE-1. That the Secretary convey to the United States Coast and Geodetic Survey SCAR's appreciation of the valuable work done in producing the *Antarctic Seismological Bulletin*, and congratulations on the excellent quality of the first issue.

UPPER ATMOSPHERE PHYSICS

F. Jacka (Chairman and Secretary); D. K. Bailey, S. Evans, A. Lebeau, P. H. Stoker and W. H. Ward. Other participants, not members of the group: G. Cartwright, S. Chapman, C. Collins, Miss V. Lincoln, C. G. Little, M. A. Pomerantz, F. Roach, S. Ruttenberg.

[492]

Chairman's report

In response to action taken on *Recommendation V. UA-7*, the President of IAGA has replied that the IAGA Executive have recommended the formation of a Sub-committee on Auroral Instruments and Methods of Observation. Also, "IAGA welcomes the decision made by your group that the Chairman will maintain close contact with the Association on problems of common interest, and I feel convinced that such a contact will prove of mutual benefit to our two organizations."

Review of progress

It was agreed that the group should not produce a progress report as had been done in the past. Members were urged, however, to keep the Editor of the *Polar Record* informed of new publications in order that the journal's bibliography may be comprehensive.

Joint meeting with Working Group on Geomagnetism

Distribution of alerts

Recommendation V1. UA-1. That the prompt receipt of advice of Geoalerts and Special World Intervals at Antarctic stations is desirable. Existing broadcasts from WWV/H and facilities for direct communication with home countries are considered adequate to meet requirements.

The working groups further recognize the great importance of Antarctic data to the World Warning Agency and recommend that information on outstanding geophysical events be forwarded with the highest possible priority through the existing radio communications network via McMurdo and Sydney or through any other available channels.

Conjugate point studies

Recommendation V1. UA-2. That simultaneous geophysical observations should be made on either a synoptic or short-term basis at or near geomagnetically conjugate points in the Antarctic and Arctic regions. It would be appropriate to select an existing geophysical observatory as one of the conjugate points of each pair. It may be desirable to have a small close-spaced network of stations at one or two of the selected conjugate points. A minimum of four pairs of conjugate points would be desirable (at least one being well inside, two near the maximum and one somewhat outside the auroral zone), each pair being equipped with closely comparable equipment.

A partial list of approximately conjugate points is as follows (existing stations are indicated by *):

Macquarie Island*	Kotzebue or Healy
Campbell Island*	Anchorage* or Farewell
"Syowa"	Reykjavik
"Little America"	Baker Lake
"Byrd"	Great Whale River
Île Kerguelen	Archangelsk*
Mirny	Spitsbergen
"Vostok"	Thule*
"Hallett"	68° N., 104° E.
Scott base*	68° N., 89° W.

[493]

The types of observations which might be made, and which would be of particular interest, are as follows (not necessarily in order of priority):

- Vertical incidence sounding
- Geomagnetic variations including micropulsations
- ELF and VLF emissions
- Ionospheric absorption (using riometers)
- Distribution of auroras (using all-sky cameras)
- Auroral emission at 3914 (or 4279), 5577 and 6300 Å. using zenith photometers
- Low energy particle radiations (using rocket and balloon-borne detectors)
- Neutron monitors

Ionospheric physics

Vertical incidence soundings. The meeting was advised that South Africa would be prepared to operate ionosondes at Marion Island and Gough Island if the equipment could be made available from other sources.

Forward scatter propagation. The scientific value and technical requirements of VHF forward scatter propagation studies were discussed. It was agreed that a quite specific proposal for joint action by interested parties should be formulated and a small working group was formed (with D. K. Bailey as convenor) to draw up such a proposal. Their report is presented in Annex 2.

Recommendation V1. UA-3. That the report (Annex 2) is adopted as a guide to the development of a programme of forward scatter observations in the Antarctic during the IQSY.

Riometers

C. G. Little outlined a method of determining electron density profiles in the D region from the records of several riometers operating at frequencies between 5 and 50 Mc./sec. He referred also to results obtained in conjugate point studies; in particular indicating the possibility of determining from such studies the nature of the solar control over absorption.

For ship-board operation he mentioned the difficulty of determining the quiet day curve. By using two channels on widely different frequencies, the ratio of the two records in the absences of absorption can be assumed constant.

The meeting agreed that a network of riometers in conjunction with forward scatter equipment was highly desirable for the study of morphology of ionospheric absorption during the IQSY. It was stated that riometers may now be purchased in USA for about \$2500.

Recommendation V1. UA-4. That in view of the plans of many groups to conduct riometer investigations in the Antarctic, and in order to insure maximum homogeneity of the data obtained, it is recommended that CIG be requested to prepare a requirement specification for a standardized riometer system for synoptic studies.

VLF emissions

Recommendation V1. UA-5. That in view of the value of whistler observations in investigating the propagation of VLF radiation, SCAR urges National Committees to co-operate in the implementation of requests for arranging pulsed transmissions.

Cosmic rays

The Upper Atmosphere Working Group reviewed the report of the Working Group on Cosmic Rays of the First IQSY Meeting, and, in particular, the specific reference to the need for filling the serious gaps in the neutron monitor network was endorsed. The group was informed that the Antarctic high counting rate super neutron monitor specified by the IQSY Working Group is scheduled to be installed at "McMurdo" at the end of 1963. Cosmic-ray observations which are planned for the Antarctic during the IQSY are:

Neutron monitors: "McMurdo" (Super), "Vostok", Mirny, "Dumont d'Urville", "Ellsworth", Wilkes, Mawson, "Sanae", South Pole, Îles Kerguelen.

Meson telescopes: Mawson.

Special projects: Wilkes, balloon flights; Macquarie Island, balloon flights; USNS *Eltanin*, high-counting rate meson telescopes; *RSA* (Antarctic relief vessel), neutron monitor; US "Project "Magnet" aircraft", neutron monitor and meson telescopes; "McMurdo", rocket flights and high-counting rate meson telescopes; South Pole, high-counting rate meson telescopes.

Aurora

All-sky camera for the IQSY. The group reconsidered the exposure sequence to be used by the standard all-sky cameras during the IQSY. It was felt that a 1 min. interval between exposures is too long to observe the most rapid development of an auroral display or to measure the movement of individual auroral features. On the other hand, it is much shorter than is necessary to survey the probability of occurrence of aurora. For this latter investigation, exposure durations of 2½, 10 and 40 sec. are required and it is sufficient to repeat the sequence four times per hour. The views of interested organizations not represented at the meeting are to be sought by the Chairman with a view to recommending that the 1 min. repetition interval be optional.

[The cost of film for full programme is not a trivial fraction of the cost of the whole undertaking—approximately 30 000 ft. of film are required per season for each camera.]

