

SCAR

SPECIAL COMMITTEE ON ANTARCTIC RESEARCH

BULLETIN

ARGENTINA AUSTRALIA BELGIUM
CHILE FRANCE JAPAN NEW ZEALAND
NORWAY SOUTH AFRICA UNITED KINGDOM
UNION OF SOVIET SOCIALIST REPUBLICS
UNITED STATES OF AMERICA

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S.C.A.R. BULLETIN

No. 1, January 1959

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Aims and establishment of S.C.A.R.

In December 1956 the United States National Committee for the International Geophysical Year submitted a proposal to C.S.A.G.I. that the I.G.Y. antarctic programme should be continued for an additional year in order to realize the full scientific benefit from the large investment in stations and equipment made by the twelve nations participating in the programme.

The proposal was approved at the Fourth C.S.A.G.I. Conference in June 1957, and a recommendation submitted to the I.C.S.U. Executive Board that a committee should be set up to examine the merits of further general scientific investigations in Antarctica. The I.C.S.U. Board approved the creation of the *ad hoc* committee which met in Stockholm in September 1957, under the convenorship of Dr N. Herlofson.

Members of the Committee were: Argentina, L. M. de la Canal; Chile, R. Canas-Montalva; France, A. Gougenheim; Norway, H. Solberg; U.K., Sir David Brunt; U.S.A., H. Wexler; U.S.S.R., M. M. Somov. Observers: Japan, S. Shima; I.C.S.U., B. Lindblad. Secretary: V. Schytt.

The Committee resolved that there was need for further international organization of scientific activity in Antarctica and recommended that I.C.S.U. should establish a committee to undertake this task. This Special Committee on Antarctic Research (S.C.A.R.) should consist of a delegate from each nation actively engaged in Antarctic research, and representatives of the International Unions of Geography (I.G.U.), Geodesy and Geophysics (I.U.G.G.), Biological Sciences (I.U.B.S.) and Scientific Radio (U.R.S.I.). Each delegate should be authorized to bring with him to meetings advisers in various scientific disciplines, logistics and communications.

It was also resolved that the continuation of scientific activity in antarctic research should be regarded as being inspired by the interest roused by the activities of the I.G.Y. but in no way as an extension of the I.G.Y.

Members of S.C.A.R.

The following are the permanent delegates to S.C.A.R., October 1958:

Argentina	R. N. Panzarini, through the Government of Argentina
Australia	K. E. Bullen, through Academy of Science, Canberra
Belgium	J. van Mieghem, through Académie Royale de Belgique and Koninklijke Vlaamse Academie voor Wetenschappen, Letteren en Shone Kunsten van Belgie
Chile	D. H. Fuenzalida
France	A. Gougenheim, through l'Académie des Sciences
Japan	T. Nagata, through Science Council of Japan
New Zealand	E. I. Robertson, through Royal Society of New Zealand
Norway	L. Harang, through Det Norske Videnskaps-Akademi

U.K.	G. de Q. Robin, through Royal Society
U.S.A.	L. M. Gould (alternative H. Wexler), through National Academy of Sciences
U.S.S.R.	M. M. Somov, through Academy of Sciences of U.S.S.R.
I.G.U.	V. Schytt
I.U.B.S.	A. F. Bruun
I.U.G.G.	G. R. Laclavère
U.R.S.I.	L. Harang

First meeting of S.C.A.R., held at The Hague, 3 to 5 February 1958

Present. Convenor: Dr N. Herlofson

Delegates: Argentina, L. de la Canal; Australia, K. E. Bullen; Belgium, J. van Mieghem; France, A. Gougenheim; Japan, T. Rikitake; Norway, L. Harang; United Kingdom, Sir James Wordie; U.S.A., L. M. Gould; U.S.S.R., M. M. Somov; I.G.U., V. Schytt; I.U.B.S., A. F. Brunn; I.U.G.G., G. R. Laclavère

Advisers: Belgium, F. Bastin; U.S.A., H. Wexler

Representatives of I.C.S.U.: R. Fraser and E. Herbays

The main objects of this meeting were:

(a) To recommend a constitution for the Committee. A proposed constitution was circulated before the meeting and later recommended by it to I.C.S.U. (see p. 366). It was ratified in October 1958 at the Eighth General Assembly of I.C.S.U.

