Chapter 2

The Early Years (1958–67)

Establishing SCAR

ICSU had invited each of the twelve nations actively engaged in Antarctic research to nominate a Delegate to the Special Committee on Antarctic Research (SCAR). At this time "actively engaged" meant supporting over-wintering parties. Delegates were also invited from the relevant scientific unions *viz*. the International Union of Geodesy and Geophysics (IUGG), the International Geographical Union (IGU), the International Union of Biological Sciences (IUBS), the International Union of Pure and Applied Physics (IUPAP) and the Union Radio Scientifique Internationale (URSI) as well as from the World Meteorological Organization.

The following permanent Delegates were nominated, mainly but not always through their National Academies of Science: Argentina: L de la Canal; Australia: K E Bullen; Belgium: J van Mieghem; Chile: D H Fuenzalida; France: A Gougenheim; Japan: T Nagata; New Zealand: E I Robertson; Norway: L Harang (also representing URSI); South Africa: J J Taljaard; United Kingdom: G de Q Robin; United States: L M Gould; USSR: M M Somov; IUBS: A F Bruun: IUGG: G R Laclavère; and IGU: V Schytt.

The first meeting of SCAR was held at The Hague 3–5 February 1958 and all the participating nations and unions were represented by scientists except Chile (whose ambassador attended as an Observer), New Zealand and South Africa. Only Belgium, the USSR and the USA brought advisors along so it was a small meeting of 19 people. [A substitute Delegate was termed an observer whereas a person additional to the Delegate was termed an advisor.] R Fraser and E Herbays represented ICSU, V Schytt IGU, A Bruun IUBS and G Laclavère IUGG whilst N Herlofson chaired the meeting. The main objectives were to agree a draft constitution for the committee, elect officers, frame a budget and prepare a scientific plan for the years after IGY. A first draft constitution had been prepared, apparently by Valter Schytt, based on other ICSU constitutions, and circulated in advance. It was commendably short at this stage!

The objective of the first constitution is worth quoting:

> *"SCAR is a Special Committee of ICSU charged with furthering the co-ordination of scientific activity in the Antarctic, with a view to framing a scientific programme of circumpolar scope and significance. In establishing this programme, SCAR will take care to acknowledge the autonomy of existing bodies".*

Their sterling international work done during IGY ensured the unopposed election of Georges Laclavère from France as President, with Keith Bullen from Australia as Vice-President and Valter Schytt as Secretary. Annual costs were estimated at US $6000 so the initial contribution was set at US $500 per nation with the intention to move to a sliding scale in future years based on the number of overwintering staff. It was assumed that the sponsoring body in each country (the

Participants at the first meeting of SCAR, The Hague, The Netherlands, 3–5 February 1958. 1. Dr L M Gould, USA; 2. Dr R Fraser, ICSU; 3. Dr N Herlofson, Convenor; 4. Col E Herbays, ICSU; 5. Prof T Rikitake (for T Nagata), Japan; 6. Prof L Harang, Norway; 7. Dr V Schytt, IGU; 8. Dr A F Bruun, IUBS; 9. Mr J J Taljaard, South Africa; 10. Capt F Bastin, Belgium; 11 Capt L de la Canal, Argentina; 12. Sir James Wordie (for G de Q Robin), UK; 13. Prof K E Bullen, Australia; 14. Dr H Wexler, USA; 15. Ing Gén G Laclavère, IUGG; 16. Ing Gén A Gougenheim, France; 17. Ambassador L Renard, Chile; 18. Dr M M Somov, USSR; 19. Prof J van Mieghen, Belgium. (Photograph courtesy of the Scientific Committee on Oceanic Research.)

academy of science) would provide the subscription, thus making SCAR independent of any direct government funding. The establishment of the World Data Centres had already removed one potential task from the list of future scientific collaborations so three working groups were set up at this meeting, and further ones at the next two meetings, to discuss and prepare future research programmes. In addition it was agreed that SCAR's area of interest would not be determined by the arbitrary political boundary of 60°S but by more realistic scientific features. The SCAR scientists agreed on the Antarctic Convergence (Polar Front) as the general boundary but then decided that some islands lying north of this would need to be included for biological reasons: Ile Amsterdam, Iles Crozet, Gough Island, Iles de Kerguelen (*sic*), Macquarie Island, Prince Edward Islands, Ile St Paul, South Georgia, and Tristan da Cunha. Inexplicably Heard Island was left out of the list.

Most importantly they confirmed that "the continuation of scientific activity in Antarctic research should be regarded as being inspired by the interest aroused by the activities of IGY but was in no way an extension of the IGY". This statement was clearly a get-out clause for politicians who wanted to draw a line under their national involvement and had the potential to severely limit future involvement. The three Working Groups to discuss future research programmes were: WG-I Meteorology, cosmic physics, biology, physiology and oceanography; WG-II Geology, glaciology, morphology and cartography; and WG-III Seismology, gravity and vulcanology. Since they were composed entirely of the Delegates present the spread of expertise was very uneven, as was the representation by country for any particular discipline.

Developing the Antarctic Treaty

Since SCAR was not directly involved in the negotiation of the Antarctic Treaty its scientific independence was taken for granted by the Treaty Parties.

The development of the Antarctic Treaty has relied to a very significant extent on input from SCAR. It therefore seems essential to describe here how this inter-

governmental collaboration began and developed.

Back in 1948 the USA had decided that a condominium might be the ideal governance system for Antarctica with only those countries the Americans were happy with being invited to take part – an effective way of excluding the Soviet Union. Circulating a diplomatic note to the seven states claiming Antarctic territory showed that whilst Norway, New Zealand and the UK were willing to discuss the idea the other four countries rejected it as infringing their sovereignty. The idea was dropped.

During the early stages of the IGY President Eisenhower had seen the geopolitical potential of Antarctic scientific co-operation to solve two problems. The US State Department was worried about the relations between the UK, Argentina and Chile, all allies of the Americans but continually bickering over their sovereignty rights. In addition, the US Department of Defense wanted to try to ensure that the Soviet Union did not have the opportunity to militarize the Antarctic with consequent problems and expense for the USA in countering this. The National Security Agency developed a proposal for an international peace treaty for the continent which Eisenhower seized upon as a way of ensuring that Soviet ambitions could be contained. Just before the Moscow meeting of CSAGI on 2 May 1958 the USA circulated a diplomatic note to the governments of the other eleven Antarctic IGY countries proposing a conference to draft a treaty that would reserve the continent for peaceful uses and ensure continuing scientific co-operation. The other countries unanimously accepted this. Thus thinking in both the political and scientific camps came to the same conclusion, perhaps because at the time there had been something of a thaw in US/Soviet relations.

There were sixty secret meetings over a period of 15 months, starting on 13 June 1958 in the National Science Foundation building to negotiate the basis for the Treaty. From the start there were differing interpretations as to what the meetings were meant to achieve. The Soviet Union wanted them merely to prepare the ground for an open conference, the Australians did not really want any agreement that let the Russians stay in Antarctica and Chile and Argentina were concerned about their land claims. Compromises were necessary from everyone and one way of making everyone more equal was to rotate the chairmanship between nations. There were arguments within countries as well as between countries, with the prospect of agreement attracting the interest of Prime Ministers and Presidents in the details of progress.