Standard auroral photometer for the IQSY

Recommendation V1. UA-6. That photometric measurements of intensity variations at 3914 or 4278, 5577 and 6300 Å. be undertaken during the IQSY at all Antarctic stations engaged in upper atmosphere studies.

That the measurements should be made with photoelectric filter photometers satisfying the following specifications:

- (1) Field of view less than 20° and greater than 3° diameter, axis vertical.
- (2) Recording range of intensity—less than 0.1 to more than 100 kR.
- (3) Recording schedule—at least six measurements per hour at each wavelength.
- (4) Absolute accuracy—better than 5 per cent.

Satellite studies

Recommendation V1. UA-7. That SCAR invites the appropriate United States authorities to consider the possibility of using Nimbus satellites to record the distribution of auroras on the dark side of the earth.

Analysis of data

The group has formulated specific proposals for standardization of instruments and observing procedures in connexion with a number of projects planned for the duration of the IQSY. An important aspect of these projects is the study of synoptic data from the whole network of stations. Such studies could most effectively be carried out by small (two to four) groups of named individuals. Such "Study Groups" would be responsible for the effective analysis and interpretation of data which can lead to the publication of research papers and for recommendations on further experiments.

A tentative list of participants in the proposed study groups were proposed and will be published when confirmed.

Recommendation V1. UA-8. That the International Geophysical Data Centre of the Science Council of Japan be invited to prepare and publish synoptic maps of auroras recorded with all-sky cameras during IQSY in the Antarctic.

Presentation of auroral data. The Chairman was instructed to communicate to the IQSY Committee the text of the SCAR IV recommendation published under the title "Auroral and airglow physics" part (b) in *SCAR Bulletin*, No. 7, p. 95.

ANNEX 2

Report of the Special Working Group on Forward Scatter Observations in the Antarctic during the IQSY

The Fifth Meeting of SCAR, and the subsequent First IQSY meeting in Paris, recommended that ionospheric forward scatter observations be made in the Antarctic in addition to, and usefully supplementing, riometer observations. The purpose of the following report is to review the objectives and provide a guide for such observations.

Objectives

Cosmic rays. The main object of a programme of ionospheric forward scatter observations in the Antarctic is to detect distinct solar cosmic ray emission events, and to investigate their spectral, geographical and temporal variations. Ionospheric forward scatter observations provide continuous monitoring at fixed locations of the flux of protons and heavier nuclons in an energy range not accessible to other techniques. In particular, the combination of a forward scatter programme with a neutron monitor programme permits complete coverage of the energy spectrum of solar-produced cosmic rays from a few MeV. upwards. Although riometers detect ionization resulting from incoming solar particles in the same general energy range as forward scatter observations, the interpretation of riometer observations from the solar cosmic ray viewpoint is complicated by the additional response of riometers to auroral ionization and solar radio noise. Forward scatter signals do not exhibit absorption effects associated with auroral phenomena. Thus, for example, at or near the auroral zone, records of forward scatter signal intensity show no confusing effects

[496]

associated with the onset of geomagnetic storms, and hence permit the continued study of the decay in intensity of incident solar cosmic rays in the period after the onset of a magnetic storm. For this reason, appropriately situated forward scatter links provide means for observing geomagnetic cut-off reduction effects.

Disposition of station-pairs

To accomplish the objects discussed above, several scatter links are proposed. Since it is possible that impact zone effects for low energy solar cosmic rays may occur within the polar cap, and be particularly marked during periods of low solar activity, as complete coverage as practicable is indicated. In considering a possible link two geographical conditions must be satisfied:

(1) The separation between transmitter and receiver should be between about 1000 and 2000 km.

(2) The topographic features in the vicinity of each terminal must be suitable for the propagation path.

Subject to satisfying local topographic and logistic requirements links between the station pairs, shown on p. 498, are needed.

Equipment

In order that the Antarctic scatter links may be particularly sensitive to the very small, but highly interesting, solar cosmic ray events occurring at the minimum phase of the solar cycle, the equipment proposed below departs significantly in several characteristics from that previously employed in the Arctic. Since the proposed Antarctic links are solely intended for scientific observations, the transmissions are in one direction only. Furthermore, the transmitter power levels and receiver band widths are significantly reduced, thus effecting considerable economy. Finally, the operating frequencies are substantially lower than those which would be appropriate for observing the large solar cosmic-ray events which appear to occur only during periods of moderate and high solar activity. In this way the sensitivity will be significantly increased, thereby permitting the detection of a much lower flux of low-energy solar-produced cosmic rays than hitherto.

The following characteristics for the scatter links are specified:

Frequency	20 to 25 Mc./s. (preferably between 22 and 24 Mc./s.)
Frequency stability	Maximum system detuning not to exceed 2 c.p.s. per day, or not more than about $\frac{1}{2}$ part in 10^7 per day at each end
Emission	Continuous wave
Antennas	Single 5 element Yagis cut to assigned frequencies and erected at a height correct for local foreground topography and for length of link (assuming 85 km. scattering height)
Transmitter power output	500 W. (to be monitored)

[497]

Path mid-point		Path length (km.)	Lat. (deg.)	Long. (deg.)	Geomag. lat. (deg. S.)	Vertical cut-off rigidity† (bv.)	Proton energy (Mev.)
Transmitter	Receiver						
South Pole	Halley Bay	1612	82.7 S.	26.9 W.	73	< 0.5	< 180
"Byrd"	South Pole	1113	85.0 S.	120.0 W.	75	< 0.35	< 60
"Byrd"	"McMurdo-Scott"	1440	81.1 S.	160.9 W.	72	< 0.1	< 5
"Dumont d'Urville"	"McMurdo-Scott"	1493	72.6 S.	149.0 E.	79	< 0.001	< 0.0005
Wilkes	"Dumont d'Urville"	1805	67.3 S.	125.2 E.	78	0.0082	0.04
"Dumont d'Urville"	"Hallett"	1310	70.2 S.	152.9 E.	76	0.012	0.08
"Dumont d'Urville"	Cape Adare	1290	69.7 S.	153.4 E.	75	0.015	0.11
Macquarie Island	"Dumont d'Urville"	1680	60 S.	153 E.	67	0.147	11
"Dumont d'Urville"†	Campbell Island	2200	60.5 S.	157.6 E.	66	0.164	16
"Hallett"†	Campbell Island	2110	62 S.	170 E.	65	0.232	21
Cape Adare	Campbell Island	2000	61.5 S.	170 E.	65	0.240	22
Hobart	Macquarie Island	1550	49 S.	153 E.	56	0.99	420
South Pole	"Vostok"	1285	84.2 S.	106.8 E.	85	< 0.001	< 0.0005
"Vostok"†	Mirny	1380	72.6 S.	97.6 E.	82	< 0.001	< 0.0005
"Vostok"†	"McMurdo" - "Scott"	1277	79.7 S.	137.6 E.	83	< 0.001	< 0.0005
Mawson	Îles Kerguelen	2030	59 S.	67 E.	66	0.47	120
Mawson	"Syowa"	967	68.7 S.	51.6 E.	72	0.245	24
Wilkes	Mawson	2000	68.8 S.	87.1 E.	79	0.045	1.1

Although essentially identical data would result from transmission in either direction, there are logistic or special technical advantages to operation in the direction implied by the first two column headings.
 † According to J. J. Quenby and G. J. Wenk, Cosmic ray threshold rigidities and the earth's magnetic field, *Philosophical Magazine* (in press), 1962.

