

International Council of Scientific Unions

SCARreport

No 2
November 1986

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Reports of working group meetings, held as part of the
19th Meeting of SCAR, San Diego, California USA
June 1986

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Published for the
SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH
at the
Scott Polar Research Institute, Cambridge, England

XIX - SCAR - 23

Nineteenth Meeting of SCAR, San Diego, California, USA
Working Group on Biology
16-20 June 1986

Attendees:

(a) Members:

R M Laws (Chairman)	United Kingdom
A S Blix	Norway
* W N Bonner	Chairman, Sub-Committee on Conservation, UK
C De Broyer	Belgium
* S Z El-Sayed	Chairman, BIOMASS Executive, USA
Izabel Gurgel	Brazil
G Hempel	Federal Republic of Germany
T Hoshiai	Japan
J C Hureau	France
K R Kerry	Australia
G A Knox	New Zealand
* D J Lugg	Chairman, SCAR WG on Human Biology and Medicine, Australia
E R Marschoff	Argentina
S Z Qasim	India
R W Risebrough	USA
W R Siegfried	South Africa
J Valencia	Chile
* P R Condy (Rapporteur, co-opted)	South Africa

(b) Observers:

S B Abbott	USA
A Ballester	Spain
J L Bengtson	USA
W S Benninghoff	USA
J P Croxall	United Kingdom
G di Prisco	Italy
Euclides a dos Santos F	Brazil
J P Dragonetti	Uruguay
S Drieschman	USA
B Angel Grillo	Uruguay
W T Hushen	USA
F Jara	Chile
P Lu	China
R G Miller	USA
W F Perrin	IUCN
O R Rogne	Norway
R I Lewis Smith	United Kingdom
C W Sullivan	USA
D N Torres	Chile

*=non-voting members

1. ADOPTION OF AGENDA

The Chairman welcomed members and observers. The draft agenda was adopted. P R Condry was appointed rapporteur.

2. SECOND INTERNATIONAL SYMPOSIUM ON ANTARCTIC AQUATIC BIOLOGY, BRAZIL, 1985

A report on the Symposium in Rio de Janeiro, 23-27 September 1985 was noted with appreciation and thanks were expressed to the organizers.

3. FIFTH SCAR SYMPOSIUM ON ANTARCTIC BIOLOGY, AUSTRALIA, 1988

3.1 Venue and date - K R Kerry's proposal to hold the symposium in Hobart in late August/early September 1988 preceding XX SCAR was approved. The meeting thought it convenient to hold the Symposium between meetings of the Sub-Committees and Working Groups.

3.2 Theme - Three possible themes had been proposed. It was agreed that the theme would be "Ecological Change and the Conservation of Antarctic Ecosystems."

3.3 Steering Committee - It was agreed that W N Bonner (Chairman, Conservation Sub-Committee of SCAR WG on Biology) should be co-opted onto the Steering Committee, which comprised R M Laws, G Hempel, K R Kerry, W R Siegfried, and J Valencia. The Steering Committee met on 20 June to discuss arrangements and planning.

4. SCAR GROUP OF SPECIALISTS ON SOUTHERN OCEAN ECOSYSTEMS AND THEIR LIVING RESOURCES

4.1 Report on BIOMASS Programmes (publications, progress, data base and Data Centre) - S Z El-Sayed presented his report. The meeting recorded its appreciation to Dr El-Sayed and members of the BIOMASS Executive for steering the continued success and productivity of this programme.

4.2 Future Activities - The meeting agreed that:

(a) The SCAR Executive should be asked to reaffirm the extension of the BIOMASS Programme beyond 1986 to 1989;

(b) the BIOMASS Executive, as presently constituted, in addition to any co-opted experts, should continue to steer the programme in an organized, well-defined manner aimed at the synthesis of FIBEX and SIBEX data in workshops having pre-set goals and deadlines, culminating as proposed in a BIOMASS evaluation meeting in 1989;

(c) between now and 1989 no further BIOMASS Programme fieldwork other than that necessary for the efficient conduct of the analysis and evaluation phase should be initiated;

(d) the BIOMASS Executive should aim at the production of an integrated final report on the results of the programme for presentation at XXI SCAR in 1990.

The meeting recalled that BIOMASS and the SCAR Group of Specialists on Southern Ocean Ecosystems and their Living Resources were not synonymous, BIOMASS being a research programme developed by the Group of Specialists and steered by the BIOMASS Executive.

The Working Group expressed its concern at the disbandment of the Group of Specialists by the SCAR Executive. It was agreed that in view of the unparalleled success and significant achievements of the BIOMASS Programme to date and the yet to come overall evaluation of it, proposed for 1989, this was an untimely action.

5. FUTURE ARRANGEMENTS FOR SOUTHERN OCEAN RESEARCH

G A Knox tabled a summary of the decisions and actions in 1985 of the SCOR and SCAR Executives concerning the Group of Specialists on Southern Ocean Ecosystems and their Living Resources, and the SCAR Executive's request to this Working Group for recommendations on how future coordination of biological research in the Southern Ocean should be achieved. In the light of this background and information contained in additional tabled documents, the meeting agreed to make the following recommendation to SCAR (see Annex 1 for background):

It is recommended that SCAR consider the creation of a GROUP OF SPECIALISTS ON SOUTHERN OCEAN ECOLOGY, whose membership should include experts in the various branches of marine ecology as well as at least one physical and one chemical oceanographer. Co-sponsorship with SCOR should be sought.

Possible terms of reference might be:

- (i) to identify important fields for research on Antarctic marine ecology and to propose cooperative studies, including multi-ship experiments,
- (ii) to encourage and facilitate interdisciplinary studies in Antarctic marine ecosystems,
- (iii) to develop Southern Ocean ecosystem studies through workshops and other activities,
- (iv) to respond through SCAR to requests for scientific advice and information by the Antarctic Treaty, CCAMLR, and other international organizations with interests in science, resources and conservation in the Southern Ocean,
- (v) to liaise with other relevant international research programmes.

The SCAR Executive had proposed to SCOR the convening of a small joint meeting of about 6 or 7 specialists to discuss the whole question of future needs in all aspects of the marine sciences, and to submit a report for the 1986 meetings of SCAR and SCOR. This proposal was not taken up by SCOR. The new Group of Specialists on Southern Ocean Ecology, if established jointly by SCAR and SCOR, will be an appropriate forum for discussing the needs in Antarctic marine biology in relation to physical and chemical oceanography.

6. SCAR GROUP OF SPECIALISTS ON SEALS AND RELATED MATTERS

6.1 Report of meetings - R M Laws, Convenor of the Group of Specialists on Seals, presented the reports on the meetings of the Group in San Diego with XIX SCAR, 11-13 June 1986, and in Seattle at the National Marine Mammal Laboratory, 2-3 May 1985 (distributed as BIOMASS Report Series No. 47). The report to XIX SCAR was also noted.

6.2 Future Activities

- (a) Handbook on Seal Research Methods - it was noted that good progress was being made with this, and that Cambridge University Press had expressed an interest in publishing it. The meeting welcomed this information and supported the Group of Specialists' initiatives in this regard.
- (b) Convention for the Conservation of Antarctic Seals (CCAS) - the meeting fully supported the Group of Specialists' concern at the failure of some nations to meet their reporting obligations under CCAS. Their request to urge SCAR to call this matter to the attention of National Committees was supported.
- (c) National Contacts for distributing copies of reports - the meeting supported the Group of Specialists' views on this matter and urged each member of the Working Group on Biology to supply the Secretary of the Group of Specialists with the name and address of a contact person in his/her country who would be able to distribute to interested persons copies of the reports of Group of Specialists meetings.

6.3 Other Matters

- (a) It was recommended that the Group of Specialists should include in their Handbook the names of the various species concerned in other languages as well as English. Non-English speaking members of the Working Group on Biology would supply Dr. Laws with the names in their languages.
- (b) The meeting expressed its strong support for the Group of Specialists to consider the question of population assessments for the ice species of seals, and if necessary to approach National Committees through SCAR for cooperation, with respect to logistical requirements to facilitate this.

7. SCAR GROUP OF SPECIALISTS ON ANTARCTIC SEA ICE AND RELATED MATTERS

In view of the importance of the proposed ASIZ (Antarctic Sea Ice Zone) programme to Antarctic biology, it was agreed that the Working Group should make a greater input to the programme. An ad hoc group comprising T Hoshiai, G Hempel, K R Kerry, J P Croxall, C Sullivan and E R Marschoff was established to consider how this could be done.

The report of this group is attached as Annex 2 to this report. It was agreed that this report should be submitted to the Convenor of the Group of Specialists on Antarctic Sea Ice as the Working Group's response to his request for further biological input.

G Hempel reported on a recent proposal by the Arctic Ocean Science Board (AOSB) to SCOR for the establishment of a Working Group on Ecology of Sea Ice. This WG would focus on the sea ice biota, i.e., the organisms living in the brine channels and on the underside of ice floes and fast ice, their ecology and relation to the physical and chemical environment of sea ice and its formation and decay. Arctic as well as Antarctic studies were to be included. The proposed terms of reference call for reviews of present knowledge and methods, the desirability and feasibility of cooperative multidisciplinary studies was to be explored, and a workshop on biological sea ice studies to be planned. The WG might be co-sponsored by SCAR which then may nominate further members to it or be consulted in establishing the membership.