There was apparently general agreement that scientific research and co-operation were the principal activities to be encouraged. Chile proposed at an early stage that the boundary of the Treaty area should be set at 60°S although the Soviets wanted the Antarctic Convergence. The high seas were excluded on the suggestion of the USA, with the reassurance that marine scientific research was protected by the principle of the freedom of the seas. P C Daniels for the USA produced two drafts concerned with freedom of scientific investigation, scientific exchanges and co-ordination of plans between countries. The question of what research should be allowed was raised by the UK as were other questions on how to avoid research overlap and the unwanted – from a science viewpoint – clustering of stations. Daniels wanted to clarify the role of SCAR and even suggested that it should be represented at the conference but this fell on deaf ears and nothing was included in the final draft. Chile even suggested that one route for accession of new countries to the Treaty could be through an International Institute of Antarctic Scientific Investigations but again this came to nothing.

An agreement was finally reached at a formal conference in Washington DC, starting on 15 October 1959 and finishing with the signing ceremony on 1 December 1959, between just the 12

countries active in the Antarctic part of IGY. Although the negotiations were conducted by diplomats and lawyers there were scientists in some delegations, like Brian Roberts from the UK, who would provide important support to SCAR in due course. Ratification was swift and the Antarctic Treaty entered into force on 23 June 1961. Important to many future activities of SCAR was Recommendation IV from the First Antarctic Treaty Consultative Meeting in Canberra which recognized the special contribution of SCAR and encouraged its continuation.

After the Treaty had been signed and before it was ratified in 1961 there were numerous meetings of an Interim Consultative Group in Washington composed entirely of officials. Part of the discussions concerned how to define the role of SCAR. Australian archives show that several countries wanted SCAR to be designated as "the appropriate body to co-ordinate scientific investigation in the Antarctic". Despite support from Australia, the UK, New Zealand and Japan the USA decided that this could provide the USSR with a way of taking a SCAR recommendation and using it to justify activities that had not been agreed by Parties and therefore vetoed it, such was the paranoia of the time. The UK and South Africa suggested that SCAR should be allocated research projects but they both wished to reserve the right to ignore the recommendations arising from such research. There was also inconclusive discussion about how to communicate Treaty decisions to SCAR but the diplomats appeared unable to find an agreed way of linking a non-governmental organization to an international governmental meeting. In an attempt to assure SCAR that they were being supportive the Australian Ministry of Foreign Affairs called Keith Bullen, the Vice President of SCAR, to Canberra for discussions. He was assured that SCAR's existing activities would not be disturbed, that scientific exchange was seen as best organized by the scientists and that all Parties had concluded that contact between SCAR and the Treaty would continue through National Academies not least because there was no permanent body that SCAR could contact. In response to suggestions that the Treaty Parties might wish to exert some control over SCAR, perhaps through a Secretariat, Bullen made it clear that a strong reaction against this was likely from Antarctic scientists. Gordon Robin as SCAR Secretary was busy investigating if it would prove possible to use any special position for SCAR in the Treaty to gain funding directly from governments to support international facilities, an idea tried out many times over later years without any success. There was even some talk of having SCAR directly represented in discussions but this came to nothing. The exchange of information that SCAR developed right at the start provided a basis for the negotiations between the Parties on what should be included in the Treaty Exchange of Information.

New Zealand kept raising the suggestion that a Treaty Secretariat was necessary, suggesting Australia as the first choice and the USA as second but there was too little powerful support, together with strong objections from Chile, for this to make any progress. So began a period of over 40 years where the Treaty was unable to provide any centralized management of information or indeed any form of concrete existence in the period between meetings.

Developing the structure of SCAR

Ninety-three scientists attended a Symposium on Antarctic Research held in Wellington, New Zealand in February 1958. This was the same month in which SCAR was formed and so the meeting could not be said to be a SCAR meeting although both its organizers and attendees would go on to use its results for fleshing out SCAR science. There was no formal publication from this meeting but it provided an important initial step in discussing the results from IGY and considering how future programmes could be organized. It was followed in November 1959 by a second symposium, this time in Buenos Aires, again to discuss the IGY data.

Georges R Laclavère, President 1958-1963

Georges Laclavère was closely involved with IGY from the outset because he was Secretary General of IUGG from 1951(see below) and as IUGG was the leading ICSU Union concerned it was inevitable that Laclavère would be involved, if he wished. When Director of L'Institut Géographie Nationale in Paris he was appointed to CSAGI in 1953, serving throughout IGY as a member of the finance committee, chair of the publications committee, convenor for oceanography and president of all meetings of the Geographical Working Group on Antarctica 1955–58. His administrative abilities were clearly impressive as he was elected Secretary General of the Comité International de Géophysique, (which rounded off the work of IGY) and was the Secretary General of IUGG 1951–63, and Treasurer of ICSU 1961–68. At the first meeting of SCAR he represented IUGG and, because of his earlier involvement, was a natural choice as the first President of SCAR in 1958. His retirement as President did not break his link with the Antarctic as he continued as the French Delegate to SCAR until 1986. He was the first Honorary Member appointed by SCAR at VII SCAR in Cape Town, South Africa, September 1963.

Photograph courtesy of the Laclavère family.

He was born in 1906 and died on 26 September 1994. His name is commemorated by Laclavère Plateau (63°27'S, 57°45'W), an ice cap rising to 1053 m on the northern Antarctic Peninsula, although he made only one brief visit to the Antarctic.

Although again it was not formally a SCAR symposium the meeting in Buenos Aires from 17 to 25 November 1959 was important in the development of SCAR science. Its purpose was to report and review the IGY Antarctic science and scientists from all twelve countries were there. For SCAR, still formulating the details of its proposed science programmes, its value lay as much in highlighting what remained to be achieved in each field as in reporting on the progress during IGY. In this respect the resolutions passed were important for each of the science working groups. For instance, a new atlas of auroral forms was proposed, the importance of the South Atlantic geomagnetic anomaly was recognized, the need for orientated and characterized rock samples for palaeomagnetic measurements and radiometric age determinations to determine Antarctic geological history was stressed, and the importance of immediate steps for the conservation of Antarctic wild life was recognized. At this meeting a paper on Antarctic conservation by Robert Carrick was considered sufficiently important to be published later in *SCAR Bulletin* No 6 in 1960.

In 1959 Poland indicated that it was intending to send an expedition to the Antarctic and would, therefore, like to join SCAR. However, in the early days of SCAR an over-wintering team was required be-

fore an application for SCAR membership could be accepted.

By the time of the second SCAR meeting in Moscow that began on 4 August 1958 and continued on 11 August the number of attendees had increased to 26 but still Chile was not represented. The number of advisors had increased sharply with three for the USSR, two each for Australia and France, and one each for USA, Argentina and Norway. For the first time observers from WMO and SCOR attended the meeting. The Committee now had a constitution and its working groups had provided scientific recommendations for meteorology, ionosphere, aurora, geomagnetism, cosmic rays, geology, glaciology, geomorphology, cartography, seismology, gravity, volcanology, physical oceanography and marine biology. They recognized that proposals were needed for medical research and the meteorology programme, already agreed, was revised and expanded. This meeting also agreed to the publication of its decisions in the *SCAR Bulletin* and asked Scott Polar Research Institute (SPRI) to reproduce it as a part of *Polar Record*, the first issue, *SCAR Bulletin* No 1, appearing in volume 9 (No 61) in 1959. It was also decided to re-instate the international scientist exchange programme established in IGY and it was agreed that the future of Weather Central, operated at Little America throughout IGY, should be in either Australia or New Zealand.