(b) To make provisional appointments of officers for the Committee. The following were elected: President, G. R. Laclavère; Vice-President, K. E. Bullen; Secretary, V. Schytt (G. de Q. Robin subsequently became Acting Secretary during Schytt's absence in Spitsbergen during the summer of 1958). To ensure continuity the President was elected in the first instance for two years, the Vice-President for one year and the Secretary for three years.

(c) To frame a budget for the work of the Committee. Two members of a Finance Committee were elected: L. M. Gould and M. M. Somov, with H. Wexler acting as deputy to the former if necessary. The Treasurer of I.C.S.U. is an ex-officio member of this Committee.

It was decided that the basic contribution for 1958 should be \$500 per nation which would cover the estimated cost of \$6,000 for the expenses of S.C.A.R.

If the budget for future years requires more than this sum, the excess should be divided between the nations in proportion to their activity in the Antarctic, this activity to be defined by the following category numbers:

Category 1	1 to 10	} wintering members.
Category 2	11 to 20	
Category 3	21 to 50	
Category 4	51 to 100	
Category 5	Over 100	

It was not expected that this formula would result in a total contribution of more than \$2000 per year from any participating nation.

(d) To prepare a plan for the scientific exploration of Antarctica in the years following the I.G.Y. This plan (see p. 367) was formed and amended during

the first and second meetings of S.C.A.R. and circulated to members of S.C.A.R. and to the Special Committee on Oceanographical Research (S.C.O.R.). It was decided to circulate this, and other S.C.A.R. papers, to outside countries and institutions to encourage their participation.

Other items of important business included:

- (a) Area of interest of S.C.A.R. See p. 864.
- (b) National reports on projected activities in Antarctica. These were understood to be tentative and not binding on the nations concerned.
- (c) Formation of Working Groups. Three Working Groups were set up: Group I. Meteorology, cosmic physics, biology, physiology and oceanography; Group II. Geology, glaciology, morphology and cartography; Group III. Seismology, gravity and vulcanology.
- Reports from these groups were later read by J. van Meighem (Group I), L. M. Gould (Group II) and K. E. Bullen (Group III).
- (d) I.C.S.U. was requested to inform the United Nations, through proper channels, of the existence and purpose of S.C.A.R.
- (e) It was decided that suitable relations with S.C.O.R. and other international scientific bodies interested in Antarctic research should be established for the interchange of information and co-ordination of programmes. Also that co-operative programmes by several nations should be encouraged to enable maintenance of the present Antarctic station network, and possible extensions.
- (f) The Committee expressed its gratitude to the Administrative Secretary of I.C.S.U. and his staff for help given during the meeting and acknowledged the financial assistance offered by I.C.S.U. to initiate the work of S.C.A.R.

Second meeting of S.C.A.R., held in Moscow 4 to 11 August 1958

Present. Delegates: Argentina, R. N. Panzarini; Australia, K. E. Bullen; Belgium, J. van Meighem; France, B. Imbert; Japan, M. Miyadi; New Zealand, E. Robertson; Norway, L. Harang (also representing U.R.S.I.); South Africa, M. P. van Rooy; United Kingdom, G. de Q. Robin; United States, H. Wexler; U.S.S.R., M. M. Somov; I.G.U., B. Bolin; I.U.B.S., L. Zentevitch; I.U.G.G., G. R. Laclavère

Observers: S.C.O.R., G. Böhnecke; W.M.O., O. Ashford

Advisers: Argentina, O. Schneider; Australia, W. J. Gibbs, F. Jacka; France, S. Emery, R. Pone, P.-E. Victor; Norway, A. Eliassen; United States, M. D. Cartwright; U.S.S.R., V. F. Burkhanov, K. Krichak, D. I. Shcherbakov

The representatives from W.M.O. and S.C.O.R. attended the meeting by invitation.

(a) National Antarctic Committees. It was reported that the following countries had formed these committees: Australia, Belgium, France, Japan, New Zealand, South Africa. The United States had already formed a Polar Committee which would act as the National Antarctic Committee for the purposes of S.C.A.R. The U.S.S.R. was in the process of forming a new National Antarctic Committee. The United Kingdom had strengthened its existing I.G.Y. Antarctic Subcommittee to deal with the problems of S.C.A.R.