8. BIOMASS WORKING PARTY ON BIRD ECOLOGY AND SUB-COMMITTEE ON BIRD BIOLOGY

8.1 BIOMASS Working Party on Bird Ecology - W R Siegfried presented the final report of the BIOMASS Working Party on Bird Ecology. The meeting recorded a vote of thanks to him and the members of this Working Party, and congratulated them on the significant achievements of their group.

8.2 Sub-Committee on Bird Biology - The meeting noted that, as had been approved at XVIII SCAR, the BIOMASS Working Party on Bird Ecology had been reconstituted as the Sub-Committee on Bird Biology of the SCAR Working Group on Biology. All of the requests arising out of the recent meeting of the Sub-Committee were accepted. The recommendations contained therein were discussed and the meeting agreed that:

- (a) the Working Group should invite the following persons: J P Croxall (Chairman), J Cooper (Secretary), D G Ainley, R Bannasch, P C Harper, G L Hunt, G W Johnstone, P Jouventin, P A Prince, M Sallaberry, and W R Siegfried to serve on the Sub-Committee. Since M Sander (Brazil) has had no prior contact with the members of the Sub-Committee, it was suggested that he be invited to attend the Sub-Committee's next meeting as an observer. It was recalled that membership of Working Group Sub-Committees was based upon individual expertise relevant to the tasks of Sub-Committees and not on national representation.
- (b) suitable arrangements should be made through SCAR to promote the submission to the Sub-Committee of outstanding ISAS information relating to survey and monitoring operations from Argentina, Federal Republic of Germany, German Democratic Republic, and Norway. It was also agreed to recommend to SCAR that National Committees be asked to submit to the Sub-Committee the required data on monitoring studies of certain species and sites.

- (c) suitable arrangements should be made through SCAR to promote the submission to the Sub-Committee of Central Data Bank Antarctic bird banding information from Argentina, German Democratic Republic, and New Zealand.
- (d) the Working Group supported the proposal to raise funds from private organizations in aid of the Sub-Committee's International Giant Petrel Dispersal Project, and seeks approval for this action from the SCAR Executive.
- (e) The New Zealand National Programme should be requested to make suitable arrangements to promote the banding of giant petrels at the Chatham Islands and other sites under New Zealand jurisdiction, as part of the Sub-Committee's International Giant Petrel Dispersal Project.
- (f) Arrangements should be made to promote the submission to the Sub-Committee of national lists of publications on Antarctic seabirds for 1984 to 1986 and currently in press.
- (g) the Working Group supported the Sub-Committee's request to hold its next meeting in association with XX SCAR in 1988.

9. PROGRESS ON THE BIOTAS PROGRAMME

R I Lewis Smith presented his report on progress. The meeting acknowledged his efforts in this regard.

The question of whether the BIOTAS (Biological Investigations of Terrestrial Antarctic Systems) Programme should or should not include the intertidal zone was debated. It was agreed that this should be integrated into the programme since it had been excluded from BIOMASS. It was also recognized that although in scientific terms the littoral in Antarctica more closely relates to the marine than to the terrestrial environment, in logistical terms it more closely relates to terrestrial than to marine activities.

Concerning future action it was agreed that:

- (a) the BIOTAS Programme proposal (Annex 3) was welcomed by the Working Group, which sought from XIX SCAR their approval of it in principle.
- (b) R I Lewis Smith should co-opt an ad hoc core group and consult with other scientists to continue to develop the programme plan for consideration by the Working Group in 1988 at XX SCAR. The period up to 1988 should be viewed as an exploratory phase of the programme.
- (c) a meeting of interested persons will be held during the Paimpont Symposium on "Antarctic and Sub-Antarctic Terrestrial Ecosystems" in France in September, 1986, and again during the Fifth SCAR Symposium on Antarctic Biology in Australia, 1988.
- (d) the concept of research sites was to be welcomed and should be developed further, noting that such sites could be viewed as potential SSSIs.

- (e) the proposal to establish a BIOTAS Newsletter was welcomed. The question of production and distribution costs should be examined by the programme planning ad hoc group and a suggestion on this put forward in 1988 to the Working Group. It was agreed that the Newsletter should not become a formal publication.

10. PROGRESS ON THE SCAR MANUAL ON MONITORING

R Risebrough reported that since the formulation of his original mandate on this matter at the Working Group's previous meeting in 1984 in Bremerhaven, some aspects had been or were being fulfilled by the activities of other groups, such as the Working Group for the CCAMLR Ecosystem Monitoring Programme in the Antarctic. It was noted that this group was not, however, preparing a manual on monitoring and does not cover all aspects of the environment.

The meeting, therefore, agreed in principle that a SCAR manual on monitoring would be extremely valuable and that the production of this be considered at a later stage.

11. COMMISSION FOR THE CONSERVATION OF ANTARCTIC MARINE LIVING RESOURCES (CCAMLR)

- 11.1 Fourth (September 1985) Meeting of the Scientific Committee (SC)
J-C Hureau reported on this meeting, the report of which had been published by CCAMLR in 1985. The main items of relevance were:
 - (a) Workshop on fish stock assessment - the ad hoc Working Group on Fish Stock Assessment had met prior to the SC meeting at the CSIRO Marine laboratories in Hobart, and made considerable progress. More data were available than before and a review of basic data was possible. The SC was able to obtain some indication of mortality rates and calculate recruitment changes using the Virtual Population Analysis Method. Estimates of yield and biomass per recruit were also obtained. More precise evaluations of the status of fish stocks at South Georgia, and also Kerguelen, were obtained, but for other South Atlantic areas the data were too limited for meaningful assessments. In the case of South Georgia stocks, four possible protective actions were proposed, but, as in 1984, were not accepted for implementation.

In addition the recently published BIOMASS scientific series report (No. 6) entitled, "Review of the Biology and Present Status of Exploited Antarctic Fish Stocks" was made available to the SC. This had been well received.

- (b) Krill resources - the SC examined catch per unit effort (CPUE) statistics as a possible indicator of krill abundance. It had been agreed to set up an exploratory study on this matter, for which terms of reference were proposed. In order to allow experts to undertake theoretical studies, fishing countries were requested to make available information on vessels, fishing gear, and tow and catch records per tow.

The SC was informed that the BIOMASS review on the biology and present status of Antarctic krill was progressing well and should be available soon.

- (c) Squid resources - this matter was discussed for the first time by the SC, although there was no commercial squid fishing in the Convention area. Because squid was important in the diet of many seabirds and marine mammals in the area, the SC strongly encouraged further research on squid.
- (d) Ecosystem monitoring and management - a Working Group for the CCAMLR Ecosystem Monitoring Programme was established and terms of reference adopted (see 11.3 below). This group was asked to proceed with its work during the intersessional period and to report back to the SC in 1986.

11.2 Report by SCAR Observer - the report of the SCAR observer (W N Bonner) to the Fourth Meeting (1985) of CCAMLR was distributed.

The Working Group agreed that there was substantial value to SCAR in being represented at meetings of CCAMLR and that the practice of sending an observer should be continued. It was noted that it is not effective for a national delegate to CCAMLR to function also as the SCAR observer. Furthermore, it is necessary that the observer is properly briefed on those SCAR matters relevant to CCAMLR. At the last CCAMLR meeting some embarrassment had been caused by the SCAR observer not having been informed of the SCAR Executive's decision to disband the Group of Specialists on Southern Ocean Ecosystems and their Living Resources. It was further agreed that SCAR's position would be best presented by the submission of a document (which would be circulated together with other CCAMLR papers), rather than by an oral presentation only (which would not appear in the record). A draft document prepared by W. N. Bonner was amended and approved for submission through SCAR to CCAMLR in 1986 (Annex 4).

It was recognized that SCAR has an important role to play in the operation of CCAMLR. The principles of the Convention require the scientific management of Southern Ocean resources and this can only be done in the light of research results. CCAMLR can set up expert groups, but the research proposed by these must in many cases be carried out wholly or partially by the scientists in national programmes. SCAR has extensive experience in coordinating such research and should continue with this task.

The meeting agreed to suggest to the Chairman names of persons who could be invited to act as the SCAR observer to CCAMLR in 1986, and it was agreed that the Chairman would propose one of these to SCAR.

- 11.3 Workshop on Ecosystem Monitoring, May 1985 - Dr K R Kerry reported on progress made by CCAMLR on the development of an ecosystem monitoring programme and reviewed the report of the ad hoc Working Group workshop held in Seattle in May 1985. The main body of that report was included in the report of the Fourth Meeting of the CCAMLR SC. The SC, in accepting the report, had recognised the urgent need for pilot studies on predators and prey in terms of monitoring important variables as identified by the ad hoc Working Group. It also considered that directed ecological research on important predator and prey species was an urgent prerequisite for determining potential indicator variables and providing essential background information for evaluating or interpreting results of monitoring studies.

Accordingly the SC had established a WORKING GROUP FOR THE CCAMLR ECOSYSTEM MONITORING PROGRAM with K R Kerry as the convenor. The Working Group will meet from 2-7 July 1986 in Hamburg, FRG. The draft agenda for this meeting was distributed.

It was noted that G Hempel would be the SCAR observer to the Hamburg workshop in July 1986.