Interestingly, discussion over legal details had already begun as the very simple initial constitution was found to be in conflict with some ICSU principles. Tinkering with the constitution developed into a continuing saga over the next five decades as SCAR developed into a more complex organization. Another source of argument revolved around when SCAR could be formally said to be open for business with Laclavère opting for 1 July 1959 but Robin and others concluding that 1 January 1959 was actually more appropriate as it followed on exactly from the end of IGY field operations.

To support the continuing development of SCAR, participating countries were urged to form National Antarctic Committees. This seemed to happen fairly rapidly with Australia, Belgium, France, Japan, New Zealand and South Africa all reporting active Antarctic committees. By III SCAR in Canberra on 2 March 1959 they were joined by Argentina, Norway, the UK and the USSR.

In 1958 Gordon de Quetteville Robin, an Australian glaciologist, was appointed the first full-time Director of the Scott Polar Research Institute (SPRI) in Cambridge, United Kingdom. He was thus able to offer to house the initial secretariat of SCAR in the SPRI building after he was elected Honorary Secretary of SCAR the following year in Canberra when Valter Schytt had to retire due to ill health. He clearly needed some assistance and a local secretary was soon appointed to deal with the routine correspondence whilst George Hemmen, a member of the UK team that had established Halley Bay in 1956 and a full-time employee of the Royal Society, was seconded part-time in 1962 to help Robin as Assistant Secretary. SCAR simply re-imbursed the Royal Society for Hemmen's time. Seen from 50 years on, all of these arrangements were organized in a very casual way. The local secretary opened the mail and telephoned Hemmen if anything important arrived. Hemmen made a practice of coming up to Cambridge for a few days each month to talk to Robin and answer correspondence! Nothing happened quickly!

Attendance continued to increase with 41 people at III SCAR in Canberra in March 1959 where the 27 advisors now firmly outnumbered the Delegates. Circulating information about activities was a pressing problem and it was the WG on Exchange of Information that first proposed the national SCAR reports and outlined what they should contain.

The Working Groups had been busy and the original sketchy outline of future science had been considerably extended, with a lengthy new section on terrestrial

"Working Groups"

I SCAR (February 1958)	I	Meteorology, cosmic physics, biology, physiology and oceanography
	II	Geology, glaciology, morphology and cartography
	III	Seismology, gravity and vulcanology
II SCAR (August 1958)	I	Biology, physiology and oceanography
	II	International cooperation and publications
	III	Weather Central and studies of the atmosphere, earth and ice
III SCAR (September 1959)		Cartography
		Exchange of Information
		Biology
		Meteorology and Physical Oceanography
		Upper Atmosphere Physics
		SCAR Programme amendments

"Permanent Working Groups"

IV SCAR (August 1960)	Cartography *
	Communications
	Upper Atmosphere Physics
	Geology
	Meteorology
	Biology
	Logistics
	Oceanography
	Crustal Geophysics **
	National Reports **

* Changed to Geodesy and Cartography at VI SCAR in 1962
** Disbanded at V SCAR in 1961

biology, and with medical research included for the first time. The Working Groups realized that there was a need for formal communication of their decisions to the SCAR Delegates. It was at this meeting that the idea of "Recommendations" was first introduced, some of them being targeted at SCAR activities but some requesting that SCAR, as an organization, take up important science questions with other organizations, such as WMO.

The Australian Academy of Sciences had decided to make this meeting a memorable event and organized a dinner at Parliament House with the Minister for External Affairs, a dinner with the President of the Academy, as well as visits to Mount Stromlo Observatory and a sheep station. At the end of the meeting three Delegates provided the first SCAR public lecture on science and there had already been a public display of Antarctic photographs. Finally, the Delegates set off on a three-day government-organized coach tour of New South Wales.

The concept of Permanent Working Groups was established at IV SCAR in 1960 in Cambridge. Until then, working groups were set up afresh at each SCAR meeting to cover the needs at the time and involving all those present. The report of IV SCAR shows that there were several "working groups" in operation as "Permanent Working Groups" and these now included a Working Group on Logistics. Any new organization will take a little time to establish its working practices and SCAR was no exception. It might

be worth noting that at IV SCAR, Cambridge, UK, August 1960, there were 15 national and Union Delegates present accompanied by 49 observers and advisors, that latter group largely constituting the members of the working groups.

The Australian experience had shown how much fun a SCAR meeting could be and the British were determined to make Cambridge as interesting as Canberra. All the attendees stayed in Gonville and Caius College and for entertainment the organizing committee laid on a formal university dinner, tea at the Royal Society and a government dinner at Lancaster House in London, as well as visits to Pye Telecommunications Ltd and to the country estate of Burghley House – it was a full week in which they also found time to get through a considerable agenda with 31 working papers including a detailed proposal from the biologists for "Conservation of Nature"! Formal reports from the various working groups had now become important as a way for the Delegates to assess progress.

At V SCAR in Wellington, October 1961, organized by the Royal Society of New Zealand, the meetings took place at Victoria University. There was less organized entertainment but attendees still had to brave a mayoral reception in the Town Hall, a Royal Society of New Zealand reception, and a government reception with Maori entertainment, hosted by the Prime Minister. Paul-Emile Victor gave a public lecture on French polar expeditions and to crown the week the Royal New Zealand Air Force flew everyone down to South Island on the final Sunday with lunch provided by the mayor of Christchurch! For a lucky 15 there was a visit to Antarctica with the US Antarctic Program at the invitation of Admiral Tyree.

Money problems had begun to arise. Robin needed assistance to run the SCAR Office and the costs of SCAR Officers attending the meeting in New Zealand had severely strained the budget. The meeting therefore agreed new arrangements for differential national contributions to provide for an increase in annual running costs estimated to be now around US $12,000. There was growing concern that SCAR meetings were becoming too large and the Delegates agreed that all Working Groups should now have elected chairs and secretaries so they could undertake a major part of the work by correspondence. To save national expense only two to four WGs would be allowed to meet at each SCAR meeting, with those not meeting with SCAR being told that they should attach their meetings to appropriate international disciplinary meetings. In fact it took until 1963 before two of the Working Groups (Geology and Oceanography) actually met at a SCAR meeting.

Delegates and local support staff at V SCAR in Wellington, New Zealand, 9–14 October 1961.

Delegates at VI SCAR in Boulder, Colorado, USA, 20–24 August 1962.

The Americans offered to host VI SCAR in Boulder, Colorado in August 1962. It was preceded by a logistics symposium, organized by the Logistics Working Group, which later met as part of VI SCAR.

Several new proposals were considered in Boulder under an agenda heading of "Functions of SCAR". One in particular raised considerable difficulties. A private Swiss Expedition led by Gilbert Caillet had requested advice from SCAR on radio communications for establishing a wintering station at Port Martin. After much discussion SCAR finally set up an *ad hoc* committee to consider the safety features but it is clear that the meeting considered this as an example of tourism and outside its official remit. In a different context the Netherlands reported forming an Antarctic Research Committee, which would organize sending scientists down with Belgian expeditions. Interestingly SCAR decided to welcome this initiative. Meanwhile New Zealand had suggested that the sub-Antarctic islands were not really appropriate for SCAR's remit and requested their inclusion be reconsidered; the majority of the Delegates disagreed so no change was made.