‡ No clear arguments available as to more desirable direction of transmission over path.

Receiver bandwidth	40 c.p.s.
Recorders	Pen and ink type with mechanical drive, time constant, 30 sec., chart speed, 3 in. per hour
Calibration	A suitable signal generator to be provided; in addition provision for automatic periodic interruption of transmission should be made to permit observation of background noise level as a part of the calibration procedure. Time should be known at all times on the recordings to within 30 sec.
Reliability	Unattended operation for a period of one day should be standard; little loss in quality of observations should be tolerated, even in event of emergency unattended periods of as much as three days
Power demands	Transmitter, 1 kW. (including voltage regulator). Receiver, 500 W. (including voltage regulator)
Space required	One rack each for receiving and transmitting installations

Co-ordination of Antarctic forward scatter project activities

As the project for ionospheric forward scatter observations in the Antarctic during the IQSY involves station pairs not always under the operational control of one nation, there will arise needs for direct and rapid exchange of information concerning plans and activities of several nations that may contemplate taking part in the project.

In order to formalize this need, it is recommended that:

1. The SCAR National Committees of each nation intending to participate in the scatter project shall designate a representative to be responsible for providing to the other representatives so designated, and receiving from them, information and assistance necessary for the efficient establishment of the project.
2. The National Committees of the nations concerned will notify the Secretary of SCAR of the name of their representative. The Secretary will then circulate the list of such representatives to the other committees concerned.
3. To facilitate the work of establishing the project, the designated representatives shall deal directly among themselves as appropriate, sending copies of their correspondence to the Secretary of SCAR.
4. In the event of a need arising for a direct meeting of representatives designated above, the Secretary of SCAR shall make the necessary arrangements.

SCAR SYMPOSIUM ON ANTARCTIC BIOLOGY

PARIS, 2 TO 8 SEPTEMBER 1962

The Symposium was extremely well attended, and over 60 papers, ranging from "background" reviews of work already accomplished to reports of work in progress and projected, were delivered. Extensive and lively discussions

were a feature of most of the thirteen main sessions, and these often continued on an informal basis long after the closure of the meetings. The resulting interchange of views and establishment of personal contacts between biologists directly concerned with Antarctic problems was agreed to have been of the greatest value. It was evident that the work so far accomplished was little more than a beginning in what should prove a long and rewarding research programme. The need to establish good laboratory facilities at a number of Antarctic stations was emphasized, as was the desirability of encouraging more senior research workers to visit the region for summer seasons. Competent taxonomic studies of a number of animal and plant groups were recognized as a fundamental preliminary requirement, before many detailed ecological programmes could be undertaken profitably. Since the food chains supporting the vast majority of Antarctic animals begin in the sea, it was agreed that more attention should be paid to marine biology and oceanography, and that quantitative productivity studies were greatly to be desired. Finally, it was apparent that the flora and fauna of Antarctica could not properly be studied without a parallel consideration of those of the sub-Antarctic belt, the Southern Ocean, and the southern temperate mainlands. During the concluding session some practical steps for improving international co-ordination of research and facilitating the interchange of data were discussed, and these matters were taken up more fully by the SCAR Working Group on Biology, which met after the symposium. The proceedings of the meeting are now being edited and will be published in co-operation with Expéditions Polaires Françaises; they should appear in the summer of 1963.

The following abstracts of papers read at the Symposium were not printed in *SCAR Bulletin*, No. 12, 1962:

Session 2. Medical research

TITLE: A study of ethnic differences in physiological reactions during acute exposure to cold, and of adaptation of one ethnic group on longer exposure.

AUTHORS: C. H. Wyndham, Department of Physiology, University of Witwatersrand, Johannesburg and the Applied Physiology Laboratory, Transvaal and Orange Free State Chamber of Mines, Johannesburg; and R. Plotkin, Medical Officer to the South African Antarctic Expedition, 1961.

It is suggested that a study of thermoregulatory reactions over a range of air temperatures, say 27° to 5° C., is more informative than one over a single air temperature in the evaluation of ethnic differences in reactions to a short, acute exposure to cold, and also to a possible cold acclimatization effect. Hardy and du Bois, for example, showed that vasomotor regulation of tissue conductance is the major determinant in thermal balance over a narrow range of 28° to 30° C.; below this range metabolism increases and maintains thermal balance until an air temperature is reached where metabolism is maximal, due to shivering, but it still does not balance heat losses. Vasomotor regulation, metabolic regulation and losses of stored heat should be looked for, optimally, at different air temperatures and this is the basis of the range of air temperatures proposed.

Twelve Bantu, natives of South Africa, and twelve Caucasians, all young adults, were exposed at each of a number of temperatures between 27° and 5° C. for two

hours in the post-absorptive state during which time metabolism, and rectal and body surface temperatures were measured at half-hourly intervals. Metabolisms were plotted against air temperatures and the "best-fit" curve has an exponential function. The best-fit curves for rectal temperatures, hand and foot temperatures and average skin temperatures were parabolic functions. By calculating 78 per cent limits to the best-fit curves for the two ethnic groups one can say that, where the limits are separated, one is 95 per cent sure that the curves are significantly different. On this basis, the metabolic responses of the two ethnic groups over this range of air temperatures were not significantly different. Average skin temperatures of the Bantu were significantly higher than those of the Caucasians below 10° C. and rectal temperatures were significantly lower below 17° C. These findings are different from those of Adam and Covino and Iampetro *et al.* who compared Negroes and Caucasians at 17° and 10° C. respectively. Differences in acculturation of the Negro and the Bantu might be the reason for the difference in results.

A group of six young Caucasians were exposed to the same range of air conditions before departure to Antarctica on a one-year stay, and again at six-monthly intervals during their sojourn. Working conditions there require intermittent exposure to cold air conditions when going outside. The outstanding result of this study is that, while before departure for the Antarctic there was no difference in the curve of metabolism plotted against air temperature from that of the control Caucasian group, after six months there a significant change was shown. At 27° C. metabolism was the same as that in the initial study, but at air temperatures below 27° C. it was significantly less. Rectal temperatures were not changed but average skin temperature, and that of the hands and feet, were higher after some months in Antarctica. These findings are in agreement with those of Le Blanc and with Rodahl *et al.* They also show that the alternation in metabolism is not a shift of the whole metabolism curve downwards but rather that it rotates around an axis at 27°, where metabolism is unchanged, to assume a lower slope. These physiological reactions are associated with a progressive stripping off of heavy winter garments until ultimately the men were comfortable running about naked in the snow for short periods when the wind was low. The threshold of discomfort in cold had undoubtedly changed over this period.