- 11.4 FAO Species Identification Sheets - J-C Hureau briefly described the newly published (2 volumes) FAO Species Identification Sheets. For the Southern Ocean these include seaweeds, euphausiids, crabs, molluscs, hagfish and lampreys, sharks and rays, bony fishes, and marine mammals. The species selected for inclusion in the publications include those known to be of present or potential commercial interest, species taken as by catch, or species requiring special protection.

It was noted that these identification sheets were complementary to the book on Southern Ocean fishes being prepared by a group of international experts and coordinated by the JLB Smith Institute for Ichthyology in South Africa.

- 11.5 General - it was noted that the CCAMLR SC was gaining momentum and is looking increasingly to SCAR for closer cooperation. It was recommended that SCAR should respond positively (see item 5 of this report).

12. SUB-COMMITTEE ON CONSERVATION AND RELATED MATTERS

The meeting noted and accepted the report of the Sub-Committee meeting, 11-13 June 1986, San Diego.

- 12.1 Matters arising from report of the Sub-Committee meeting at XVIII SCAR, Bremerhaven, Sept 1984 - it was noted that 8 countries (Australia, Brazil, France, FRG, Japan, New Zealand, UK, Uruguay) had produced a "Visitors Guide to the Antarctic". There were no other matters arising that had not been addressed elsewhere in the agenda for the Sub-Committee's meeting.

12.2 XIII Antarctic Treaty Consultative Meeting (ATCM) Brussels, October 1985.

- (a) Waste disposal - the Sub-Committee's suggestion that a panel of experts be appointed to develop a response to Rec. XIII-4 (Antarctic Expeditions and Station Activities: Waste Disposal) was approved. The panel should operate in terms of the request contained in Rec. XIII-4 and take into consideration the following points:
- (1) to undertake a preliminary assessment of waste disposal practices presently implemented by Antarctic operators, including the identification of;
 - (i) the principal kinds of waste products,
 - (ii) the ones potentially hazardous or toxic to the environment,
 - (iii) their quantities,
 - (iv) current disposal methods,
 - (v) current sites of disposal,
 - (2) on the basis of this review develop guidelines on ecologically, logistically, and economically acceptable methods and standards for:
 - (i) monitoring and regulating the generation of waste products,
 - (ii) monitoring and regulating the disposal of these products at coastal and inland stations or field camps in Antarctica,
 - (3) develop guidelines on the minimization of the impacts of waste from Antarctic stations or field camps on neighbouring and associated ecosystems,
 - (4) in the light of the above, to review the existing Code of Conduct on Waste Disposal.

It was also agreed that the panel should produce a report in time for it to be reviewed and submitted by the SCAR Executive to the next (14th) ATCM in 1987. Membership on the panel was to be determined in consultation with the Working Group on Logistics. Possible nominees included W N Bonner, R I Lewis Smith, and G A Knox.

In a joint meeting this and other matters were discussed with representatives of the Working Group on Logistics. They preferred to view the Code of Conduct on Waste Disposal as a set of "waste disposal objectives". Their comments on Rec XIII-4 were distributed.

- (b) Additional protective arrangements - In accordance with the Sub-Committee's suggestion concerning Rec XIII-5 (Man's Impact on the Antarctic Environment: Additional Protective Arrangements), it was agreed that the Working Group recommend to SCAR that a small ad hoc group be appointed to respond to the first part of Rec. XIII-5 and that this group include W N Bonner, W S Benninghoff, P R Condry and K R Kerry. The terms of reference, as proposed by the Sub-Committee, would be (see also 12.2.i and 12.4 below):

- (1) to review:
 - (i) the effectiveness of Article VIII of the Agreed Measures for the Conservation of Antarctic Flora and Fauna and subsequent practice in according special protection to certain areas as a conservation mechanism, and
 - (ii) the effectiveness of ATCM Rec VII-3 and subsequent practice in designating SSSIs as a means of protecting scientific research from harmful interference,
- (2) to consider how the concept of management of areas might be applied in the Antarctic Treaty Area as a means of:
 - (i) improving the effectiveness of the Agreed Measures for the Conservation of Antarctic Flora and Fauna,
 - (ii) regulating the environmental impact of coastal and inland stations and field camps and their associated activities,
 - (iii) protecting areas of non-biological significance and/or outstanding scenic value,
 - (iv) achieving other ends of conservation and environmental protection consistent with the principles and purposes of the Antarctic Treaty System,
- (3) to advise accordingly.

It was also agreed that the ad hoc group should produce a report in time for it to be reviewed and submitted by the SCAR Executive to the next (14th) ATCM, 1987.

- (c) Siting of Stations - The Working Group endorsed the Sub-Committee's comment concerning Rec XIII-6 (Facilitation of Scientific Research: Siting of Stations) that environmental impact assessment procedures, if carried out as suggested in SCAR's response to Rec XII-3 of the 12th ATCM, would help considerably to avoid problems that might arise from contiguous stations.
- (d) Extension of SSSI Designations - the Sub-Committee's comments on Rec XIII-7 (Facilitation of Scientific Research: SSSIs - Extension of Designation) were supported. Furthermore, it was agreed that the Working Group had no objection to the further extension of designation of SSSI No. 2 (Arrival Heights), designated for its special electromagnetic features rather than biological reasons, but felt that the matter should be referred to the Working Group on Upper Atmosphere Physics. This was done.
- (e) Additional SSSIs - concerning Rec XIII-8 (Facilitation of Scientific Research: SSSIs - Additional Sites), the meeting concurred with the Sub-Committee in noting with approval that SSSIs 9-21 had been accepted.
- (f) Amendments to SSSIs - concerning Rec XIII-9 (Facilitation of Scientific Research: SSSI No. 1 Amendment to Management Plans), the meeting concurred with the Sub-Committee in noting with approval that the large extension to SSSI No. 1 had been accepted.

- (g) Additional, extended, and interim guidelines for SPAs - concerning Recs XIII-10, XIII-11 and XIII-12 (Specially Protected Areas Nos. 18-20), the meeting concurred again with the Sub-Committee's welcoming of the designation of these additional SPAs.

The extension to SPA No. 7 (Rec XIII-13) and the acceptance of Recs XIII-10 to XIII-13 as interim guidelines (Rec XIII-14) by the ATCPs was similarly welcomed by the meeting.

- (h) Man's Impact on the Antarctic Environment - the meeting concurred with the Sub-Committee's disappointment that SCAR's response to the ATCPs request (Rec XII-3, Man's Impact on the Antarctic Environment, 12th ATCM, 1983) for advice on this subject (evaluating the effects of scientific and logistic activity) had not been accepted at the 13th ATCM, 1985. The meeting expressed its strong hope that more success will be achieved at the next (14th) ATCM, 1987.

Meanwhile, it was recalled that the Working Group's recommendation on this matter at XVIII SCAR (Rec XVIII-BIOL-1) in 1984 had been approved by SCAR and, therefore, it was hoped that SCAR members were proceeding accordingly (see item 10.4 of the report of the 1984 Working Group on Biology Meeting, SCAR Bulletin No. 80, May 1985).

It was noted that under the new dispensation embodied in Rec XIII-2 (item 2c) of the 13th ATCM (Operation of the Antarctic Treaty System: Overview), SCAR could be invited to present a report to future ATCMs. It was recommended that such a report presented to the 14th ATCM in 1987 should contain a commentary on this subject.

- (i) Marine SSSIs - the meeting again concurred with the Sub-Committee's disappointment that the proposed SSSIs at Port Foster, Chile Bay, and South Bay, approved by XVIII SCAR, were not accepted at the 13th ATCM. It was agreed that SCAR should be urged to re-submit these to the 14th ATCM in 1987.

It was also agreed that the whole question of Marine SSSIs should be examined by the panel appointed to investigate additional protective arrangements (item 12.2.b above), taking also into consideration the Sub-Committee's comments on this matter.

- 12.3 Proposals for New SPAs and SSSIs - the four new proposals for SSSIs (Yukidori Valley, Svarthamaren, Mt. Melbourne, and Marine Plain), examined and supported by the Sub-Committee, were approved.

It was agreed to recommend to SCAR that it request National Committees submitting proposals to it on new SSSIs and SPAs to adhere in future to the format used in the SCAR publication, "Conservation Areas in the Antarctic."

- 12.4 Conservation Areas - items 5 (Conservation areas and other proposals, including an informal proposal on a Ross Island Management Plan) and 6 (Gerlache Strait Antarctic Reserve) of the Sub-Committee's report were noted. It was agreed that these matters should be given further consideration by the group established under 12.2.b above.

- 12.5 Guidelines for the Introduction of Living Material into Antarctica - the meeting agreed with the Sub-Committee's proposal to establish a small ad hoc group to report back to the Working Group at XX SCAR.

It was agreed that W S Benninghoff should act as Convenor and that he should consult freely with individuals (e.g. microbiologists) and organizations (e.g. SCOPE). It was also agreed that for this preliminary study a major input by logisticians was not essential, that the exercise be focused on microorganisms, and that the area of consideration be that south of the Antarctic Convergence.