By this meeting SCAR had lost its "temporary status" and formally became the Scientific Committee on Antarctic Research, now that the ICSU Executive had finally recognized the need for a permanent committee. Attendance increased again with 64 people, most of them classed as advisors. A more recognizable structure of permanent working groups had now been reached but with a curious range of officers. Some groups had chairmen, others a secretary and yet others a chairman and secretary. The eleven groups now comprised: geology, meteorology, biology, logistics, geodesy and cartography, upper atmosphere physics, oceanography, geomagnetism, glaciology, solid-earth geophysics and communications. K Bullen from Australia was replaced as Vice-President by Vice Admiral Panzarini from Argentina.

VII SCAR in 1963 was in Cape Town and began with a sightseeing and geological excursion around the Cape Peninsula. This time the entertainment was more limited with only a cocktail party given by the Provincial Administration and a dinner hosted by the Minister of Transport. Prior to the meeting there had been a protest from the USSR that neither the SCAR meeting nor the SCAR Geology Symposium should be held in South Africa as this would be in breach of UN Resolution 1761 urging states to boycott the apartheid regime. The Soviets threatened to stay away from both meetings unless the

venue was changed. SCAR took a robust position, insisting that since no other country supported the Soviet position and moving the meeting would run counter to ICSU rules on political non-discrimination no changes would be made. The Russians did indeed stay away but their protest proved to be of little significance. Why Chile and Belgium did not attend is not recorded.

Laclavère finished his term as the first President of SCAR in Cape Town and was made the first Honorary Member. Larry Gould, one of the pillars of IGY and a leading Antarctic scientist, was elected without opposition as the second President.

SCAR next convened in Paris in August 1964 (VIII SCAR) with over 60 people attending and all twelve nations represented. Finance had not markedly improved, not least because some countries had not paid their dues and others had paid only part of them. There was a $10,000 loan from ICSU that needed repaying meaning that SCAR was actually in debt by $3,000. In the light of a request from New Zealand, Delegates discussed the date of the next meeting and decided that it should be in 1966, which, in effect, set the pattern for future biennial meetings of SCAR. Suggestions for marking the tenth anniversary of continuous scientific collaboration since 1957 were put forward, including special articles in journals, a bumper issue of *SCAR Bulletin* and the possibility of commissioning a set of review papers. The WG Biology decided to establish a number of subcommittees, a move that was followed at IX SCAR by the WG Oceanography .

The following year the SCAR Executive Committee held its first separate meeting at the University Club in New York on 27 September 1965 with L M Gould (President), Vice Admiral R N M Panzarini (Vice-President) and G de Q Robin (Secretary). They agreed to support the first SCAR symposium on oceanography in Santiago, Chile, the following year including providing some funding for invited speakers, and decided that a *SCAR Manual* would be prepared. The Executive also decided that the proposed "Antarctic Day" should be held in early October 1966, shortly after the IX SCAR Meeting.

By IX SCAR in Santiago, Chile, September 1966, the present meeting frequency, with a biennial meeting of the Delegates and some of the Working Groups, along with a meeting of the Executive Committee in alternate years, was formally adopted. Already some of the Working Groups had seized on what became a long-standing problem for SCAR – the appointment by National Committees of Delegates with little active role in the Antarctic and members of Working Groups who were no longer active researchers. The concept of specialist subgroups, of three or four scientists, under Working Groups was first discussed at this meeting.

IX SCAR proved to be an important meeting. As this was the 10th anniversary of continuous scientific co-operation in the Antarctic a special ceremony was held at the University of Chile. The University had organized a special exhibition with the support of many SCAR nations to mark the event.

It was at this meeting that the problems of representation by the smaller countries surfaced. Whilst several countries felt that annual meetings of SCAR were essential, Delegates from some of the smaller countries had indicated that their governments would simply not provide the necessary funds. Indeed, it had already been observed that Working Groups were not always adequately attended especially when the person appointed was from a university rather than a government institute. There were, on the other hand, some Delegates who complained that biennial meetings were not conducive to continuity in rapidly changing fields. No compromise was really possible but the need to maximize national attendance ensured that the agreed system of biennial meetings was confirmed. Yet again SCAR addressed, diplomatically of course, the question of the competence of national appointments. Too many Del-

Laurence M Gould, President 1963–70

Laurence McKinley Gould was an outstanding geologist and closely involved in polar research throughout his career. Born on a farm in Lacota, Michigan 22 August 1896, he taught school for two years in Boca Raton before enrolling for law at the University of Michigan. Under the influence of W H Hobbs, then chair of the geology department, he switched to geology which became his life long interest. Only after World War I, in which he served in the ambulance corps in Italy and France, did he begin his polar research, starting with expeditions to Greenland in 1926 and then Baffin Island in 1927. Joining Commander Richard Byrd as geologist on his first Antarctic expedition 1928-30, he was in charge of the construction of Little America and led sledge parties to investigate the Rockefeller Mountains and the Queen Maud Mountains. On his return he was awarded the Congressional Gold Medal, three other medals and the first of his 26 honorary degrees. He wrote what has become a classic account of his experiences : Cold. Moving in 1932 to Carleton College, Minnesota, he retired from there as president in 1962 and moved to the University of Arizona in Tucson where he taught geology until he died on 20 June 1995. He led the US delegation to IGY and followed Laclavère as President of SCAR. On many influential boards and committees, including the Ford Foundation, the Carnegie Foundation and the National Science Board, Gould's advice was sought by many. His support was critical in raising money for the extension of the Scott Polar Research Institute in 1968. In 1997 the National Science Foundation named their new polar research vessel the R/V *Laurence M Gould* and his name is commemorated in six Antarctic topographic features.

Photograph courtesy of Carleton College Archives

egates were being appointed because of their official positions rather than for their expertise in the subject. This was especially obvious when appointments were made from the military, a feature of several countries that relied on military support for their logistics. The idea was also floated of holding an Antarctic Congress covering all disciplines every four or five years but this gained little support. There was little enthusiasm amongst the majority of scientists for hearing about research in disciplines other than their own. In addition a review of the Working Groups was undertaken and a range of changes agreed including the disbanding of Geomagnetism (whose responsibilities were transferred to two other groups).

Recognition of the need for dedicated groups to discuss particular topics on a continuing basis stimulated SCAR to form groups of specialists. These were directly appointed by the Executive Committee from nominations made by the Working Groups, normally limited in size to six people, supported from SCAR funds and often dealing with multidisciplinary problems. This seemed an attractive and efficient way of developing initiatives in

particular areas and answering some of the requests for advice from the Antarctic Treaty. Initially 13 groups were proposed, of which four were biological, two were glaciological, four were oceanographical, and three were linked to logistics. Twelve groups were developed and by 1968, nine of these were in active existence.

In 1966 at IX SCAR it was agreed that an *ad hoc* committee was needed to co-ordinate studies between biology, geology, glaciology and oceanography. Eduard van Zinderen Bakker (South Africa) was chosen to head the committee and a first meeting was organized for the week before the biology symposium in Cambridge in 1968. As well as reviewing their separate fields they outlined some prescient objectives for study including analyses of ice and sediment cores, pollen studies on the subantarctic islands, the value of aerobiology and ice sheet margins in oases.