Bushmen in the Kalahari Desert are also subject to intermittent exposures to cold; at night, during the winter, it freezes but during the day air temperatures are in the 25° C. range. Bushmen studied over a similar range of air temperatures, 20° to 3° C., did not show any significant difference in metabolism from that of the Bantu control group. Skin temperatures and rectal temperatures were also similar, but tended to be lower, at 10° to 5° C.

In our view, the form of adaptation observed in the Caucasian in the polar regions is not acclimatization—if by acclimatization is meant an alteration in physiological reactions towards a restoration of homeostasis. It is merely as an accustomization, or change in threshold, to cold. We are in disagreement with Scholander *et al.*, therefore, on their interpretation of their data on the Australian Aborigine. They report a failure to increase metabolism and a fall in rectal temperature and of skin temperatures during exposure in a sleeping bag on a cold night. As we see it, this is merely a measure of the ability of the Aborigine to sleep deeply under conditions of cold discomfort which would penetrate the consciousness of the Caucasian and cause him to shiver. They are, in our view, measuring the physiological reaction to different depths of sleep in the two groups under conditions of cold; this is not an acclimatization phenomenon.

Session 4. Biogeography and systematics—Botany

TITLE: Problems and progress in Antarctic bryology

AUTHOR: S. W. Greene, Department of Botany, University of Birmingham.

Although the presence of bryophytes in the Scotia Arc–Graham Land sector has been known since the visit of Eights over 130 years ago, knowledge of the taxonomy and distribution of this group of plants in Antarctic regions is still very defective. No assessment is available of the total flora from the sub-Antarctic zone and such a list for the Antarctic zone has only recently been published. The taxonomic status of many of the reported species is in doubt, either due to the inadequacy of existing description or to the suspicion that many of the "new species" ought to be treated as synonyms of existing taxa.

Field work in South Georgia has added many species and genera to the island's flora, e.g. *Sphagnum fimbriatum*. Revision work on the genus *Tortula* has resulted, amongst other changes, in the reduction of *T. rubra* to the status of a synonym of *T. robusta* and the addition of *T. serrata* to the South Georgia check-list.

Although the fruiting of mosses has been reported as rare in the area, provisional results from a study of the reproductive behaviour of *Polytrichum strictum* suggest that this moss is capable of completing its life cycle on South Georgia.

Field survey elsewhere in the Scotia Arc–Graham Land sector has revealed the presence of a considerably richer bryophyte flora than previously suspected, and material has been obtained of many genera and species not previously reported from the Antarctic zone.

Session 7. Marine productivity

TITLE: The phytoplankton and marine productivity in some inshore waters of Antarctica

AUTHOR: Dr J. S. Bunt, School of Agriculture, University of Sydney.

An account is given of studies carried out in two sectors of Antarctica: Mawson in Mac.Robertson Land and "McMurdo" base in the Ross Sea area; the former covering the period from June 1956 to February 1957, and the latter, part of the summer of 1961–62.

At Mawson, regular measurements were taken throughout the water column of temperature, chlorinity, dissolved phosphates, dissolved oxygen, pH, Eh, and buffer capacity. Two stations were occupied, one in 25 m. and one in 100 m., both close inshore. Some measurements were made of total submarine radiation. Regular estimations were made of photosynthetic pigments. Total counts and identification of phytoplankton organisms were made from continuously centrifuged water samples. Material taken in net hauls was used for taxonomic study. Nets were used, mainly in vertical hauls, for sampling zooplankton.

At McMurdo Base, attention was focused upon the measurement of marine productivity using ^{14}C techniques, the determination of extractable pigments and the estimation of phytoplankton populations by direct counts.

In discussing the results obtained, attention is focused upon the nature of the phytoplankton populations, their distribution in time and spatially within the water masses, and upon the primary productivity of the waters under consideration. An attempt was made to assess the influence of hydrological and other conditions of the environment upon the phytoplankton and its activities.

Results obtained in the two sectors are compared. The need for more extensive studies in this region is stressed.

TITLE: Studies on southern stock of Blue and Fin Whales

AUTHORS: A. Jonsgård and J. T. Ruud, Institutt for Marin Biologi Avd. a og Statens Institutt for Hvalforskning, University of Oslo.

The Bureau of International Whaling Statistics collects biological and statistical material relating to the operations of all nations participating in Antarctic whaling.

Technical improvements in whale-catching vessels have largely counterbalanced the expected decrease of the Antarctic stocks of whales, and the over-all catch per catcher per day was fairly regular and constant over a long series of seasons up to and including 1958–59. During this period there was, however, a marked decline in the relative numbers of Blue Whales taken. In the aggregate catches of Blue and Fin Whales, Blue Whales have declined from about 80 per cent in the early thirties to less than 5 per cent in recent seasons. With some qualifications, it is generally agreed that this reflects a serious decline in the stock of Blue Whales. The returns of the industry have been kept at level only by a considerably greater taxation levied on the stocks of the smaller species, the Fin Whale, which in turn shows sign of depletion. The catch per unit of effort, calculated as Blue Whale units per catcher per day (1 Blue Whale = 2 Fin Whales) declined from 0.94 in 1958–59 to 0.73 in 1959–60, to 0.68 in 1960–61 and to 0.51 in 1961–62.

TITLE: Primary productivity studies on Antarctic ponds and lakes

AUTHOR: C. R. Goldman, Department of Zoology, University of California.

The flora and fauna of Antarctic fresh waters are subject to severe climatic restrictions. The primary producers in ponds have their growing season limited to a short period of summer melt; this compression of the aquatic productivity makes it possible to study the entire annual production in a few weeks.

The high sensitivity of the ^{14}C techniques was utilized for measuring photosynthetic rates of both periphyton and phytoplankton in this study. Productivity in the littoral melt zone of the lakes in the "dry valley" area of Victoria Land was appreciably higher than that recorded beneath the ice. The limited phytoplankton population under almost 4 m. of ice in these lakes is adapted to low light intensity. Evidence of nitrate deficiency was found in the littoral zone of Lake Vanda. Algal growth at Cape Evans, Ross Island, was severely inhibited by high light intensity during the middle of the Antarctic summer. Samples of phytoplankton which were protected from 80 per cent of the incident light by neutral density filters had higher rates of carbon fixation than did samples which were less shaded.

The nesting skua population was found to be contributing appreciable quantities of organic nitrogen and salts to one lake. The abundance of the birds and a measurable change in the salt concentration associated with their activity is believed to influence the melting and primary productivity of the lake.