- 12.6 IUCN/SCAR Collaboration

- (a) Bonn Symposium, April 1985 - the meeting noted the Sub-Committee's report on this, thanking W N Bonner for his efforts with regard to the proceedings to be published in Environment International and the report on the symposium published in SCAR Bulletin 81, September 1985.
- (b) IUCN/SCAR Working Group on Long-Term Conservation in the Antarctic - the sub-Committee's report was noted. W N Bonner presented the IUCN/SCAR Working Group's report to the meeting, explaining that in view of the different philosophy on Antarctic conservation between the SCAR and IUCN representatives in the group, the document of necessity presented a compromise.

The Working Group accepted the document as being satisfactory for its present purposes, noting that time for detailed study was short and that some members felt there were certain shortcomings. W N Bonner, however, explained that any substantial changes would cause considerable difficulties. The meeting congratulated the group responsible for its production.

It was suggested that if approved by SCAR and IUCN in time, the full document should be submitted to CCAMLR for its meeting in 1986. The Working Group also agreed to recommend to SCAR that the SCAR/IUCN Working Group as presently constituted should be retained and encouraged to continue with the work proposed in the document.

In the joint meeting representatives of the Working Group on Logistics were not able to accept the document as it stood. Representatives of both the Biology and Logistics Working Groups met separately under the Convenorship of G Hempel, representing the SCAR Executive, to further discuss the document.

- (c) SCAR/IUCN Workshop on the Biological Basis of Conservation in the Sub-Antarctic Islands - the meeting agreed with the Sub-Committee's suggestion that the scope of the workshop, as originally proposed by the Workshop convenor, should be retained notwithstanding proposals by IUCN to widen its scope to include management and policy considerations. It was noted that the Workshop was to be held from 12-14 September 1986 immediately after the Symposium on "Antarctic and Sub-Antarctic Terrestrial Environments," Paimpont, France, 8-11 September.

12.7 Future of the SCAR publication "Conservation Areas in the Antarctic" - the meeting agreed with the Sub-Committee's suggestions that:

- (a) a revised edition be published as a bound volume, containing information about future additions and corrections, new SSSIs and SPAs, and information on work that has been or is planned to be done in SSSIs and SPAs.,
- (b) the SCAR Secretariat be invited to inform National Committees that comments for the revision should be submitted to the Secretariat by 1 November 1986,
- (c) SCAR be invited to consider requesting National Committees to include in their annual reports to SCAR information about permits issued for entry into SPAs and SSSIs, and the work performed therein.

12.8 Intersessional Meetings - the Working Group agreed to recommend to SCAR that support be provided for an intersessional meeting of the Sub-Committee. In view of the Sub-Committee's large workload, particularly as a result of the growing number of requests to SCAR from recent ATCMs for advice, it was considered important that if SCAR is to respond appropriately, the Sub-Committee be given the support to properly undertake these tasks.

13. INFORMATION MANAGEMENT FOR ANTARCTIC CONSERVATION

The Working Group considered the second part of ATCM Rec. XIII-5, (Man's Impact on the Antarctic Environment: Additional Protective Arrangements), which invites SCAR to offer scientific advice "on steps that possibly could be taken to improve the comparability and accessibility of scientific data on Antarctica", and noted that the increasing tempo and scale of activities in Antarctica require increased effort to compile data in formats and in data centers so that items and data bases are in uniform or comparable notations and are readily accessible.

The Working Group agreed that the scale of activities in the Antarctic has increased to the point where adverse impact on the environment is likely, and measurement of biological and/or environmental change is the necessary response to environmental impact assessment. It was recalled that the Antarctic has been dedicated by the Treaty Nations as "a continent for science" especially because of:

- (1) its role in certain global processes such as solar energy exchange,
- (2) the uniqueness of many plant and animal species and their communities in the harsh physical environments, and
- (3) the opportunities afforded for investigations and experimentation on a pristine continent.

It follows that comparability, storage, and accessibility of scientific data on the physical environments and biota are essential parts of stewardship.

In relation to ATCM Rec. XIII-5 (item ii) and taking note of the above, and an informative document submitted by W S Benninghoff, the Working Group on Biology recommended to SCAR the establishment of an ad hoc group on Data Management with the following terms of reference:

- (a) to survey the kinds of biological data bases available and the nature of their contents,
- (b) to examine the relevance of data management to existing and planned SCAR programmes,
- (c) to assess future needs for new and expanding SCAR programmes and for ensuring comparability of data formats,
- (d) to liaise with other relevant programmes (e.g. ICSU's CODATA) and to recommend further action.

It was agreed that W S Benninghoff should convene the ad hoc group and co-opt members as necessary.

A report from the Group will be expected at the next meeting of the Working Group on Biology.

14. REPORT ON THE EUROPEAN SCIENCE FOUNDATION POLAR SCIENCE NETWORK

G Hempel reported that on the request of the Council of Europe the European Science Foundation (ESF) has established a number of networks for fostering European cooperation in certain fields of research. During consultations held in December 1985 and February 1986 experts from 10 countries discussed whether there is a need and room for a specific European programme in polar science, in view of existing organizations like SCAR. W N Bonner (UK) described the situation with respect to Antarctic biology.

Three areas were identified for immediate action:

- (i) bringing together European expertise and technological expertise for obtaining long ice cores for palaeoclimatology,
- (ii) cooperation in the geological/geophysical study of the continental margin of West Spitzbergen and East Greenland,
- (iii) joint marine ecological studies in the Southern Ocean, particularly at the ice edge.

The latter will be facilitated by the provision of RV POLARSTERN in the austral summer of 1988/89. Planning for the "European POLARSTERN Study" [EPOS] has commenced under Prof J.-O. Stromberg (Sweden). Programme proposals are being solicited and will be discussed on 2 September 1986.

15. INTERNATIONAL GEOSPHERE - BIOSPHERE PROGRAMME

The meeting agreed that the proposal was too diffuse for the Working Group to be able to identify where it could make a definitive input. At the same time it was noted that many of the SCAR programmes (e.g. BIOMASS, BIOTAS, ASIZ) and bodies (e.g. the proposed new Group of Specialists on Southern Ocean Ecology), as well as the national programmes, were already or would be contributing to the aims of IGBP. It was recognized that other SCAR Working Groups and Groups of Specialists might in the same way be making inputs to the Antarctic element of IGBP.

It was agreed that until such time as IGBP produced more specific proposals there was little more the Working Group could do to assess and/or contribute towards it.

16. JOURNAL OF POLAR BIOLOGY

G Hempel reported that the Journal Polar Biology had made good progress during recent years. The number of manuscripts has increased so that more issues per year will have to be published. He thanked members and observers who had acted as advisory editors and referees for their great efforts in reviewing papers. In the interests of the authors he urged all who might be called upon as referees to make sure that manuscripts do not rest unattended during long periods of absence. He invited members and observers of the Working Group to solicit further manuscripts and to provide him with names of potential referees, particularly in the field of terrestrial polar biology (e.g. limnology, soil science, microbiology). Members commented favorably on the scientific and technical standards of the journal, although they agreed that the standard of language editing and broadening of the book review section were fields where improvement was desirable.

17. WORKING GROUP ON HUMAN BIOLOGY AND MEDICINE

D J Lugg, Chairman of the SCAR Working Group on Human Biology and Medicine, presented a summary of the group's activities over the past decade. The meeting acknowledged the achievements of that Working Group and recognized the importance and significance of these.

It was noted that the status of the Working Group was to be reviewed at XIX SCAR, and that the Working Group on Logistics had concluded that it was not a suitable parent body for Human Biology and Medicine should the Working Group be reconstituted as a Sub-Committee. It was

recalled that originally the Working Group was a Sub-Committee of the Working Group on Biology, and the meeting reaffirmed the earlier decision that this status was not appropriate in view of the composition of the Working Group on Biology. It was felt that Working Group status was more appropriate for human biology and medicine.

18. NEXT MEETING

Because of the numerous important and timely topics under consideration by the Working Group, the Group requested approval to hold its next meeting in association with XX SCAR.

19. REVIEW OF RECOMMENDATIONS

The recommendations arising from the Working Group meetings at XVII (1982) and XVIII (1984) SCAR, was noted. It was agreed that:

- (a) Rec. XVII-BIOL-2 should stand,
- (b) Rec. XVII-BIOL-3 should lapse,
- (c) Rec. XVII-BIOL-4 should lapse,
- (d) Rec. XVIII-BIOL-1 should stand,
- (e) Rec. XVIII-BIOL-2 should stand.

20. ELECTION OF CHAIRMAN AND SECRETARY

The Chairman informed the meeting that he wished to stand down. By vote of 14 national representatives (Argentina, Australia, Belgium, Brazil, Chile, France, Federal Republic of Germany, India, Japan, New Zealand, Norway, South Africa, United Kingdom, United States of America) G Hempel was elected Chairman and J Valencia as Secretary.

21. CLOSURE

G A Knox informed the meeting that after a long association with the Working Group this was his last meeting. He wished the Working Group well in its future. The Chairman and Members thanked him for the role he had played in the Working Group, and indeed in SCAR, over this period.

R M Laws thanked the Working Group for its cooperation and support during his term of office as Chairman. The Group had recorded significant achievements over these years, becoming one of the most active and important Working Groups in SCAR during the process. The meeting recorded its vote of thanks and appreciation to Dr Laws.