Other specialist groups included Space Vehicles, and Technical Problems Affecting Communications. These and other specialist groups were, in effect, subgroups of the working groups and distinct from the formalized, and more familiar, Groups of Specialists, the first of which were established at XII SCAR in 1972. The records of these early Groups of Specialists are incomplete and it is difficult at this distance in time to determine what some of these achieved, if anything. The formalized Group of Specialists' structure continued until the SCAR re-organization was implemented at XXVII SCAR in Shanghai, July 2002. The groups slowly improved their performance with regular reports and meetings, and continuing oversight by the Executive Committee of both the membership and their terms of reference

Antarctic Treaty relations

In early 1961 Larry Gould raised the question of how SCAR should communicate with the newly agreed Treaty Parties – he clearly did not know that this had already been discussed by the Parties. His suggestion of a direct link to their meetings worried Robin who proposed instead that more should be made of links through National Committees to governments and that perhaps some activities, like the circulation of logistic reports, would be better left to the Parties at Consultative Meetings. In the event there were actually six SCAR scientists (Laclavère, Panzarini, Nagata, Robertson, Van Rooy and Somov) present in delegations at the first Antarctic Treaty Meeting Consultative in Canberra, July 1961.

Whilst SCAR is not specifically mentioned in the Antarctic Treaty itself, at the first meeting in Canberra Recommendation I-I deals with the SCAR programmes and Recommendation I-IV specifically requests that SCAR continues with its role to advise on science questions to facilitate international scientific co-operation in Antarctica. This pattern continued in subsequent meetings with SCAR specifically mentioned in many of the recommendations as the source of the key information or as the appropriate body to be tasked with organizing a meeting or researching some new topic. Thus SCAR has always been the *de facto* scientific advisor to the Antarctic Treaty System.

In Canberra, 1961, I ATCM adopted the "General Rules of Conduct for Preservation and Conservation of Living Resources in Antarctica" extracted directly from the document prepared by the SCAR Biology WG and a key precursor to the Agreed Measures for the Conservation of Antarctic Fauna and Flora. At this stage only State Parties were able to attend the ATCM and thus much SCAR input was through papers presented by the UK, largely because the SCAR Secretariat was in Cambridge, UK; this proved a most efficient route. In part it was also because the UK had enthusiastically embraced many of the early ideas put forward by SCAR and was, therefore, an eager proponent of them at the meetings. Over the years, the reports and papers prepared by SCAR for the ATCM were well-received and welcomed by the Treaty Parties. Some delegations included SCAR scientists among

their members who could, if necessary, amplify a particular point through the heads of their delegations. However, SCAR had no right of representation at an ATCM. This situation was to continue for many years but a major change came in 1987 (see Chapter 4).

At V ATCM in Paris, November 1968, there were detailed discussions of both telecommunications and sealing. Whilst the Treaty Parties seemed keen to adopt the SCAR proposals on management of any sealing industry there were clearly concerns on both the logistics and telecommunications fronts which some Parties felt were not properly SCAR business. The Soviet Delegation even suggested that SCAR should be responsible for advising on historic sites, a view strongly rejected by other delegations and by SCAR itself as completely outside its scientific remit. The SCAR Executive Committee had suggested that a more direct route for SCAR advice and input would be directly to the Consultative Meetings but Parties decided that this might inhibit the freedom of action of SCAR and it was not adopted.

Cartography

Although cartography was not included in the official IGY programme the twelve nations needed to undertake a considerable amount of surveying in support of the science and for the navigation of field parties. The United States Operation High Jump (1946–48) had pioneered the use of extensive aerial photography, especially of coastal regions. By the end of IGY there was trimetrogon aerial photography of almost 5% of the continent and maps were available showing most of the major features. SCAR realized right at the start that accurate mapping would be a critical element for the advancement of many aspects of science but the photographs needed accurate ground control to allow them to be used in mapping.

The original linking of cartography with geology by using the same working group was, at least in part, because the geologists in particular needed better maps. Some countries, like the UK, had been progressively mapping their claimed area of the Antarctic since the end of the Second World War but there had been no agreed framework within which to link maps of the Antarctic Peninsula to the rest of the continent. SCAR offered a way forward and, since the claims had been put to one side by the Treaty, there was every expectation that national mapping groups could use SCAR as the basis for developing collaboration.

That was, of course, far too simplistic. All the claimant nations decided that politically they would wish to publish their own maps as a way of advertising their sovereignty and so the sensible course of joint mapping by Argentina, Chile and the UK was never possible. Nevertheless, the cartographers took heart and by the second meeting in 1958 they had decided to try to produce a collaborative continental map at a scale of 1:3,000,000. They had recognized that standardization of map specification was needed and Wexler was asked to produce the first definitive list of all available published maps of Antarctica.

It was quickly recognized that the cartographers needed their own group. The Antarctic Cartography Working Group, chaired by Laclavère, had senior cartographers from Argentina, Australia, Belgium, France, Japan, New Zealand, UK, USA and USSR. Norway and South Africa soon appointed members but Chile was some way behind. Nevertheless at III SCAR in 1959, all SCAR Members advised the Working Group of the addresses of their newly established National Antarctic Mapping Centres. It agreed that all new maps would be distributed automatically to all Antarctic Mapping Centres, some basic principles on projections and scales to be used were agreed, and it was decided to try to agree a set of international conventional signs for use on all maps and to consider how different nations could assist in the grand Soviet proposal for mapping the whole of the continent. However, some Delegates,

like Brigadier Hotine from the UK, showed little enthusiasm for standardization and were resolutely opposed to the WG discussing place names although they did all agree to exchange gazetteers.

By the IV SCAR meeting they were prepared to implement a standard set of symbols and this was published for SCAR by the Australian Division of National Mapping in 1961. They also proposed that all relevant nations prepare and maintain aerial photography flight index diagrams and tried to grasp the thorny nettle of place names again, encouraging bilateral resolution of conflicting names. The national reporting system they had encouraged had already shown overlap in proposed mapping programmes, with three countries competing in one area.

The range of interests in the group increased and at V SCAR in 1961 it was renamed Geodesy and Cartography. Now they saw the need to establish a geodetic network on rock outcrops from which ice movement could be measured. In addition they were trying to get every nation, and especially those planning new scientific atlases, to aim for uniformity of approach in base maps, scale, projection and symbols but at this juncture SCAR itself had no way of delivering an agreed basic outline. Despite this both the USA and USSR forged ahead with major new works, the US *Antarctic Map Folio Series* beginning in 1964 and volume I of the Soviet *Atlas Antarktiki* being published in 1966. The first catalogue of topographic maps, aeronautical charts and hydrographic charts published by member nations was produced by SCAR in 1961.

In 1962 the WG started investigating in earnest the possibility of recording geodetic positions using satellites.