(b) National reports on antarctic research planned for 1959 were summarized as follows:

Argentina will take over "Ellsworth" station from the United States and run a main scientific programme there, but limited studies will continue at "Base General Belgrano". Other Argentine antarctic bases will continue to operate as before.

Australia will continue operations at Macquarie Island, Mawson and Davis. In addition they will take over "Wilkes" station from the United States in February 1959. Ice sheet traverses will continue from Mawson for one more summer, then will be transferred to "Wilkes" station.

Belgium will continue to operate its Antarctic station during 1959.

Chile. The 1958 bases will continue in operation, and "Luis Risopatron", which was destroyed by fire in March 1958, will be rebuilt. Further investigations in geomagnetism, cosmic rays, geology, chemistry, biochemistry and bioclimatology are planned.

France. The inland station "Charcot" will be closed at the end of the I.G.Y. but "Dumont d'Urville" will continue to operate, with some small reductions in the programme.

Japan will reoccupy "Syowa" in February 1959 and leave a wintering party of 12 to 15 men. The party will study aurora and airglow, cosmic rays, geomagnetism, ionospheric physics, meteorology, glaciology, seismology.

New Zealand will continue operations at "Scott Base" and, jointly with the United States, at "Hallett" station on a modified basis. During the summer of 1958-59 biological, geological, surveying and oceanographic surveys will also be carried out.

Norway will continue the present scientific programme at their Antarctic base during 1959.

South Africa will continue to work on Tristan da Cunha and Marion Islands, and on Gough Island subject to agreement with the United Kingdom. They would welcome co-operation in putting a base on Bouvetøya and would like to send one or two meteorologists to help in an Antarctic coastal station. All above proposals are tentative.

United Kingdom. At Halley Bay research will continue in the most important scientific disciplines, but the programme is not fully decided. Extensive topographical and geological surveys will continue in the Graham Land region and eight existing Antarctic bases will continue their programmes.

United States will continue to operate the "Amundsen-Scott", "Byrd" and "McMurdo" stations, and "Hallett" station in co-operation with New Zealand. They are also prepared to help at "Ellsworth" station and "Wilkes" station. Ice sheet traverses would continue including one on to the Victoria Land plateau.

In addition, the "Little America V" station will be kept open as a logistics and supply base in support of United States antarctic research.

The United States National Academy of Sciences is considering the question of further scientific investigations at "Little America V".

U.S.S.R. will continue work at existing bases. "Pionerskaya" will be closed

in January 1959, while there will be some reduction of work at "Oasis". It is hoped to move "Sovetskaya" to the Pole of Inaccessibility in October or November 1958. Ice sheet traverses will continue, including one from "Vostok" to the South Pole and back to "Sovetskaya". It is intended to establish small bases south of the Bellingshausen Sea and in Dronning Maud Land. These will study glaciology and surface meteorology and will assist in traverses which are planned to cross the Antarctic in the future. Oceanographical work will continue in the Bellingshausen Sea and in the region of the Antarctic Convergence to the north, and along the coast of Dronning Maud Land.

(c) For the purpose of S.C.A.R. it was agreed that the "Antarctic" shall be bounded by the Antarctic Convergence. Certain subantarctic islands, listed below, may be included in S.C.A.R.'s area of interest even if they lie outside the Antarctic Convergence:

Île Amsterdam	Prince Edward Islands
Îles Crozet	Île St Paul
Gough Island	South Georgia
Îles de Kerguelen	Tristan da Cunha
Macquarie Island	

(d) Three Working Groups were formed. Group I. Biology, physiology and oceanography, under L. Zenkevitch. Group II. International co-operation and publications, under G. R. Laclavère. Group III. Weather Central and studies of the atmosphere, earth and ice, under H. Wexler. Reports from the Working Groups were read later in the meeting. Arising from the report of Working Group III the following resolutions were passed:

(1) Weather Central. The importance of the continuance of an international Weather Central was recognized and it was suggested that it should be transferred to one of the countries in the southern hemisphere. It was recommended that Australia and New Zealand should consider the establishment of an international analysis centre in one of these two countries, and should submit a proposal to S.C.A.R. before 30 September 1958;

(2) that the mother-daughter communications network established in the Antarctic during the I.G.Y. be maintained and strengthened to ensure more effective and rapid collection of meteorological data within Antarctica;

(3) that additional radioteletype facilities be established in Antarctica to speed up the two-way flow of data between Antarctica and meteorological centres in the southern hemisphere;

(4) the W.M.O. be requested to recommend how southern hemisphere communication networks can be strengthened to enable complete and speedy exchange of data between all southern hemisphere countries;

(5) that a continuing Working Group on Antarctic communications be constituted under S.C.A.R. to include a communications expert, experienced in Antarctic communications, from each country involved in Antarctic work, and a communications expert from the W.M.O., to further the co-ordination of communications for the Antarctic region, including the collection and distribution schedules for meteorological and other scientific data.