Session 9. Ecology of vertebrates

TITLE: Behaviour studies on Antarctic animals

AUTHOR: S. J. J. F. Davies, Sub-department of Animal Behaviour, University of Cambridge.

The influence of the selective pressures imposed by the harsh Antarctic environment is reflected in the behaviour of the animals that live there just as clearly as it is in their ecology. The large proportion of socially breeding birds and mammals, and the high degree of synchrony during each phase of the breeding cycle, which these colonies maintain within themselves, may be cited as examples.

Although little quantitative or experimental behaviour study has been carried out amongst Antarctic animals, the large size of the colonies, the number of breeding populations of known age which are already available, and the remarkable tameness of the animals suggest that the fauna would make excellent material for certain types of behaviour study.

Recent studies have suggested a correlation between the breeding activities of seals and the hormonal conditions of the animals at successive phases of the breeding cycle; the Antarctic mammal populations seem to provide good material for work in this field. The penguins, on the other hand, appear to be suitable for the quantitative study of the causation, ontogeny and seasonal maturation of specific behaviour patterns, for example display postures and nest-building behaviour.

TITLE: Southern seals and sea-birds as subjects for ecological research

AUTHOR: R. Carrick.

1. Mammal and bird species vary widely in regard to suitability for study in the field; ideally, choice of species is determined by the aims of the research, which may be:

(a) To establish ecological principles in the general field of population regulation

This involves data on distribution, use of habitat, life-cycle (accurate information on this is the essential basis for quantitative study), social organization, seasonal movements, age/sex structure of population, fluctuations in numbers/structure through natality and mortality, proximate/ultimate causes of mortality (food, predation, disease, etc.); also data on physical/biological environment.

Fundamental studies in population ecology are long-term; difficulties of continuity, and high costs, have to be balanced against freedom from human interference and opportunity to study entirely natural situations. To justify study, southern species should provide better data or unique examples not obtainable elsewhere. A major problem in factors regulating numbers of seals and sea birds is their dependence on food in the sea, where the significant mortality occurs. Co-ordinated terrestrial and marine research are essential.

Attributes of species that facilitate field study are their size, abundance, visibility, approachability, ease of capture and marking, sex and age distinction, constancy of location, and longevity. Marking is usually necessary, preferably individually and identifiable without recapture, to evaluate emigration/immigration and individual variation. Feeding habits, and the possibility of measuring available food and obtaining specimens and observations throughout the year, are important. Opportunities for field experimentation are desirable.

(b) To investigate adaptations to Antarctic conditions

Studies with ecological/physiological/behavioural components, such as the seasonal timing and synchrony of breeding, incubation, onset of maturity, social organization of breeding, moult, etc., are possible on Antarctic and sub-Antarctic species not suitable for wider population study. Comparative study at optimal and marginal locations is profitable.

(c) To obtain information on particular species because of scientific interest, economic importance, etc.

When the species is predetermined, data commensurate with its suitability for study have to be accepted. Comparison of exploited and unexploited populations is useful.

2. Antarctic and sub-Antarctic species of seals and sea birds are considered as subjects for ecological research, in the light of studies already done and of the author's experience with the Elephant Seal, *Mirounga leonina*, and the Royal Penguin, *Eudayptes chrysolophus schlegeli*.

TITLE: Submarine biological diving at Îles Saint-Paul and Nouvelle Amsterdam

AUTHOR: P. Grua, Station Biologique de Roscoff, Finistère.

The research possibilities and safety precautions for submarine observation are discussed, after a four-month stay at these islands. Faunistic study by diving methods is being developed in several countries; in France this technique is now being applied to scientific research.

At Îles Saint-Paul and Nouvelle Amsterdam the clear water and summer sun give a luminosity comparable to the centre of the Mediterranean Sea. Even in fine weather there is a long swell, and there is most disturbance of water on the west coasts. The wind can rise rapidly. Currents are present at all stages of the tide. Dangerous animals (*Thyrstites atun*, *Orca gladiator*, sharks, etc.) and giant seaweeds (*Macrocystis*) occur in deeper water at a distance from the shore. The bottoms accessible to the diver, up to 20 m. deep, are widely representative. Access to the shore from the land is very limited, and a motor boat is required. Île Saint-Paul, 50 miles south of Nouvelle Amsterdam, is uninhabited and a camp is necessary.

The biologist-diver operating in such unfamiliar waters must have experience and self-control. The technique is not the most important element, but rather the psychological feeling of security felt by the diver. This depends on sound nervous and physical condition.

There must be one person on the surface, in a boat or on the shore nearby. When alone, it is not safe for even an experienced diver to go deeper than 10 or 15 m. Morale decreases with depth and visibility, and at greater depths a companion is necessary.

Cold is no problem, even in icy waters, with modern equipment. The only essential precaution is to isolate the aqualung cylinders with isothermic neoprene, as the air delivered is cooled by depression.

TITLE: Comparative biology of Antarctic seals

AUTHOR: R. M. Laws, Queen Elizabeth Game Park, Uganda.

Outline of evolution of Antarctic phocids from small Arctic and Northern Hemisphere species to large Antarctic species.

Discussion of present distribution and ecology, with comparisons.

Comparisons and contrasts with Arctic seals—pelagic and coastal species, feeding specializations, no bottom feeders, populations, ecological specialization and geographical isolation, beginnings of speciation.

Annual cycles, delayed implantation, growth rates and longevity.

Brief mention of exploitation of Elephant Seals at South Georgia and prospects of exploitation of other species.

Session 11. Conservation

TITLE: Conservation of the Antarctic fauna

AUTHOR: R. C. Murphy, American Museum of Natural History, New York.

The Antarctic air-breathing fauna exists on a marginal basis of stability because of the extreme climatic severity and the fact that food all comes from the sea.

Unfavourable weather frequently renders prey inaccessible, which heavily weights the hazards against offspring of both birds and mammals. Among most Antarctic

animals, annual replacement is only a single young per adult pair, and immature mortality is so high that lack of reproductive success is statistically "normal".

On the other hand, viability and life-expectancy seem to be exceptionally good for animals past their vulnerable infancy. Quantitative examples of this are presented.

Since, despite the known rigours, many Antarctic animals achieve extraordinarily large populations, why has conservation of the fauna suddenly become of grave concern?

The answer is that Man is a wholly new type of interloper in a long-isolated field of perhaps uniquely specialized adjustment and sensitive equilibrium. Examples are given of how unwittingly and rapidly he has caused unfavourable changes. Means for bettering the situation are quoted and suggested.

TITLE: Problems of conservation in and around the Southern Ocean

AUTHOR: Robert Carrick.

Antarctic and sub-Antarctic life is broadly divisible:

(a) purely terrestrial forms such as lichens, vegetation, invertebrates and a few land vertebrates.

(b) Marine forms, and the sea-birds and seals that breed on land but feed at sea.