This WG proved to be one of the most active in this period. With Bruce Lambert from Australia as its secretary the group reported in detail at every SCAR meeting and Lambert published an overview of progress for the period 1960–65 in which he summarized activities by nation and looked at some specific advances. During the period there was a marked increase in map production, aerial photography and survey control points. All known rock features appeared to have been photographed whilst the inland elevation of the ice sheet had been determined by radio-altimeters. Detailed hydrographic surveys had been undertaken around most coastal stations and there was a wealth of new oceanographic data from routine resupply voyages and special cruises. Many new gravity stations had been visited and the Antarctic network tied in more substantially to the world network. SCAR's mapping specifications had been generally accepted as had the standard symbol set whilst an up-to-date catalogue of all Antarctic maps was now available.

Logistics and Communications

Logistics for IGY had been handled in a variety of ways by the different countries. Many had needed substantial support from their military to provide not only ships and aircraft but also men on the ground to build and run the infrastructure. After IGY this support was not necessarily forthcoming in quite the same way and civilians began to assume a greater role in many of these fields.

SCAR had recognized early on that co-ordinating logistics was a key requirement for future international work and that there was no other body able to provide this. Accordingly at SCAR IV both a Communications Working Group and a Logistics Working Group were formed and a logistics symposium was proposed. Interestingly this proved to be the first official SCAR Symposium and was held at Boulder, Colorado in August 1962 (in conjunction with VI SCAR) with 40 participants. With 74 papers presented in six sections this proved to be a major step forward in exchanging logistics information and improving good practice. There were papers on air operations from Argentina, New Zealand, Australia, UK, USA and Japan but the largest sections were devoted to buildings and Antarctic provisioning. For the first time it was pos-

sible to compare the approaches of different expeditions on field rations as well as hearing the recipe for dog pemmican. The strengths and weaknesses of various vehicles were examined whilst a variety of construction techniques for buildings were described by many countries. The problems of water supplies, sewage disposal (including an incinerator latrine) and fire security were all presented for the first time at an international meeting. The final symposium report published the following year ran to 788 pages.

Whilst the symposium may have been a success it did not stimulate regular meetings of this kind, as was to become the custom for the major science groups, and this meant that it was only at the meetings of the Working Group on Logistics that regular contact was maintained.

The Treaty Parties were obviously impressed by the publication from the 1962 symposium and urged that further meetings should be organized. Apparently SCAR did not take up this suggestion and it was left to the ATCM to organize the next logistics symposium as a Meeting of Experts in Logistics in Tokyo, June 1968.

The SCAR Logistics Group wanted to share information on infrastructure and designed a form that all countries could complete to register details of their stations etc. In addition they recognized that notice of travel movements circulated in advance of each summer season would be an excellent basis for international co-operation. Despite this being suggested as long ago as 1960 it proved to be impossible to achieve, even in a limited way, for several decades. However, at the very first meeting of the ATCM in 1961 Recommendation VI set out the basic form of exchange of information between Parties which has continued ever since.

The SCAR Communications WG had immediate tasks in developing a coherent network to support the meteorological reporting as well as carrying the normal station communications. The First Antarctic Treaty Telecommunications Meeting took place in Washington in 1963 and SCAR was able to play a major role in providing technical advice. The assumption after this meeting was that the Parties were going to take over the SCAR co-ordinating role and SCAR therefore disbanded the Communications WG in 1966, transferring a very limited role to the Logistics WG. However, it soon became clear that the Parties were unable to exchange information effectively and to stop the system failing SCAR again undertook the job of compiling and distributing the technical information through the SCARCOM Manual.

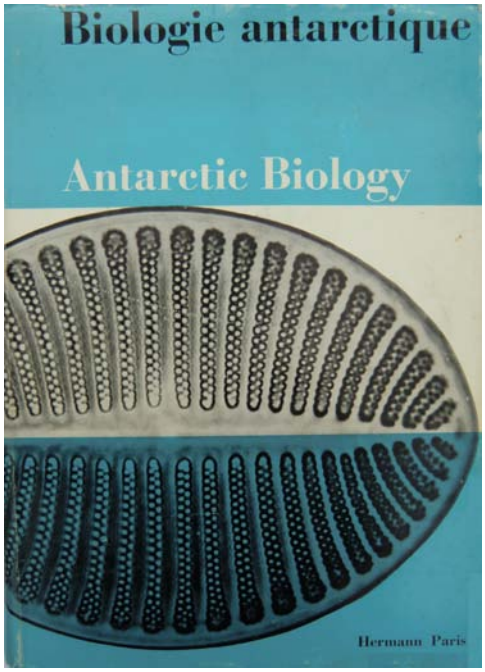
Later, at X SCAR in Tokyo, June 1968, the Australian Delegate, Phil Law, proposed that a study on radio noise as part of communications should not be undertaken by SCAR in what turned out to be a forerunner of the Australian Government position at the Antarctic Treaty Telecommunications meeting in Buenos Aires, September 1969. This subject area, in which science and logistics crossed with national agendas, continued to be a problematical one for SCAR.

Biology

Because biology was not a discipline of the IGY there were few biologists on the continent and their output was of minimal significance compared to the overwhelming achievements of the physicists. However, SCAR recognized this needed addressing immediately and at the 3rd meeting in March 1959 the first programmes in marine and terrestrial biology and medical research were drafted, and an international meeting was suggested by Bill Sladen (UK). Although the Working Group on Biology was not constituted until the following year, it was keen to make up for lost time and swiftly accepted an offer from France to organize its first symposium in Paris in 1962. This was essentially a stocktaking exercise, encompassing the whole of biology without any particular theme, and an opportunity to establish an international Antarctic biological community for

the first time. With 100 scientists from 14 countries presenting 55 papers this was deemed an outstanding success, and its organization set a pattern that later meetings also followed.

The lack of provision for Antarctic conservation had clearly been troubling several scientists for some time. The rest of the world was developing national parks and protected areas but there was nothing in the Antarctic. It seems likely that some of these scientists learnt that this was not to be incorporated in the Treaty and so, at the SCAR meeting in 1960, the biologists developed some brief "General rules of conduct for the preservation and conservation of living resources in Antarctica" which were intended to promote a discussion at the first ATCM. They were welcomed and adopted as an interim measure whilst the subject was put firmly on the agenda for the second ATCM. SCAR decided to develop its ideas further and these are reflected in a paper prepared by the Working Group on Biology and circulated in 1960 to National Committees. It set out some general principles for conservation, then provided five recommendations followed by annexes that listed all relevant national laws or regulations. The draft text of a leaflet called *Preservation of Wildlife*, for SCAR to circulate to everyone, provided a series of technical definitions and an annex on methods for sampling fauna and flora. This carefully worded document provided the core of the paper submitted by the UK to II ATCM. Discussion of these ideas finally resulted in the draft of the Agreed Measures for the Conservation of Antarctic Fauna and Flora adopted at III ATCM and provided the basis for most of the conservation recommendations that followed, up to and including the Protocol on Environmental Protection to the Antarctic Treaty (see Chapter 5).



The cover of the proceedings volume of the first Antarctic Biology Symposium held in Paris, France, in 1962.

Key elements of the Agreed Measures were the possibility of designating specific areas for the protection of the flora and fauna and nominating particular species for special protection. The Specially Protected Areas (SPA) were seized upon by the conservationists in the community and at IV ATCM the first 15 areas were adopted. Most of this first group were designated to protect birds but, in the South Orkney Islands, Green Island and Lynch Island were specifically chosen to protect vegetation whilst Moe Island was the first example of an area selected as a control against which impacts elsewhere could be measured. The Agreed Measures also recognized, for the first time, the category of Specially Protected Species, and SCAR recommended that the Ross Seal and all species of fur seals found in the Antarctic should be given this designation after discussions in the WG on Biology at V SCAR. In addition it also defined harmful interference and recognized the potential damage of accidental introductions into the area.