G Hempel (incoming Chairman) and J Valencia (incoming Secretary) thanked the Working Group for the confidence it placed in electing them. Both pledged their intentions to retain the cordial, efficient and effective activity of the Group.

Finally the meeting thanked the Rapporteur (P R Condry) for his substantial efforts during this meeting.

Annex 1

Establishment of a Group of Specialists on Southern Ocean Ecology

The case for the establishment of a group of specialists on Southern Ocean Ecology rests on the following:

1. The past decade has seen a strong development in ecological studies in the Southern Ocean, largely in the framework of BIOMASS which was initiated by SCAR in cooperation with SCOR. The results of BIOMASS are presently being evaluated through a series of international workshops under the BIOMASS Executive. Nowadays most of the SCAR countries carry out ship-based investigations of marine ecosystems of the Southern Ocean and of the ecology of its organisms. Major international programmes in physical oceanography and meteorology of the Southern Ocean and its sea-ice zone are under preparation as recommended by the IOC Programme Group for the Southern Oceans and planned for the World Ocean Circulation Experiment. Those programmes provide promising opportunities for the integration of studies of biological systems in relation to the environment. The awareness for the needs of conservation of the Antarctic marine habitats and communities is rapidly growing as is the call for adequate prediction and monitoring of potential man-made effects. All this has to be based on scientific knowledge and methods. Much of it can only be obtained collectively through international and multidisciplinary cooperation.

2. While the BIOMASS Executive is engaged in evaluation of the results of past activities under BIOMASS, there is no group within the SCAR and SCOR structure which could act as a forum for review, discussion and coordination of on-going and new activities in Southern Ocean Ecology and related fields. If such a group is not set up SCAR would not have a means of coordinating future research.

3. There is a need for a specific body within the SCAR structure which can respond to requests for scientific advice from the Antarctic Treaty as well as CCAMLR, and other international organizations with interest in science, resources, and conservation in the Southern Ocean, including possible impacts on marine ecosystems from fishing and potential mineral exploitation.

4. Membership of a Group of Specialists on Southern Ocean Ecology should include experts in the various branches of marine ecology as well as at least one physical and one chemical oceanographer. Co-sponsorship with SCOR should be sought.

Possible Terms of Reference

- 1) To identify important fields for research on Antarctic marine ecology and to propose cooperative studies, including multi-ship experiments,
- 2) To encourage and facilitate interdisciplinary studies in Antarctic marine ecosystems,
- 3) To further Southern Ocean ecosystem studies through workshops and other activities,

4) To respond through SCAR to requests for scientific advice and information by the Antarctic Treaty, CCAMLR (Commission on the Conservation of Antarctic Marine Living Resources) and other international organizations with interests in science, resources and conservation in the Southern Ocean,

5) To liaise with other relevant international research programmes.

Annex 2

SCAR Document for ASIZ Proposal

Sea ice is a key habitat for marine organisms in the Antarctic region and exerts a profound influence on the Southern Ocean ecosystem through the physical and chemical processes associated with it. This influence extends to all trophic levels. Thus communities of microscopic algae with bacteria and protozoa develop throughout the sea ice, but particularly in its bottom part, where these microorganisms are eaten by various invertebrates, including copepods, krill, and foraminifera. Just beneath the sea ice, krill and amphipods also feed on microorganisms and juvenile fish take copepods. Krill and fish provide food for seabirds, seals and whales. Algal cells and detritus, mainly released during the ice melt, are consumed by the benthic fauna. It is likely that the biota of the pack ice zone and the fast ice zone each have characteristic structures and developmental processes.

In the water column under the sea ice there is a food web of marine organisms comprising plankton, nekton and benthos which may differ from that of the permanently open sea. Because sea ice covers 20 x 10 km at the maximum extent in September, i.e. half of the Southern Ocean south of the Polar Frontal Zone, investigations of this system are fundamental to a deeper understanding of the marine polar ecosystem.

The importance of this zone has long been recognised but research effort has hitherto been limited to the summer months and only near the ice margin, due principally to the very limited accessibility of the region by conventional ocean research vessels. It is recognised as essential that biologists, together with those working on the physical environment (oceanographers, meteorologists, glaciologists, etc.), obtain further data on the dynamics of the biological and physical processes which take place within the sea ice zone.

Recently several nations have focused attention on processes taking place in the marginal sea ice zone and seasonal research has been undertaken during winter months, in early spring when the sea ice is at its maximum extent and in autumn when ice formation begins. These expeditions are providing a valuable insight into the region and point out the need for further and more detailed research dealing with biological processes in relation to the physical environment.

The proposed ASIZ ice-edge and pack ice studies are of great potential importance to Antarctic marine biologists and ecologists. It is vital that links with, and input to, the ASIZ programme should enable biologists to:

- 1) gain access to the extensive body of environmental data, of fundamental relevance to biological research in the zone, that would become available as a result of the programme

- 2) participate directly in the proposed field activities
 - a) by involving individuals or research groups in interdisciplinary shipboard projects, and
 - b) by organizing research vessel operations, dedicated to marine biological research, but also operating in close conjunction with physical environmental studies, in particular as part of the proposed multiship operations.

Two fundamental questions to be addressed are:

1. How do the growth, presence and recession of pack ice influence the biota of the southern ocean? This question needs to be viewed in terms of both the mechanical presence of ice and the physical processes associated with the formation and break-up of the ice.
2. What biological processes take place in the pack ice zone on a seasonal basis?

The annex to this document provides some suggestions for the topics and approaches that might form part of such investigations. This is necessarily only a very broad and general conspectus of the research contribution that biologists could make to ASIZ. The preparation of more detailed proposals and the co-ordination of biological input can only be achieved by a properly constituted group of experts. If a SCAR Group of Specialists in Southern Ocean Ecology is convened, an appropriate, and very important, charge on that Group would be to provide the detailed liaison with the ASIZ programme.

The proposal to establish a SCOR Working Group on the Ecology of Sea Ice is also of the greatest relevance to Antarctic pack ice and ice-edge studies. Of particular importance within the proposed terms of reference for this group are the review of sampling methods for sea-ice studies and the planning of a workshop on biological sea ice studies. It was considered important that SCAR should maintain the closest links with this Working Group and should seek to co-sponsor the proposed workshop, which could provide much of the essential biological input into the planning for ASIZ.

SCAR Document for ASIZ proposal: Annex Topics and techniques for biological Antarctic sea ice studies

1. Spatial distribution, species composition, biomass and growth of phytoplankton in the ice edge zone during winter.
 - 1.1 Horizontal and vertical distribution of phytoplankton biomass in terms of chlorophyll a and phaeopigments
 - Water bottles
 - Fluorometry
 - 1.2 Species composition of phytoplankton communities
 - Light microscopic and scanning electron microscopic observations

- 1.3 Primary productivity measurement
 - ^{14}C technique

2. Spatial distribution, species composition, biomass and growth of ice algae in the ice edge zone during winter.

- 2.1 Horizontal and vertical distribution of ice algal biomass in the sea ice in terms of chlorophyll a and phaeopigments in relation to physical and chemical environmental factors
 - Ice auger
 - Sampling by the SCUBA divers
 - Fluorometry technique
 - Standard chemical analyses
- 2.2 Species composition of algal communities
 - Light microscopic and scanning electron microscopic observations
- 2.3 Primary productivity measurement
 - ^{14}C technique

3. Spatial distribution, species composition, biomass and growth of zooplankton in the ice edge zone during winter.

- 3.1 Horizontal and vertical distribution of zooplankton abundance, biomass and species composition
 - Towing of plankton nets
 - LHPR (Longhurst Hardy Plankton Recorder)
- 3.2 Age structure analysis of selected zooplankton populations
- 3.3 Energy budget study, mainly feeding, respiration and excretion studies in some representative species
 - Experiments by culture

4. Spatial distribution, species composition, biomass and growth of micronekton in the ice edge zone in winter.

- 4.1 Spatial distribution, abundance and biomass of euphausiids, squids, chaetognaths and juvenile fishes
 - RMT and/or appropriate nets
 - Acoustic technique
- 4.2 Species composition of micronekton communities
 - RMT and/or appropriate nets
- 4.3 Age structure of the Antarctic krill population
 - RMT and/or appropriate nets
 - Morphometric analyses
 - Biochemical studies

- 4.4 Energy budgets of micronekton
 - Physiological and biochemical studies
- 5. Distribution, ecology and behaviour of seabirds in the pack ice zone in winter
 - 5.1 Abundance, distribution and species composition
 - Ship-based census
 - 5.2 Relationships with physical and biological environmental features
 - 5.3 Feeding ecology and prey characteristics
 - Stomach and gut contents
 - Time-depth recorders and diving monitors
 - Estimate of feeding rates
 - 5.4 Energetics, physical conditions and reproductive status
 - Estimates of metabolic rates
 - Fat content indices
 - 5.5 Movement and activity patterns
 - Banding studies
 - Satellite linked monitors
 - Radio telemetry
- 6. Distribution, ecology and behaviour of marine mammals in the pack ice zone in winter.
 - 6.1 Abundance, distribution and species composition
 - Aerial census
 - Ship-based observations
 - 6.2 Feeding ecology and characteristics of prey consumed
 - Radio telemetry
 - Time-depth recorders and diving monitors
 - Satellite-linked instruments
 - Stomach and gut content
 - Estimate of feeding rates
 - 6.3 Energetics, physical condition and reproductive status
 - Estimate of metabolic rates
 - Blood and urine chemistry
 - Blubber thickness
 - Analysis of reproductive material
 - 6.4 Movement and activity patterns
 - Tagging
 - Satellite-linked monitors
 - Radio telemetry

7. Measurement of environmental factors (minimum requirements for biological programmes)

- 7.1 Temperature and salinity
 - CTD/STD, XBT
- 7.2 Chemical analysis of sea water, dissolved O₂, pH and nutrient salts
 - Water bottles
 - Autoanalyser
- 7.3 Particulate matters
 - Sediment trap
- 7.4 Photic condition in the sea ice and in the water column under the sea ice
 - Pyranometer (waterproof)

Annex 3

Report to SCAR Working Group on Biology on progress
to establish the BIOTAS Programme

1. Introduction

At XVIII SCAR in Bremerhaven, September 1984, the Working Group on Biology proposed establishing a group to promote and co-ordinate an international terrestrial, inland waters and intertidal programme in the Antarctic and sub-Antarctic. Dr R I Lewis Smith was nominated to convene an ad hoc group, to which he could co-opt others, to look into this matter and report back to the Biology Working Group at XIX SCAR.