Conservation takes into account man's need to utilize living resources but not over-exploit them, and also the need to retain variety in nature. Measures include:

(1) Preservation of terrestrial habitats and breeding areas.

(2) Rational utilization of whales, seals, sea-birds and plankton at levels and by methods that will maintain adequate breeding stocks for economic, scientific and cultural purposes.

International agreement on measures is essential to prevent over-exploitation, to define sanctuary areas, and to avoid impairment by individuals and parties.

International co-operation and considerable increase in research on many aspects of Antarctic and sub-Antarctic life is required before intelligent conservation is possible.

The papers by the following authors, of which abstracts were published in *SCAR Bulletin*, No. 12, were not read at the symposium:

Session 2: A. R. Behnke; Session 3: W. L. Boyd, G. H. Meyer; Session 4: F. Drouet, W. C. Steere; Session 5: K. Brodskiy, A. P. Andriyashev; Session 7: P. K. Burkholder; Session 9: R. Novatti.

SCAR ANTARCTIC LOGISTICS SYMPOSIUM

BOULDER, 13 TO 17 AUGUST 1962

The following papers were presented to the Symposium:

Section 1. Science and logistics

A. P. Crary. The changing concept of Antarctic science
J. J. la Grange. The requirements and nature of the logistic support for a small national Antarctic expedition

P. A. Siple. Symbiosis of Antarctic scientific and logistic operations
P.-E. Victor. Changing aspects of Antarctic logistics

[506]

Section 2. Air operations

W. J. Cranfield. The operation in Antarctica of light aircraft by the RNZAF
R. Dalton. The operation of Beaver aircraft by ANARE

R. Dalton. The equipping of a Beaver aircraft for research expeditions
J. H. Greene. Operation of turbine engine helicopters in the Antarctic

M. D. Greenwell. US air operations in Antarctica

M. Itoh and S. Watanake. Report on aircraft operations of JARE

P. Law. Mooring aircraft in Antarctica against strong winds

P. E. Margalot. Argentine flight to the South Pole, 1961-62

E. H. Moser. Ice and snow runways

Section 3. Buildings

S. Awano and S. Maita. Cold- and hot-water making equipment utilizing the exhaust-gas energy of diesel engines coupled with electric generators

J. Ballantyne and J. Nisbet. A light-weight portable hut for field use

J. G. Davies. Heating, ventilation and mechanical sciences; Scott Base, Antarctica

H. Futami, A. Minow and N. Hida. Design and construction of buildings at "Syowa"

D. A. P. Giovannini. Living in a station in very low temperatures

D. A. P. Giovannini. Design for house in a zone of extreme cold

N. Hida. Problems in the erection of buildings in the Antarctic regions

J. J. la Grange. The requirements and nature of the logistic support for a small national Antarctic expedition. B. Buildings

H. G. Lewis. Designs for Antarctica

W. F. Ponder. Fire security in design of Antarctic buildings

L. G. C. E. Pugh. Portable prefabricated laboratory

SAEAE. Report on new base erected in Dronning Maud Land

R. P. Schmitt and R. Rodriguez. Glacier water supply and sewage disposal systems.

F. A. Smith. An economical snow melting and central-heating system

G. D. P. Smith. An incinerator latrine

G. D. P. Smith. Sea water for fire-fighting in Antarctica

Soviet papers. Buildings and installations of the Soviet Antarctic expedition

Fuel supply of Soviet Antarctic stations, and precautions

Cleanliness of buildings of Soviet Antarctic stations

Behaviour of basic materials at low temperatures

Anti-fire measures in Soviet Antarctic expedition

D. F. Styles, A. M. Brown, G. P. D. Smith and Z. Lukinovic. Australian design and construction of Antarctic buildings

Bureau Technique, EPF. Igloo (plastic polar building)

Section 4. Vehicles

Bureau Technique, EPF. Medium-weight transport facilities of EPF

L. Hedges and F. Jacka. A simple design for a portable catamaran

[507]

- E. J. Hird. The 557 HF polar sledge radio set
 S. Maita. Dieselization of the snow car and the electric generator for JARE
 F. Mason. Communications problems in Antarctica
 M. Murayama. Report on field operations JARE
 M. Murayama and S. Maita. Vehicles designed for, and used in, JARE, 1956-62
 N. R. Smethurst. The economics of a D-4 tractor train traverse
 F. A. Smith. Land vehicles, ANARE
 (1) Performance of D-4 tractors on plateau traverses
 (2) The Sno-trac, a useful scout vehicle
 (3) The design of field caravans

Section 5. Antarctic provisioning

- D. P. Balza. Antarctic provisioning
 H. P. Black. A blizzard visor for improved vision
 Bureau Technique, EPF. Packing for airdrop
 Bureau Médico-Physiologique, EPF. Notes on "Antar" and "Astrolabe" tents
 V. E. Donnelly. Dog pemmican
 A. J. Heine. Man ration scales for dog- and man-hauling field parties
 A. J. Heine. Field clothing for Antarctic use
 F. Jacka. A light-weight insulating field mattress
 P. G. Law. The ANARE pocket medical kit
 P. G. Law. The use of woollen garments in Antarctica
 P. G. Law and F. McMahon. The organization of supplies for an Antarctic station
 P. G. Law and F. McMahon. The ANARE field ration pack
 H. E. Lewis, A. B. E. de Jong and J. M. Harris. British sledging rations: recent developments 1962
 F. McMahon. The ANARE uniform
 R. A. Millington. Psychological responses to cold
 M. Murayama and T. Matsuda. Report on field ration of JARE
 J. Rivolier. EGIG rations
 T. Torii. Textile goods used in JARE, 1956-62

Section 6

- L. D. Bridge. Search and rescue procedure and safe practice in Antarctica
 V. E. Fuchs. Some aspects of tractor performance
 A. J. Heine. Base transport problems
 G. W. Hawman. Logistics of ice cap surface transportation
 Service Operations, EPF. Operational plan of the International Glaciological Expedition in Greenland
 Service Operations, EPF. Notes on ice-drop technique on an ice cap
 Soviet paper. Ground transport of Soviet Antarctic expeditions
 T. Yoshino. A navigation system for straight steering on the Antarctic plateau.

Abbreviations

ANARE	Australian National Antarctic Research Expeditions
EGIG	International Glaciological Expedition to Greenland
EPF	Expéditions Polaires Françaises
JARE	Japanese Antarctic Research Expeditions
SANAE	South African National Antarctic Expeditions

THE CARTOGRAPHIC ACTIVITIES OF SCAR

BY B. P. LAMBERT*

The first step towards a comprehensive and co-ordinated topographic mapping programme for the Antarctic was taken at the Second Meeting of SCAR in 1958, where the formation of a Working Group on Cartography was approved.

The working group came into being at the Third Meeting of SCAR, 1959, with G. R. Laclavère (France) as Chairman and B. P. Lambert (Australia) as Secretary; it has subsequently met at the Fourth Meeting, 1960, and at the Fifth Meeting, 1961, where the name of the group was changed to that of "Working Group on Geodesy and Cartography".