In Paris, during the biology symposium, the Biology WG was faced with deciding on its relationship with the developing elements of the International Biological Programme. One of these was named Hu-

man Adaptability and Otto Edholm from the UK persuaded the WG to agree on a new subcommittee to develop an Antarctic element for this. The group began to develop some agreed projects on human physiology and at a meeting in Paris in April 1966 advised that the collection of data on illnesses and accidents would be a useful step forward. The projects put forward to IBP were on environmental exposure and changes in body weight and skin-fold thickness.

The success of the earlier symposium in Paris had persuaded the biologists that another one was needed. In 1964 the WG organized the Symposium on Antarctic Ecology in Cambridge. Since the WG added its own business meeting to the symposium some people were there for almost two weeks. As far as entertainment was concerned an afternoon excursion to Ely and Wicken Fen was followed by tea at Gordon Robin's house. The Royal Society sponsored a reception and SPRI provided a polar film show.

Meteorology

The management and analysis of meteorological data via Weather Central at Little America had been one of the obvious successes of IGY. The meteorologists had been able for the first time to describe the circulation patterns in the troposphere (3–10 km up) but needed much more data and longer runs to improve their ability to forecast. SCAR did not wish to lose any opportunity of continuing this. At II SCAR in 1958 Harry Wexler led a group discussing how to achieve this and their conclusions were that New Zealand or Australia should be responsible for the initiative, and that a new group on Antarctic communications was needed to facilitate its functions.

Australia took up the challenge and established the International Antarctic Analysis Centre in Melbourne in 1959. The Centre struggled at first with getting regular meteorological broadcasts from Antarctic stations due to poor radio communications, a complete lack of South American data and a shortage of analysts as few countries wanted to second any staff there. Such was the Australian enthusiasm for this field, however, that they organized a symposium on Antarctic meteorology, also in Melbourne, 10–25 February 1959. This was principally a post-IGY meeting but was supported by SCAR and as such could be said to constitute its first scientific and certainly its first meteorological symposium. Much of the data had not yet been adequately analysed but the symposium volume stimulated further work.

ICSU had requested that SCAR agree to a permanent observer on the WG from WMO and this began with O Ashford in 1958. There clearly was considerable overlap of interest between WMO and SCAR and some demarcation of responsibilities was needed. Meetings with the WMO Working Group on Antarctic Meteorology in 1966 clarified the areas of interest for the future – WMO would concern itself with the synoptic network and the equipment for measurements to ensure Antarctic stations were consistent with the rest of the world, whilst SCAR would focus on the research questions. And to build further links between the two communities there was a very successful joint SCAR/WMO Polar Meteorology Symposium in Geneva (1966) organized by Morton Rubin.

Geology and Geophysics

At IV SCAR, August–September 1960, the Permanent Working Group on Geology was formally established. R W Willett (Chairman) reported to the Delegates on the geological activities of ten national members of SCAR. These were mostly accounts of geological and geomorphological fieldwork undertaken close to, or within a few days travel of, the various bases. The geographical separation of these field areas was often several hundred or more kilometres so that they formed a series of unrelated spot studies across the continent. Regional correlation was not possible and any attempts were little more than inspired guesswork. However, the Working Group drew at-

tention to the need for producing geological maps, using standard symbols and colours; for formal stratigraphical and formation names; and for the co-ordination of isotope dating of Antarctic rocks. The Group also called for studies on palaeoclimatology, palaeomagnetism, geochemistry, sub-glacial terrains (using geophysics), volcanology and structural geology within the basic framework of regional geology. It was agreed to consider all these matters further with a view to discussion at the next meeting. At V SCAR, October 1961, progress was made on all of these issues and a recommendation was adopted to hold a Symposium on Antarctic Geology in 1963. In addition, by 1961 both the solid-earth geophysicists and the geomagnetic specialists had decided that they each needed their own Working Group distinct from geology, and thus, in keeping with the scientific ethos of the day, the related disciplines began to carve out separate territories. Oddly, by IX SCAR in September 1966, the Working Group on Solid-Earth Geophysics had considered disbanding but was persuaded to continue because much of the Antarctic work was of importance to the Upper Mantle Project and "termination of the group would be unwise". Nevertheless, "there was only partial agreement with the proposal that the group be amalgamated with the Working Group on Geology". It was not until XXVI SCAR in July 2000 that the two Working Groups agreed to amalgamate into a single Working Group on Geosciences although, throughout the intervening years, they had routinely held a joint meeting whenever the opportunity arose. Territorial disputes can be long lasting!

The first Antarctic Geology Symposium was held in Cape Town in September 1963, and attracted 45 participants from 9 countries, presenting 76 papers. Almost half of the attendees were South African. Interestingly the papers came from all the 12 countries active in the IGY period despite a lack of representation from Belgium, Chile and the USSR. The single sessions were organized around various sub-disciplines in earth sciences which militated against discussion and synthesis for particular parts of the Antarctic. In many respects this was hardly surprising because the geology of most of Antarctica was so poorly known at the time. However, the value of the symposium was the publication of these isolated local studies that were used as the foundation for subsequent research and regional synthesis.

In summing up the symposium Lester King from the University of Natal underlined the importance of continental drift for Antarctic geology and the variety of data now available to support it, the

Participants at the first SCAR Antarctic Geology Symposium held in the Department of Geology, University of Cape Town, Cape Town, South Africa, 16–21 September 1963.

growing interest in the ice-free Tertiary period and the need for more information on subglacial geomorphology.

Glaciology

Despite the fact that over 99% of the Antarctic is covered with ice, glaciology was very limited before the IGY. The IGY inland journeys by the Americans and the Soviets, together with the Commonwealth Trans-Antarctic Expedition, all produced a great deal of new data on ice thickness.

In 1961 when the Working Group on Glaciology was formed, with Claude Lorius as Secretary and Gordon Robin as Chairman, there was an enormously wide range of possible research. Bert Crary provided an initial report on the various existing activities, which included ice coring at Roi Baudouin by the Belgians, measurements of glacier flow at various sites by the US, Argentina, Australia, South Africa and the UK, and seismic observations of ice thickness. A meeting of the Working Group in 1963 refined the areas that needed attention and in the process set a course for many years to come. They recognized that better drilling and coring techniques were needed, that comparative trials of different methods for ice thickness determination were required and that agreement was needed on how to identify reference horizons in snow (suggesting that radioactive fallout from thermonuclear tests would provide a useful marker).

The Secretary of the Group in 1963 was Uwe Radok and it was largely due to his energy and enthusiasm that the International Symposium on Antarctic Glaciological Exploration (ISAGE) took place in Dartmouth College, USA, in September 1968. With 125 participants from 15 countries this was an important milestone in Antarctic glaciology and its proceedings were much more widely distributed, than SCAR alone could have managed, by being published as a report of the International Association of Scientific Hydrology. Bert Crary, then President of the Commission of Snow and Ice of the International Association of Scientific Hydrology (IASH), used the symposium to highlight what he felt were the key areas for glaciological research. With little known about geothermal heat flow he suggested measuring ice-rock interface temperatures and mapping the major sub-ice barriers to flow, identifying the origin of tephra layers in ice cores, drilling through ice shelves and using radio-echo sounding to find areas of old ice to sample.