While there was general agreement about the aims of these resolutions, there was not complete agreement about the best methods to be followed. The following resolution was therefore approved:

"The Executive Committee is instructed to take appropriate action on radio-communication problems and to inform all members of S.C.A.R."

(e) A message of greeting was sent to all Antarctic stations from the Committee.

(f) Publications. It was agreed that the Committee should publish a special bulletin containing a factual record of S.C.A.R. activities. Also that the Committee would not make use of the I.C.S.U. editorial service, but that the bulletin would be published by the Scott Polar Research Institute in England and the Arctic and Antarctic Research Institute, Leningrad. The bulletin will appear as a separate section in the journals of these Institutes, and also be available as a reprint. Material in the bulletin will be free of copyright. Members of S.C.A.R. were asked to submit material for the bulletin to the Scott Polar Research Institute, Cambridge, England.

(g) Cartography. The Secretary was instructed to compile a map of Antarctica showing the past and future cartographic activities of member-nations from information supplied by them.

The formation of a Working Group was approved to

(1) study ways and means of producing a map of Antarctica on the scale of 1:3,000,000,

(2) examine the possibilities of co-operation by various nations in producing the map, and

(3) prepare specifications to ensure all possible conformity in maps produced by different agencies. One member from each nation is to serve on this Working Group of which G. R. Laclavère will be chairman. H. Wexler agreed to produce a catalogue of all available published maps of Antarctica.

(h) International co-operation. The following resolutions were passed:

(1) It was recommended that exchange of scientific personnel, as during the I.G.Y., should be continued as a general policy, subject to bilateral agreement in every case;

(2) recognizing that the integration of geological and glaciological knowledge gained from different parts of Antarctica may be impeded by differences in nomenclature, S.C.A.R. should encourage the interchange of field geologists and glaciologists working in different regions of the continent;

(3) it was recommended that exchange of scientific documents, including maps, should be continued as a general policy as during the I.G.Y.;

(i) a verbal statement was received from Poland announcing the intention to mount an antarctic expedition during the southern summer of 1959-60: (written confirmation was received after the meeting);

(j) the presence of representatives of S.C.O.R. and W.M.O. was welcomed and hope was expressed for future close co-operation with these bodies;

(k) future meetings of S.C.A.R. It was agreed that it was desirable for S.C.A.R. to meet annually during the northern hemisphere spring to enable

countries to put new plans into operation in the Antarctic during the following year.

The next meeting was arranged to be held in Canberra after the symposium on Antarctic meteorology to be held in Melbourne in March 1959. The proposal to hold an Antarctic symposium in Buenos Aires in November 1959 was welcomed.

(l) The President thanked the Academy of Sciences of U.S.S.R. and the Soviet delegates for enabling the meeting to be held so successfully in Moscow. Dr Somov thanked delegates for coming to Moscow and hoped that the same excellent spirit of co-operation would prevail at future meetings of S.C.A.R.

Constitution of S.C.A.R.

Membership

S.C.A.R. is a Special Committee of I.C.S.U. charged with furthering the co-ordination of scientific activity in Antarctica, with a view to framing a scientific programme of circumpolar scope and significance. In establishing its programme S.C.A.R. will take care to acknowledge the autonomy of other existing international bodies.

Nominations to the Committee are as follows:

- (a) Each country actively engaged in Antarctic research is represented by one scientific delegate
- (b) International Scientific Unions federated in I.C.S.U., which have indicated their interest in Antarctic research, may appoint one representative each
- (c) Other international organizations and Special Committees of I.C.S.U. may be invited to send observers.