At each meeting the group has made recommendations which have been formally approved by SCAR and published in various issues of *SCAR Bulletin*.¹

Accurate topographic maps are a requirement of most sciences within the SCAR framework; therefore, since its inception SCAR has stressed the need for adequate map coverage of the Antarctic as a whole and particularly of all areas of ice-free rock and other identifiable detail. In the fulfilment of this requirement SCAR has asked for full co-operation between member nations.

A set of standard symbols for use on Antarctic topographic maps was drawn up from the proposals of member nations and has been approved by SCAR. These standard symbols have been distributed in published form.²

The Secretary of the working group has published, on behalf of SCAR, a catalogue of topographic maps, aeronautical charts and hydrographic charts of the Antarctic published by member nations. The catalogue is kept up-to-date by periodical lists of new maps and revised editions.³

The topographic mapping activities of SCAR member nations before and after the formation of the Working Group on Geodesy and Cartography are shown on the accompanying index maps.† Hydrographic charts and aeronautical charts have not been included, but considerable work has been done in those fields of cartography.

Much of the mapping completed to date has been compiled from photography controlled by ground surveys. The photographic coverage is wide-

* Secretary, SCAR Working Group on Geodesy and Cartography.

† Noewegian maps of the section between lats. 71 and 73° S., and longs. 0 to 3° E. were published in 1962. *Ed.*

spread, and it can be said that the relatively small areas unexplored by land or air are practically featureless.

A variety of techniques have been used over the years for mapping control: sledge-wheel and compass traverses, astro-fixes, triangulation and, more recently, electronic distance measuring equipment. Now, the possibility of using artificial satellite observations for the determination of geodetic positions is being investigated.

References

- ¹ *SCAR Bulletin*, No. 3, 1959, p. 30-31; No. 7, 1961, p. 87; No. 10, January, 1962, p. 140-41.
- ² *Standard symbols for use in topographic maps of Antarctica*. Secretary, SCAR Working Group on Geodesy and Cartography, Division of National Mapping, Canberra, 1961.
- ³ *Catalogue of topographic maps, aeronautical and hydrographic charts of Antarctica*. Secretary, SCAR Working Group on Geodesy and Cartography, Division of National Mapping, Canberra, 1961.

ANTARCTIC METEOROLOGICAL OBSERVATIONS, 1960

The following Soviet observations have been reported in addition to those shown in *SCAR Bulletin*, No. 11, 1962, p. 158:

Mirny: pilot balloon; net radiation; illumination; duration of sunshine; total ozone; surface ozone; blowing snow; snow surface temperature; sub-surface temperature profile; snow crystals; radioactivity of atmosphere; radioactivity of precipitation; CO₂ content of atmosphere; chemical analysis of precipitation; atmospheric; sea ice observations.

"Lazarev": pilot balloon; diffuse radiation; net radiation; illumination; duration of sunshine; snow surface temperature; sub-surface temperature; radioactivity of atmosphere; CO₂ content of atmosphere; atmospheric; sea-ice observations.

"Vostok": diffuse, terrestrial and net variations; duration of sunshine; snow accumulation; snow surface temperature, sub-surface temperature.

All the above observations were taken throughout the year.

"Pobeda" (lat. 64° 39' S., long. 98° 54' E.); "Mir" (lat. 65° 45' S., long. 92° 20' E.) and "Druzhba" (Zavodovsky Cupola, lat. 66° 43' S., long. 86° 24' E.): surface, radiosonde; direct solar and all-sky radiation; diffuse, terrestrial and net radiation during the period May to August. In addition, at "Pobeda", snow accumulation, snow surface temperature and sub-surface temperature profile were observed.

"Mountain camp I" (lat. 71° 40' S., long. 9° 32' E., altitude 1820 m.): surface and snow surface temperature profile during the period June 1959 through January 1960.

"Mountain camp II" (lat. 71° 47' S., long. 5° 49' E., altitude 1640 m.): surface during the period January to November 1961.

"Mountain camp III" (lat. 72° 33' S., long. 1° 16' E., altitude 1510 m.): surface during the period November 1960 to 1 January 1961.