At XVIII SCAR a brief statement about the proposed programme was circulated to all national members, or their representatives, of the Working Group on Biology. This requested the names of the persons whom each member considered could best represent the major research areas currently being investigated in the Antarctic or sub-Antarctic by his country. These research areas were plant, invertebrate, microbial, littoral and inland waters biology, and included environmental studies relating to soil, water, nutrients, microclimate, etc. Unfortunately, only half the recipients of the statement responded.

In early July 1985 all persons whose names had been provided were sent a seven page information document outlining the convenor's concept of how the Programme might be developed. An accompanying letter requested that each group of national representatives discuss the document and submit to the convenor their comments and criticisms, and if they would be willing to participate in developing the Programme. Their response was requested by the end of January 1986.

For countries which had not provided any names, a letter was sent to the SCAR Biology Working Group member together with copies of the document, requesting that they be distributed to appropriate specialists who are actively involved in the four main research fields. They were asked to consider the merits of the document and to submit their comments and criticisms by late January 1986.

Countries to whom the document was sent were Argentina, Australia, Chile, France, German Democratic Republic, Germany (Federal Republic), Japan, New Zealand, Norway, Poland, South Africa, Soviet Union, United Kingdom, and the United States. Brazil and Spain received copies in May 1986 by request.

2. The BIOTAS document

In keeping with the successful BIOMASS Programme, the acronym BIOTAS (Biological Investigations of Terrestrial Antarctic Systems) was proposed as an appropriate name for the Programme.

The document highlighted the importance of the terrestrial (including the littoral and inland waters) ecosystem and the rapid development of biological and environmental research in the Antarctic and sub-Antarctic during the past two decades. It is appreciated that there is considerable disparity in the scale and organisation of the different research areas, both within and between national programmes. These systems are regarded, from an economic point of view, as being biologically unproductive, unexploitable and therefore commercially unimportant. There are severe constraints on what, where and how research is undertaken and how it can be justified both logistically and financially. Consequently, several, if not all, countries find it difficult to support large-scale continuous integrated field programmes. However, scientifically, the Antarctic offers a unique potential for studying fundamental, rather than applied or resource-orientated, questions particularly if they are directed towards exploiting the relative simplicity of the ecosystems to test ecological hypotheses. Also, terrestrial, littoral and limnological research is playing an increasingly important role in the assessment of human and natural impacts on the fragile Antarctic environment. In the proposed BIOTAS Programme emphasis has been placed on the integration of experimental research and environmental monitoring studies, since the latter are becoming increasingly relevant as the development of Antarctica proceeds. It is hoped that this will provide a stimulus to enhance the level of support which countries are prepared to invest in terrestrial, littoral and limnological research.

Some guidelines were proposed as a possible framework for developing a structured Programme. A suite of objectives were suggested. These were:

1. To increase collaboration and contact between terrestrial biologists and limnologists working in the Antarctic and sub-Antarctic.

2. To increase the interchange of information and ideas to improve awareness of what research is current or proposed.
3. To improve the co-ordination of new projects so that future research can be planned efficiently and cost-effectively, and avoid unnecessary replication.
4. To direct research studies towards a more unified approach so that national programmes may interrelate and complement each other, and allow for a more valid comparison of results between localities and systems.
5. To establish research sites associated with scientific stations where a) scientific studies can be concentrated, and b) biological and environmental changes induced by human activity can be monitored by comparing situations between impact sites and unaffected control sites.
6. To prepare Environmental Impact Assessments for as many research stations as possible.
7. To prepare a bibliography of terrestrial, inland waters and littoral publications.

It was stressed that the suggestions proposed in the document were merely guidelines, and not authoritative demands, for the mutual development of an agreed Programme. The research areas (plant, inland waters/invertebrate, littoral and microbial biology) have been specified according to how most Antarctic studies have been conducted. However, the BIOTAS Programme should not direct research along such narrowly defined channels; rather, research projects should be integrated as much as possible and not conducted in isolation. It is not the intention to follow the very ambitious IBP (International Biological Programme) approach. The BIOTAS Programme must carefully define what major questions should be addressed, and adopt a relatively simple but co-ordinated approach (one that could be achieved by all participants) in which all groups would ideally undertake exactly comparable observations and experiments using standardised techniques.

3. Response to the document

The convenor received replies from most of the 32 specialists who were sent the document, but unfortunately no response was forthcoming from the German Democratic Republic, Poland or the Soviet Union, and no specialists' names have been provided for these countries.

To summarise the general response:

Without exception the document was received favourably and many helpful constructive comments were provided. Some respondents stressed that it is absolutely necessary to develop such a programme if terrestrial biology is to progress. Virtually everyone expressed their support for increasing collaboration both on a consultative and a scientist-interchange basis. They endorsed the proposal for

increasing interchange of information and co-ordination of research projects. While there was support for the unification of research programmes, some doubts were expressed regarding the practicality of standardising techniques, equipment, etc.

The proposal to establish research sites associated with scientific stations was generally considered valuable although most countries would want also to continue with general biological surveys, taxonomic studies and biogeographic assessments outside these sites. The proposed concentration of research projects in selected disturbed (impact) and undisturbed (control) sites was considered by several respondents to serve a useful purpose in monitoring biological and environmental changes induced by human impact associated with the station activity. Several of the specialists offered their support in preparing EIAs for certain stations and their environments. Four countries (UK, Australia, Chile and Japan) were currently concentrating their research at selected sites along the lines proposed in the document. There was also significant support for increased information flow as regards current and proposed research programmes, and for the compilation of a terrestrial and limnological bibliography.

Most replies stressed that without some kind of international impetus such as the BIOTAS Programme proposes, there is little chance of increasing national research effort in terrestrial, littoral and inland waters systems because resources would not be available. The overall objective of the BIOTAS Programme is to improve the scope and quality of research and that this will be an incentive for national organisations or governments to provide greater support.

4. Conclusions

The response to the BIOTAS document was very gratifying. The general acceptance of its aims and objectives reflects genuine approval and not apathetic agreement by its recipients. The course of action which is proposed herewith is:

1. That after considering any comments and recommendations by members of the Biology Working Group, the framework of the BIOTAS Programme, as based on the document, be accepted by the Working Group and offered to SCAR for their approval.
2. If the BIOTAS Programme is approved it is requested that the convenor of the Programme be empowered to co-opt into the BIOTAS group one or more specialists from each participating country who will be best suited to represent his country's terrestrial and/or littoral and/or inland waters research. These persons would be responsible for co-ordinating their national terrestrial, littoral and inland waters research programme in as much as they would be expected to report on aspects of their programmes as required. It is hoped that these co-opted representatives will be prepared to attend meetings as and when they can be arranged.

3. It is proposed to hold a preliminary meeting of as many of the BIOTAS group as can attend the Symposium on Antarctic/sub-Antarctic Terrestrial Ecosystems at Paimpont, France, 8-11 September 1986. This has been agreed by Dr P Trehen, the organiser of the Symposium. It would be an ideal opportunity for the group to discuss and adopt an acceptable framework on which the BIOTAS Programme would be developed. As an introduction to the programme, BIOTAS representatives would also be asked to present a brief report on their country's current and long-term research programme. However, it will probably not be until the Fifth SCAR Symposium in Antarctic Biology in Australia, 1988, before a fully represented meeting can be held.
4. Between the Paimpont and SCAR Biology Symposium meetings it may be possible to develop the concept of scientific research sites, co-ordinated research programmes and environmental impact studies. It will take time to put into operation any kind of practical or collaborative field effort between participating nations.
5. In the meantime, in accordance with objectives 1) to 4), the convenor has proposed establishing a system for contact through a Newsletter reporting on current and proposed research and development in terrestrial and littoral biology, limnology and related environmental science. It could include brief accounts of persons actively working in Antarctic research and a bibliography of the latest relevant publications. Depending on demand and enthusiasm the Newsletter could be produced probably twice a year and distributed to all interested parties. However, consideration must be given to production and distribution costs.