Constitution

- (a) S.C.A.R. nominates an Executive Committee from amongst its own members consisting of a President, a Vice-President and a Secretary, each elected for a term of three years and each eligible for re-election. These nominations are subject to confirmation by the Bureau of I.C.S.U.
- (b) The Executive Committee is responsible to I.C.S.U. for the co-ordination of the scientific programme adopted by S.C.A.R.
- (c) S.C.A.R. will invite the formation of National Antarctic Committees in the participating countries to frame and carry out an operational programme designed to implement the general scientific programme formulated by S.C.A.R.
- (d) S.C.A.R. may appoint *ad hoc* committees for the examination of special problems
- (e) The Executive Committee, with the approval of S.C.A.R., will submit its budget requests to I.C.S.U. including an estimate of the scale of contributions required from the participating countries to maintain the central administration. For this purpose a Finance Committee of three members will be appointed consisting of the Treasurer of I.C.S.U. *ex-officio*,

and two members, not members of the Executive Committee, to be appointed by S.C.A.R. The Secretary of S.C.A.R. will act as adviser to the Finance Committee

- (f) The expenses of the Executive Committee of S.C.A.R. will be defrayed by S.C.A.R., but the expenses of all other members will be the responsibility of the National Committees and Scientific Unions
- (g) Expenditures incurred by S.C.A.R. will be subject to control by the Treasurer of I.C.S.U.
- (h) In addition to his normal duties the Secretary of S.C.A.R. will keep the Secretary General of I.C.S.U. fully and promptly informed of all activities.

Scientific investigations recommended by S.C.A.R.

The following scientific investigations were recommended at the first and second meetings of S.C.A.R. Any corrections or suggested additions should be sent by National Committees or National Delegates to the Secretary of S.C.A.R.

Meteorology

A. General

- (a) The heat and moisture budgets of the Antarctic atmosphere and ice sheet
- (b) The mean air circulation in the Antarctic regions
- (c) Local effects in the Antarctic, particularly in the vicinity of the coastline
- (d) The nature and extent of broad-scale meteorological processes over Antarctica and the remainder of the Southern Hemisphere
- (e) The mutual influence between pack ice and the character and motion of the air
- (f) The air flow in the friction layer over the Antarctic continent
- (g) The Antarctic stratosphere and the exchange of air between the stratosphere and troposphere as shown by such atmospheric tracers as ozone.

A ten year period of observations is desirable.

B. Synoptic observations. The greatly increased networks of meteorological stations established in Antarctica during the I.G.Y. has enabled a reasonably detailed knowledge of weather processes over the Antarctic to be obtained for the first time, and every effort should be made to maintain the present scope of surface and upper air observations, and to increase the network where possible.

The areas deficient in observations are:

- (a) the area bounded by lats. 45° S. and 60° S. and longs. 45° W. and 35° E.
- (b) the area bounded by lats. 45° S. and 65° S. and longs. 80° W. and 150° E.
- (c) the area bounded by lats. 45° S. and 65° S. and longs. 80° W. and 170° W.
- (d) the antarctic coastal area between longs. 80° W. and 150° W. and in the vicinity of longs. 155° E., 125° E. and 10° E.

(e) and the areas centred over the following positions:

- | | |
|---------------------------|----------------------------|
| lat. 80° S., long. 0° | lat. 75° S., long. 130° E. |
| lat. 75° S., long. 30° E. | lat. 80° S., long. 80° W. |
| lat. 75° S., long. 60° E. | |

As W.M.O. considers that the greatest need for an increased network is in the ocean areas within the field of interest of S.C.A.R., every effort should be made to secure surface and upper air observations from islands and ships in these areas.

The method of obtaining temperature for use in pressure reduction in the Antarctic should be standardized through the normal W.M.O. machinery. In particular, the restrictions imposed by W.M.O. on the reduction of pressure should be observed, the preferred reduction levels being 850 or 700 mb. as appropriate.