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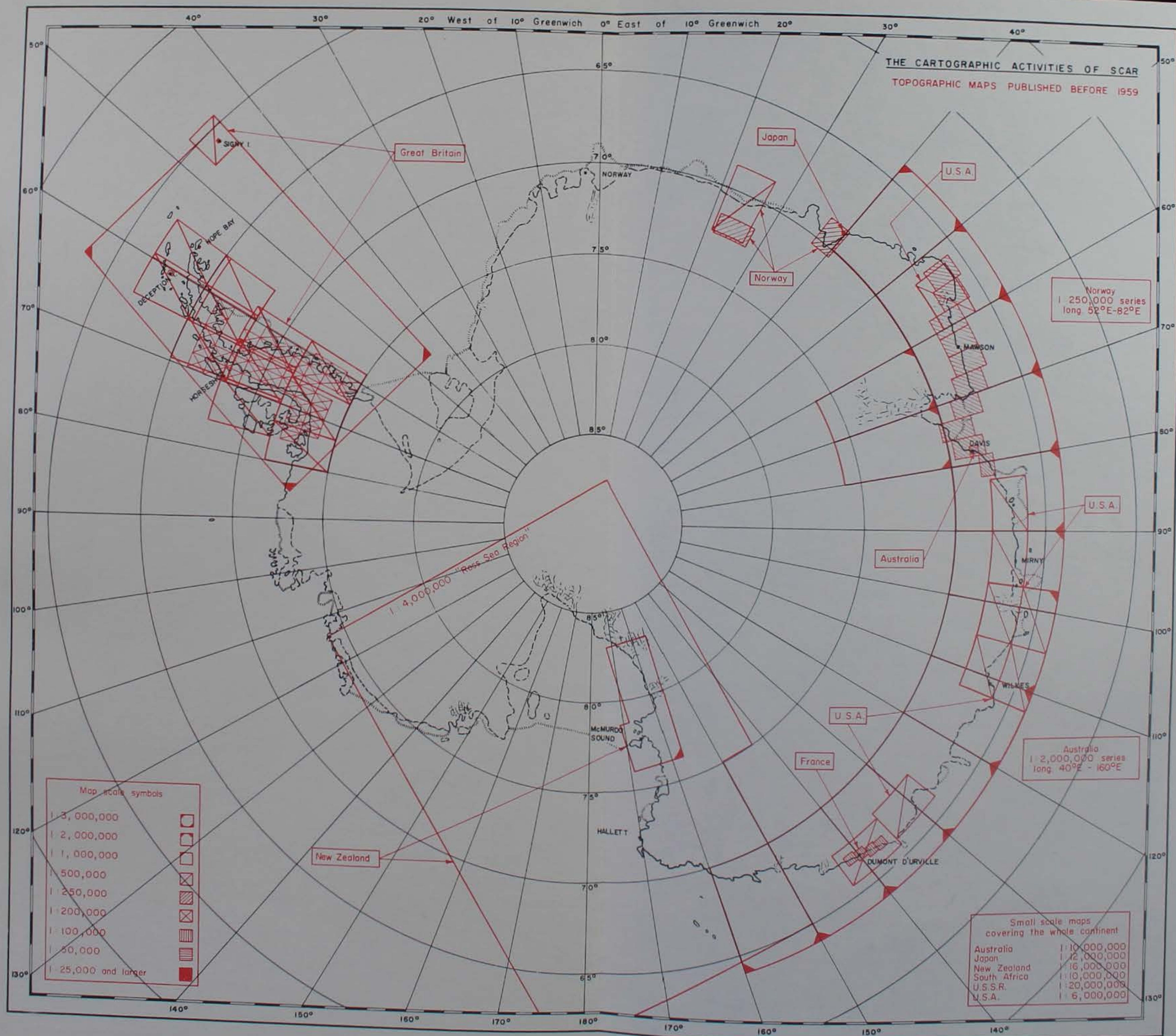
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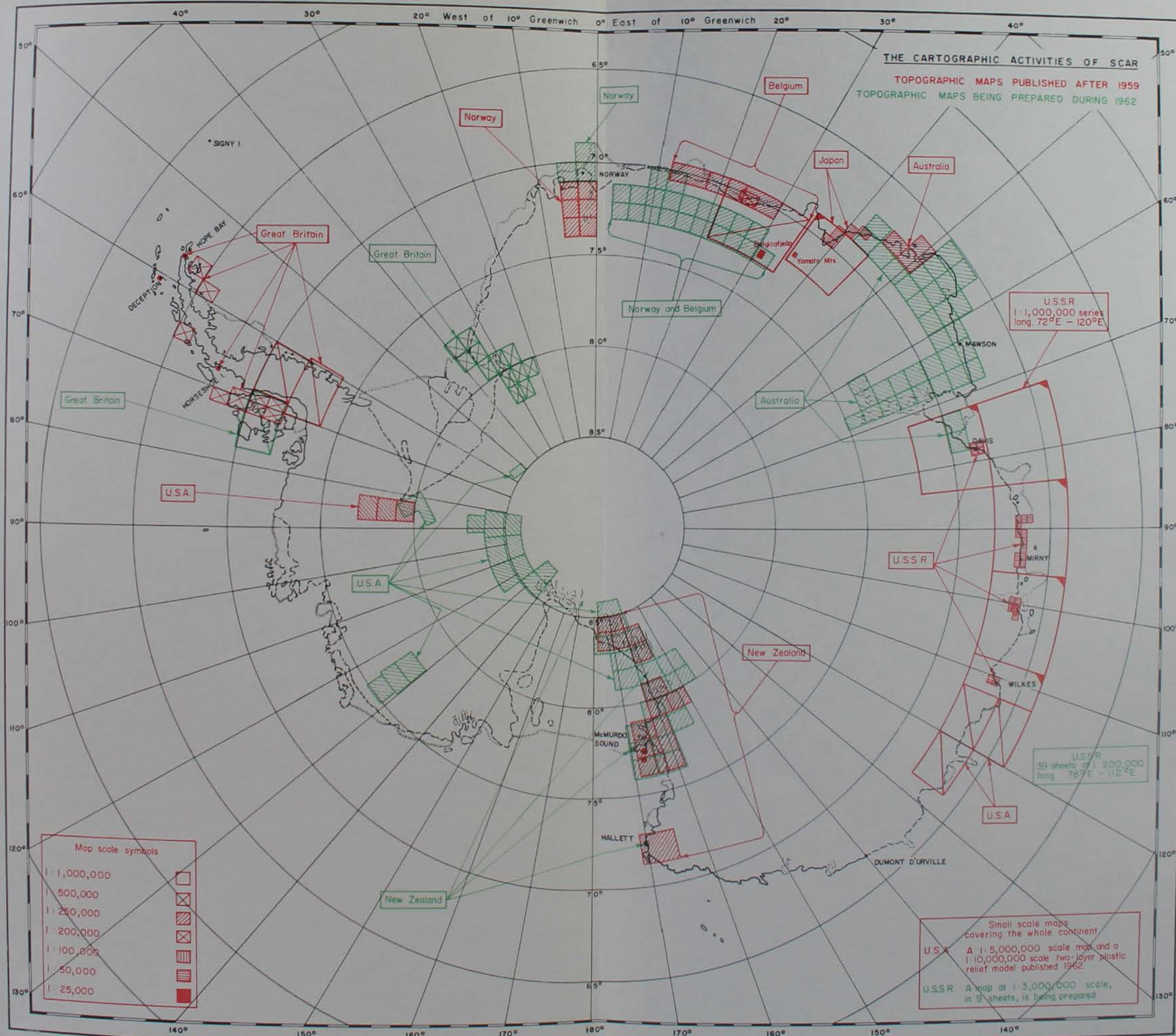
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EXCHANGE SCIENTISTS IN THE ANTARCTIC, 1961-62

Name	Country of origin	Subject	Host country
Astapenko, P. B.	USSR	Meteorology	United States ("McMurdo")
Auger, C. D.	United States	Physics	Australia (Macquarie Island)
Barnes, J. G.	United States	Meteorology	Argentina ("Ellsworth")
Battye, A. C.	Australia	Glaciology	United States ("McMurdo")
Bhagsar, M.	United States	Aeronomy	France (Îles Kerguelen)
Brown, R. R.	United States	Physics	Australia (Macquarie Island)
Campbell, W. H.	United States	Physics	Australia (Macquarie Island)
Coombes, B.	Australia	Airport engineering	United States ("McMurdo")
Evans, D. S.	United States	Physics	Australia (Macquarie Island)
Gale, P.	United States	Electronics	Argentina ("Ellsworth")
Hughes, W. B.	United States	Physics	Australia (Macquarie Island)
Lorius, M. C.	France	Glaciology	New Zealand (Scott Base)
Pryor, M. E.	United States	Biology	USSR (Mirny)
Weaver, W. E.	United States	Meteorology	Argentina ("Ellsworth")
Wiens, R.	United States	Aurora	Argentina ("Ellsworth")

NOTICE

The SCAR Bulletin is published in England in January, May and September each year as part of the *Polar Record*, the journal of the Scott Polar Research Institute.

Contributions are invited, and should consist of factual notes on the membership, equipment and activities of Antarctic parties; articles on matters of particular interest in connection with these activities are also welcome. Contributions should be sent to the Editor, Scott Polar Research Institute, Lensfield Road, Cambridge, England.

THE POLAR RECORD

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