R I Lewis Smith
British Antarctic Survey
18 June 1986

Annex 4

DRAFT

SCAR Submission to CCAMLR

The Scientific Committee on Antarctic Research, one of the component bodies of the International Council of Scientific Unions, is charged with furthering the coordination of scientific activity in Antarctica and with framing scientific programmes of circumpolar scope and significance.

The Convention on the Conservation of Antarctic Marine Living Resources recognises that it is essential to increase knowledge of the Antarctic marine ecosystem and its components so as to be able to base decisions on harvesting on sound scientific information. To achieve this it is necessary not only to collect fisheries data and statistics, but also to carry out monitoring studies on harvested and dependent species,

as well as basic scientific research on the ecosystem, its environment and component organisms. CCAMLR alone does not have the capacity or facilities to carry out all these important tasks. In particular, basic scientific research in the Antarctic is likely to be carried out by scientists working under national programmes of Antarctic research.

SCAR has had long and wide experience of the fruitful coordination of such research. Its Working Group on Biology has a general interest in the fauna and flora of the waters surrounding Antarctica. Two of its subsidiary bodies, the Sub-Committee on Bird Biology and the Sub-Committee on Conservation, are active in aspects of Southern Ocean ecosystem matters.

In 1972 the Working Group on Biology established a Sub-Committee on the Living Resources of the Southern Ocean. In 1976 this Sub-Committee was upgraded to become a Group of Specialists on Southern Ocean Ecosystems and Their Living Resources. Also in 1976, SCAR and SCOR sponsored the First International Conference on Living Resources of the Southern Ocean, held at Woods Hole, USA.

An outcome of this conference was the publication of an important document, Biological Investigations of Marine Antarctic Systems and Stocks (BIOMASS). This outlined a ten-year collaborative international research programme. The objective of BIOMASS was "to gain a deeper understanding of the structure and dynamic functioning of the Antarctic marine ecosystems as a basis for the management of actual and potential living resources." The BIOMASS programme had two major aims:

- (a) to contribute to Man's understanding of the Southern Ocean and its biota;
- (b) to develop a sound ecological strategy for the exploitation of the living resources and for the conservation of the Antarctic marine ecosystem.

The Group of Specialists was responsible for the planning and execution of the First International BIOMASS Experiment (FIBEX) in 1981/82 and the Second International BIOMASS Experiment (SIBEX) in 1983/84 and 1984/85. One of the crowning achievements of the Group of Specialists was the establishment of the BIOMASS Data Centre in Cambridge, UK, in 1984.

This Group of Specialists was disbanded by the SCAR Executive in 1985, but the important task of harvesting the results from the very large quantity of data held at the Data Centre has been assigned by SCAR to the BIOMASS Executive Committee. A series of workshops is planned to analyze the data, a task planned to be completed by 1989, when a final evolution meeting will be held in Bremerhaven, FRG.

SCAR has proposed the setting up jointly with SCOR the Group of Specialists on Southern Ocean Ecology. This will identify important fields of research on Antarctic marine ecology and will propose cooperative studies, including multiship experiments. It will encourage and facilitate interdisciplinary studies in Antarctic marine ecosystems. It will develop Southern Ocean ecosystem studies through workshops and other activities and liaise with other relevant international research programmes. Finally, it will respond, through SCAR, to requests for scientific advice and information by the Antarctic Treaty, CCAMLR and other international organizations with interests in science, resources and conservation in the Southern Ocean.

Another relevant SCAR group is the Group of Specialists on Seals which is charged with encouraging and coordinating research on Antarctic seals, reviewing the status of seal stocks and annual take of seals, and providing advice and recommendations to SCAR so that it may meet its obligations under the Convention for the Conservation of Antarctic Seals.

SCAR has viewed with concern the lack of progress in elaborating a scientifically based management system for the conservation not only of exploited stocks but also for related and dependent species. It hopes that the matter can be fruitfully pursued at this meeting of the Commission.

SCAR, which fully supports the principles underlying the Convention, wished to assure the Commission that it is ready to assist CCAMLR achieve its stated objectives in all ways within its competence.

Nineteenth Meeting of SCAR, San Diego, California, USA

Working Group on Geology19 June 1986

Present - Members: P.J. Barrett, New Zealand (Chairman); C.O. Berbert, Brazil; K. Birkenmajer, Poland; R. del Valle, Argentina; D.H. Elliot, USA; O. Gonzalez-Ferran, IAVCEI; F. Herve, Chile; D.R. Hunter, South Africa; J. Lameyre, France; H. Miller, FRG; V.K. Raina, India; M.R.A. Thomson, United Kingdom; R.J. Tingey, Australia (Secretary).

Observers: W.A. Cassidy, USA; P. Ciesielski, USA; I.W.D. Dalziel, USA; T. Inderbitzen, USA; Z. Li, China; M. Manzoni, Italy; C. Palomo, Spain; F. Tessensohn, FRG; P.N. Webb, USA.

Dr. Barrett was appointed Chairman. Apologies for absence were received from C. Craddock, IUGS; A. Elverhoi, Norway; G. Grikurov, USSR; J. Hofmann, GDR; Y. Yoshida, Japan.

1. Reports of national activities - Written reports on the recent Antarctic geological activities of Argentina, Australia, Brazil, Chile, France, GDR, FRG, India, Japan, Poland, South Africa, and USSR were distributed to members. The members present gave oral accounts of their countries' recent Antarctic geologic activities, and other items of interest.
2. Role of the Working Group. After discussion the Working Group concluded that the 1977 definition of the Working Group's role was no longer appropriate. The role of the Working Group was redefined with the following statement.

Revised Role

Antarctica is an integral part of the earth's geodynamic and environmental systems. In many respects it is unique, and its study can contribute to the solution of problems of global significance.

In this context the role of the Working Group is

1. To identify problems of major importance in the geological sciences and to facilitate and encourage the investigation of those problems through groups of specialists and other suitable avenues.
2. To coordinate the exchange of information, plans and scientific results
3. To promote the organization of workshops and symposia for the dissemination of scientific results, within the SCAR framework and the wider scientific community

3. Review of standing resolutions The Working Group examined the resolutions published in SCAR bulletins 68 and 77 and agreed that the following should be reiterated:

Recommendation G-1986-1. Sites of special geological interest. The Working Group on Geology believes that identification of sites of special geological interest may simply draw attention to their location and value. Having regard to the uniqueness of many geological features (notably fossil material and meteorites) in Antarctica, and the importance of their preservation to science, the Working Group recommends that SCAR nations be urged to (a) draw to the attention of Antarctic personnel the importance of preserving Antarctic geological features, and (b) ensure that geological specimens are taken only as part of an approved research programme.

Recommendation G-1986-2. Exchange of publications. The Working Group on Geology recommends that Antarctic earth science research publications be distributed free of charge as a means of fostering the exchange of information between Antarctic earth scientists.

4. Possible amalgamation with the Working Group on Solid Earth Geophysics

It was agreed that discussion of this would occur in the Joint Meeting with the Working Group on Solid Earth Geophysics but the Working Group unanimously took the view that amalgamation was not an appropriate course of action and that the co-operation that has continued for many years should be further developed. Refer also report of Joint meeting, Working Groups on Geology and Solid Earth Geophysics, 20 June 1986, XIX-SCAR-26, Item 3)

5. Frequency of meetings It was agreed that in view of the increased and increasing tempo of both earth science and Antarctic science it was desirable that the Working Group meet at least every two years, and that in this regard advantage be taken of the wide range of symposia of interest to Antarctic earth scientists.

6. Antarctic Stratigraphic Lexicon. The Working Group noted the publication and distribution of the international Lexicon of Antarctic Stratigraphic Nomenclature in December 1985 and urged member nations to publish their own Antarctic stratigraphic Lexicons with a view to possible revision of the international Lexicon in a few years time. The possibility of an international Lexicon being compiled for the Antarctic Peninsula area by nations active there was mentioned.

7. Geological maps of Antarctica It was pointed out that the 1:5 000 000 scale geologic map of Antarctica published by the American Geographical Society was both out of date and out of print. Mr. Tingey was empowered to investigate the possibility of publishing a revised geological map of Antarctica, possibly using a satellite image compilation as a base. He was instructed to report to the Antarctic Earth Sciences Symposium in Cambridge in 1987. The possibility of revising the Geologic Map Folio of the American Geographical Society Antarctic Map Folio Series was discussed and is to be investigated by Dr Elliot on behalf of the Working Group.