C. *Special observations*

- (a) Continuous measurements of the ozone content of air at the surface of the earth
- (b) Air photography of surface features, such as sastrugi, to obtain wind direction in areas where regular observations are not made
- (c) Aerial determinations of the albedo
- (d) Micrometeorological and meso-meteorological measurements
- (e) Atmospheric chemical and precipitation content determination
- (f) Morphological determinations of falling snow crystals and of condensation nuclei
- (g) Observations of noctilucent and mother-of-pearl clouds
- (h) Aircraft flying over or near the Antarctic should carry out the recommended meteorological observations and should report them promptly
- (i) Traverse parties should measure the temperatures of the ice down to 15 m., as the temperature at this depth is very similar to the mean annual temperature at the surface
- (j) S.C.A.R. welcomes the efforts already in progress to obtain total ozone content and urges the International Ozone Commission and the W.M.O. to devise schemes whereby the inter comparison in the Antarctic of the standards used for such measurements can be effected.

D. *Atmospheric nuclear radiation.* Stations engaged in measuring the radio-activity of air and precipitation should carry that work on as far as possible after the I.G.Y. Other stations are invited to initiate such a programme.

E. *Rockets.* Rocket-sounding programme should be enlarged to cover the winter season, measuring temperatures and winds up to 80 km., at the rate of one per week. Rocket-borne experiments to greater altitude for studies of high atmospheric conditions and parameters of particular interest for the south polar cap.

F. *Weather Central.* S.C.A.R. recommends that Australia and New Zealand should consider the possibility of the establishment of an international analysis centre in one of these two countries.

Ionosphere

(a) Vertical incidence sounding. The programme should follow the principles suggested in the 1958 Edinburgh report of the U.R.S.I.-A.G.I. Committee. At least two stations on the Antarctic continent should be Class F (full) and the remainder should be Class P (patrol) stations and as many as possible should be continued for at least another half solar cycle.

(b) Special observations. (1) Measurements of atmospheric radio noise should be continued for a full solar cycle at a minimum of two stations. (2) Special studies should be made on whistlers and very low frequency emissions, absorption and scatter and low level echoes which may be peculiar to the southern auroral zone or polar cap. These studies should be co-ordinated with special studies in other disciplines concerning the high atmosphere.

Auroral physics

(a) The morphology of visible auroras, H and He emissions and H.F. radio scattering regions

(b) The sources of energy producing geomagnetic and ionospheric disturbances and auroras

(c) The nature of the agency causing excitation of auroral emission

(d) The composition and physical state of the upper atmosphere.

Observational programmes should continue at stations well distributed in Antarctic regions using the several techniques available, such as visual observing, all-sky photography, photometric, spectographic, radar and parallactic photography.

Attention is drawn to the possibility of gaining new information on the geomagnetic field in regions far from the earth by comparing Arctic and Antarctic observations on V.L.F. radio emissions, auroras and cosmic ray variations. Such comparisons may also contribute to understanding the mechanism of production of auroras. This possibility should be considered before fixing the positions of any new Antarctic stations.

Geomagnetism

(a) A geomagnetic observatory programme with base line control should be maintained at several stations as part of the global network. Geomagnetic variation recordings should be encouraged at all stations involved in upper atmosphere studies and the recording and analysis should be designed to meet these requirements. The importance of low sensitivity recording is emphasized

(b) A geomagnetic survey of the permanent field in the Antarctic area (continent and southern seas) should be carried out and co-ordinated with the projected World Magnetic Survey.

Cosmic Rays

(a) Sources and mechanism of generation of cosmic rays

(b) Cause of changes of cosmic ray intensity which appear to be associated

with changes in the distribution of matter and/or magnetic fields in interplanetary space

- (c) Form of the geomagnetic field at great distances from the earth.

These should be the subject of long-term observances from well-distributed stations.

Geology

In addition to classical studies special attention should be directed to:

- (a) The terrain beneath the ice as revealed by seismic studies
- (b) Post-glacial and/or Quaternary geology at coastal stations
- (c) Paleoclimatic studies
- (d) Paleomagnetic studies
- (e) Submarine geology.

Glaciology

- (a) Thickness, structure and volume of inland ice as revealed in seismic soundings. The bedrock beneath the ice should also be investigated by seismic shooting
- (b) Regime observations
- (c) Annual stratification of firn to establish climatological significant precipitation records
- (d) Structure of the inland ice sheet and ice shelves as revealed from deep pits and deep bore holes, particularly near the top of ice caps
- (e) Variations of velocity of propagation with depth in typical ice areas should be made by long reversed refraction shooting and also shooting in deep bore holes. This might also aid in the study of propagation laws as a function of depth, temperature, stress, etc.
- (f) The application of indirect techniques to determine the nature of the bedrock under the ice by the use of electrical methods, etc.