Oceanography

Michael Somov from the USSR was the first chairman of the WG, formed at IV SCAR in September 1960. At III SCAR the first set of scientific objectives had been outlined and, despite the limited availability of suitable ships, the list was long and broad ranging from the Polar Front Zone and surface and deep currents through bottom relief to a suite of biological investigations. At this stage there was even a proposal that studies on whales should be undertaken and exchanged with the International Whaling Commission.

By IV SCAR the Working Group had begun refining the questions and started asking for ships and dedicated ship time. They decided to form a small group to co-operate with SCOR, emphasizing that the whole water column needed to be studied, that winter data should be aimed for and that transects across Drake Passage would be valuable.

Jim Brodie from New Zealand took over the WG at V SCAR where a review of progress showed that a range of current measurements had been made, the Soviets had been undertaking deep-water measurements and samples along the 20° E meridian and that plankton samples had been collected by several countries. At VIII SCAR with R N M Panzarini as chairman the Group established a committee for organizing a symposium in 1966. A further change in running the Group soon appeared and at IX SCAR D F Leipper (USA) was elected the new secretary. The symposium had just preceded the

SCAR meeting in Santiago and much of the discussion centred around the recommendations put forward from each of the six sessions. The three items selected for special attention were studies of the Convergence, the formation of bottom water and pack ice.

The WG on Oceanography realized at this meeting that a Group of Specialists on the pack-ice zone was needed to bridge the interdisciplinary gaps between oceanography, glaciology and biology. The Group's report, entitled "Problems of the Pack Ice Zone", was widely circulated to other organizations to elicit research links.

Upper Atmosphere Physics

Since the IGY was just finishing it is not surprising that at the very first meeting of SCAR a range of science objectives were recognized by the physicists present. Upper atmosphere studies had been a major component of IGY research and the community was keen to continue the ionospheric vertical sounding work and measurements of atmospheric radio noise for a full solar cycle. Observational programmes on auroral physics should be continued using several techniques whilst they recognized the possibility of investigating the geomagnetic fields far from the earth using cosmic ray, whistler and VLF studies. This would both build on the IGY data and start some new fields. At III SCAR Fred Jacka from Australia had been made chairman of the new WG with Otto Schneider from Argentina as the reporter. Schneider soon followed this with a short paper laying out the procedures for visual auroral observations and publishing a list for 1960 of World Days for co-ordinated observations. By IV SCAR the WG was bemoaning the fact that much of the IGY ionospheric network had ceased or reduced its schedule to a level inadequate for serious research. A paper by Roy Piggott (UK) laid out clearly what was needed and identified five sites at which sounders should be established, locating them at points conjugate to Northern Hemisphere stations. Better progress had been made with the aurora and airglow network, especially in linking specific features to magnetic disturbances. The density of magnetic observatories was finally high enough to allow the characterization of daily variation on the continent although there was still a need for new stations on islands.

In Wellington in 1961 the group decided that it wanted formal establishment with Fred Jacka as the secretary. They had also received reports of radio interference with equipment like ionosondes and made some specific requests for action by the national operators. Whilst new neutron monitors were being installed to study short-term cosmic ray variations, magnetic recording was being discontinued at Macquarie Island. Installation of more riometers was seen as an important objective whilst New Zealand had agreed to design a new all-sky camera for auroral observations. Riometers measure the ionospheric opacity for radiomagnetic noise that comes from distant stars and galaxies. The intensity of this noise depends on the ionization level in the ionosphere and thus riometers can be used to monitor solar activity effects in the upper atmosphere.

The importance of conjugate point observations was taken up again at VI SCAR where a list of 10 localities was published of which six already existed in the Antarctic but only three had been established in the Arctic. With the International Quiet Sun Year (IQSY), 1962–64, about to begin there was lengthy consideration of auroral photography and a request to the USA to use NASA Nimbus meteorological satellites to record the distribution of auroras on the dark side of the Earth. Special projects for IQSY included balloon flights of neutron monitors from Wilkes Station and Macquarie Island with meson telescopes being deployed at McMurdo and Pole stations as well as on the two ships *Eltanin* and *RSA*.

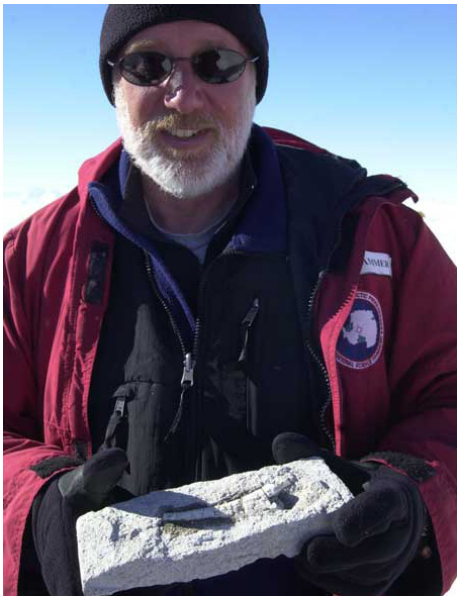
Jacka resigned as secretary in 1966 and T Nagata from Japan took over as chairman with Roland Schlich as secretary to help him.

Above: Bulgarian geologists Ianko Gerdjikov and Dimo Dimov working on Hurd Peninsula, Livingston Island, South Shetland Islands. Photograph: Christo Pimpirev.

Left: A meteorite (dark coloured) at Frontier Mountain (72°59'S, 160°20'E), Transantarctic Mountains in Oates Land. Photograph: I Franchi.

Lower left: Antoni Lewkowicz drilling rock near Terra Nova Bay to install thermistors to measure near-surface temperatures for studying weathering processes. Photograph: Antoni Lewkowicz.

Lower right: US palaeontologist Bill Hammer holding a probable sauropod bone at Mount Kirkpatrick, Transantarctic Mountains. Photograph: K Hutchison / NSF.



Above: Parties on foot searching for meteorites in the vicinity of promising moraines in the Sør-Rondane, Dronning Maud Land. Photograph: Steven Goderis / International Polar Foundation.

Below: Steve Roberts, of the British Antarctic Survey, cutting a block of granite on the moraine below Brattnipene in the Sør-Rondane, Dronning Maud Land. Photograph: René Robert / International Polar Foundation.

Above: A technician preparing a three component seismic station installation at Starr Nunatak in Victoria Land during the 2003-04 summer season Italian expedition. Photograph: Italian Antarctic Expedition.

Below: Seismologist Catherine Snelson setting off a small explosion on the flank of Mount Erebus, Ross Island, to study the interior of the volcano. Photograph: Martin Reed / NSF.

Above: A Japanese field party undertaking geological survey and research in the Sør Rondane in Dronning Maud land. Photograph: Mikio Abe.

Below: Judith Pardo (yellow jacket) studying the backbone of an ichthyosaur beside Tyndall Glacier in Torres del Paine national park, Chilean Patagonia. These dolphin-shaped reptiles lived in a common marine basin of southern Chile and the Antarctic Peninsula, 120 million years ago. Photograph: Elías Barticevic, Chilean Antarctic Institute.