Geomorphology

Studies of land forms with particular attention to the geological role of an inland ice sheet past and present.

Cartography

A comprehensive, co-ordinated mapping programme should have high priority.

S.C.A.R. will consider in detail how this programme can be co-ordinated.

Seismology

There are two principal problems of Antarctic seismological research:

- (a) to use local earthquakes and explosions to infer Antarctic crustal structure, and
- (b) to use distant earthquakes both to obtain evidence on Antarctic structure and also on the earth's deeper structure. The establishment of

first class seismological observatories in the Antarctic can fill in an important global gap.

The setting up of new seismological observatories in the Antarctic is largely experimental. Relevant factors include the suitability of particular sites (difficulties with microseisms, etc.), the human difficulties, and the as yet not fully known local seismicity. The present number of seismological observatories in the world is about 700. There should ultimately be not less than a corresponding number, determined on the basis of geographical area, in the Antarctic. Stations should normally be uniformly distributed, but special problems and features of local seismic activity may make this undesirable in some areas. Each station, in addition to having an adequate set of good seismographs, should have assured absolute time marks recorded on the seismogram so that absolute time can be read to less than a second. Stations should in due course become permanent.

Gravity

- (a) The determination of gravity for the purpose of utilizing the data for geodesy as well as for the study of the upper layers of the earth's crust, and for solving some problems of glaciology
- (b) Extension of the world networks of basic gravity points to the Antarctic
- (c) Measurement with pendulum instruments as well as gravimeters with small or constant drift.

Vulcanology

To begin with, vulcanological studies are likely to emerge from broader geological studies, and then become more specialized as development continues. The Antarctic borders on the Pacific Ocean, from round the rim of which comes 85 per cent of the total energy released in earthquakes. It is therefore important that great attention be paid to the seismic and vulcanological problems of the area.

Oceanography

- (a) Study of bottom relief and sediments in the shallow shelf zone of the Southern Ocean around the continental shelf as well as in oceanic regions adjacent to the slope
- (b) Study of the Antarctic coastal current
- (c) Study of ice in the Southern Ocean by systematic sea and air observations. All expeditions using aircraft should make systematic sea-ice observations from aircraft throughout the year, and should organize the exchange of data with other expeditions using W.M.O. codes
- (d) Study of the Antarctic Convergence zone in the Southern Ocean. Here multiple sections across the Antarctic Convergence are specially recommended (oceanographic observations and measurements of the surface currents should be made not far from the frontal line). It is desirable to carry out synchronous observations in the zone of the Antarctic Convergence, employing for this the greatest possible number of

oceanographic vessels and expedition ships working in the Antarctic. It is recommended that National Committees be asked to submit to S.C.A.R. the working plans of these investigations by 30 September 1958

- (e) Study of the deep currents in the Southern Ocean, especially in the field of the western wind drift, using the method of absolute water age determination
- (f) Study of tides and tidal current changes in the coastal regions of Antarctica. It is highly desirable to make a cycle of at least one full year, and, if possible, continuous observations of sea-level fluctuations at shore stations in the Antarctic
- (g) Systematic seasonal deep observations along the following sections should be considered the minimum requirement:
 - (a) South from Cape Town along long. 20° E.
 - (b) South from New Zealand along long. 165° E.
 - (c) Across Drake Passage.

It is desirable to increase the number of standard sections. It is recommended that the National Committees submit to the Secretary of S.C.A.R. working plans for these investigations.

Marine biology

- (a) Biological quantitative and qualitative composition of the Antarctic water population. Studies of primary production involving pigments, C^{14} , O_2 , etc.
- (b) Distribution of plankton mass (primarily phytoplankton and euphausiids, their eggs, larva stages and Copepods) as well as of the conditions (physical and chemical) of formation in different seasons.
- (c) A check against the data from these should be attempted by analysing stomach contents from as large a range of vertebrates as possible.
- (d) Biochemistry of depigmented fish (Nototeniformes order).
- (e) Studies of seals, penguins, lichens and of the invertebrate fauna associated with them should be included. The ecology and life histories of the neritic marine fauna should also be studied.

Biology

A general biological programme is at present being considered.

Physiology

A programme of medical research is at present being prepared for consideration by S.C.A.R.

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.

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