8. Antarctic Mapping and Satellite Imagery The Working Group expressed its appreciation of Dr. Luchitta's presentation on 18 June. The Working Group agreed with the Working Group on Geodesy and Cartography that remote sensing appeared to offer the most practical solution for Antarctic requirements in mapping, (Refer also to report of Joint meeting, Working Groups on Geology and Solid Earth Geophysics, 20 June 1986, XIX-SCAR-26, item 8) but resolved that in view of the very wide range of earth science applications for satellite imagery it would be best if Antarctic earth scientists acquire and use satellite imagery in the manner most appropriate to their research needs. The Group also recommended that consultation with Antarctic earth scientists during the planning of remote sensing missions needed to be improved if maximum benefit is to be obtained.
9. Antarctic Conservation. Mr. Bonner of the Sub-Committee on Conservation of the Working Group on Biology addressed the meeting and drew attention to proposals for additional Sites of Special Scientific Interest. The Working Group agreed that uncontrolled collecting of geological materials was having an adverse effect on some features of geological interest and that others had been irreparably damaged by insensitive station activities (refer also Recommendation G-1986-1 above). It was noted that a proposed SSSI in the Vestfold Hills area was mainly of geological interest and that, of the present categories of Antarctic conservation site, only SSSI's had application to geological features. Relevant recommendations from the XIIIth meeting of the Antarctic Treaty Consultative Parties were distributed.
10. International Geosphere Biosphere Program The Secretary's response to ICSU proposals for this program was approved. It was noted that although Antarctic geological science could contribute among other things an extended historical record of global climate to IGBP it appeared unlikely that IGBP would greatly influence the course of Antarctic geological science.
11. Workshops on Antarctic Crustal Structure (17 June) on Cenozoic Geology (18 June). The Working Group supported the establishment of SCAR Groups of Specialists in the subject areas addressed by the Workshops. The Working Group called on Drs Dalziel and Webb to draft terms of reference for consideration by the joint meeting of the Working Groups on Geology and Solid Earth Geophysics Friday 20 June. After considerable discussion the Working Group endorsed draft statements for consideration by the 20 June meeting. (Refer also report of Joint Meeting Geology/Solid Earth Geophysics Working Groups, XIX-SCAR-26, items 7, 8).
12. SCAR Review of Antarctic Science The Secretary described the evolution of this project from a planned SCAR response to the 1983 United Nations enquiry into Antarctica and expressed the view that the earth sciences chapter gave him little pleasure. He noted that a highly speculative and controversial account of Antarctic resources had been inserted into the earth science chapter and informed the Working Group of his efforts to have this removed. The Working Group noted that publication of the volume was imminent.

13. Annual Report to SCAR. Shortcomings in the format of the annual National Committee report to SCAR were noted. It was suggested that the report could be less formal, more informative and include program summaries and abstracts of published papers. The Working Group recommended that members exchange on an annual basis written reports that should include indications of future programs, and be accompanied by abstracts of published papers. The group noted that some nations already issued publications that served these ends.
14. Election of Officers and number of officers. It was agreed that the Working Group could function without a Chairman between meetings. R.J. Tingey offered his resignation as Working Group Secretary but was reelected for the period until the next Working Group meeting.
15. Next Working Group meeting. The Working Group resolved that SCAR be requested to approve a formal meeting of the Working Group in conjunction with the 5th International Symposium on Antarctic Earth Science in Cambridge, U.K. in August 1987. Dr. Thomson was asked to make local arrangements in consultation with the Secretary. A formal meeting in conjunction with SCAR XX in Hobart in 1988 was also recommended because of the need to review the progress of proposed groups of specialists (See Report of Joint Meeting, Working Groups on Geology and Solid Earth Geophysics, June 20, 1986), and further develop links with SCAR. Professor Cassidy indicated that it might be possible for a Workshop on Antarctic Meteorites, to be organised at that time, to draw together the Antarctic earth science, meteorite, and planetary science communities. (Refer also report of Joint Meeting, Working Groups on Geology and Solid Earth Geophysics, 20 June 1986, XIX-SCAR-26.)

Nineteenth Meeting of SCAR, San Diego, California, USA
Working Group on Solid Earth Geophysics
19 June 1986

Present - Members: M. Keller, Argentina; P. Quilty, Australia (alternate); J.C. Parra, Chile; F. Thyssen, F.R.G.; T. Nagata Japan (alternate); F.J. Davey, New Zealand - Secretary; Y. Kristofferson, Norway; L. Nicolaysen, South Africa; P.F. Barker, U.K.; C.R. Bentley, U.S.A.

Observers: J. Behrendt, U.S.A; D. Blankenship, USA; A. Cooper, U.S.A.; I. Dalziel, U.S.A.; L. Gamboa, Brazil; O. Gonzales-Ferran, IAVCEI; L. Lawver, U.S.A., R. Watts, U.S.A..

1. Minutes. The minutes of the last meeting were considered and items not on the meeting agenda discussed briefly.
2. National Reports. Reports on national activities were made verbally by Argentina, Brazil (observer), Australia, Chile, FRG, Japan, New Zealand, Norway, South Africa, UK and USA. Written reports were also presented by Argentina, Japan, GDR, Poland and USSR. Written reports were requested and will be appended to the final report if they have not been circulated earlier.
3. Major future programmes. Two major initiatives in Antarctic earth science, Geoscience Transects and Cenozoic Geology had been proposed for consideration by the SEG Working Group in conjunction with the Geology Working Group. These two topics formed the basis of the workshop sessions on 17 and 18 June and were discussed further in preparation for the joint meeting of the two working groups on 20 June.
 - a) Geoscience Transects. The Inter-Union Commission of the Lithosphere (ICL) of ISCU initiative in proposing the development of a program of crustal transects across major tectonic features in Antarctica was discussed extensively. A series of possible transects were identified. The program was considered important in its own right and also as a catalyst for the development of the techniques required to study sub-ice geology. It was thus strongly endorsed. A brief discussion was held on the resources and techniques which may be of use.
 - b) Cenozoic Geology. The problem identified in the earlier workshop on dating and glacial events in the late Cenozoic were discussed briefly. The topic is important in the interpretation of geophysical data.
4. Ocean Drilling Program (ODP). The planned program for high southern latitude ocean drilling was discussed with a member of the ODP Southern Ocean Panel, P. Barker, providing an overview of the program.
5. Possible Amalgamation with the Geology Working Group. The role and objectives of the Working Group were discussed broadly. The Working Group was strongly of the opinion that it had a role distinctly separate from, but complementary to, that of the Geology Working

Group. Although the change in emphasis in geophysics, away from observatory study to field studies, leads to a superficial close similarity in operations, there is still a major difference in the disciplines and their viewpoint. The ability of geophysical techniques to remotely sense the subsurface rock structure is of great importance in the new earth science initiatives under consideration - e.g. Geoscience Transects - for which close well based coordination of geophysicists and geologists will be required. It noted that ICSU has separate unions for geology (IUGS) and geophysics (IUGG). The Working Group has had a relatively low level of activity during the past few years but this will increase markedly with the proposed cooperative program of sub-ice crustal structure investigations and geoscience transect studies. More meetings and workshops on science and scientific liaison will be necessary to support these proposed and other programs.

6. Communications. A need to improve communication was identified if the Working Group is to carry out its role adequately. The current format of the national reports was considered too restrictive as they should include ideas for work several years in the future if this information is to be of use in setting up collaborative or compatible science projects. The advantage of attendance of meetings for personal discussion was emphasized and encouraged.
7. Global Seismology. The technique of seismic tomography is of great use in studying the deep structure under Antarctica and should be supported. To carry this out adequately a suitable network of broadband digital seismographs should be installed around Antarctica. Recommendation SEG-1986-1 refers. Details of the specifications and resources required for these instruments will be sought.
8. Satellite Imagery. The value and use of satellite images in earth science was noted. The high cost of some satellite data was noted with concern since the operation had been transferred to private enterprise. This may lead to the curtailment of some science projects. Recommendation GEOL-SEG-1986-2 refers. It was noted that the satellite gravity and magnetics program on the future Geopotential Research Mission could be opened to proposals for research on the data obtained. Recommendation SEG-1986-7 refers. The importance of the Global Positioning System (GPS) satellite system to many earth science programs was noted.
9. Geophysical Maps and Data bases. The USSR Antarctic atlas is expected to be published in about 6 years, some sheets may be published earlier and drafts may be presented at the Cambridge Symposium in 1987. The requirement for high quality geodetic control to ensure accurate base maps for earth science studies was considered essential and should be encouraged. The Working Group should also give consideration to the classification and standards desirable for geophysical maps. Support for international geophysical data bases were considered. The Working Group currently recommends the lodging of marine geophysical tracks with appropriate World Data Centers. Recommendation SEG-1986-4

refers. In view of the extensive aeromagnetic surveying being carried out it was considered desirable that the tracks for the surveys should be lodged with the World Data Center as soon as possible after the survey to enable future surveys to be planned optimally.
Recommendation SEG - 1986 - 6 refers.

The early release of geophysical data was discussed, supported strongly and identified for discussion at the joint meeting with the Geology Working Group.

10. The International Geosphere/Biosphere Program. This proposed program of ICSU was briefly discussed. The Working Group decided to adopt a responsive attitude.
11. Review of Antarctic Science. The development of the earth science chapter in this document was outlined by the Secretary. The present version will be reviewed by other members of the Working Group.
12. Meetings. Future meetings, definite and proposed, of interest to Antarctic earth scientists were discussed and noted. Discussion on the 5th International Antarctic Earth Science Symposium was held over to the joint meeting with the Geology Working Group.
13. Standing Resolutions and Recommendations. The standing resolutions were reviewed and retained unchanged. The recommendations were reviewed and the revised recommendations are attached.
14. Future Meetings. The Working Group requests a formal meeting, and a formal joint meeting with the Geology Working Group, at the 5th International Antarctic Earth Science Symposium in Cambridge, England, in August 1987.
15. Elections. F. Davey was reelected Secretary of the Working Group (moved L. Nicolaysen, seconded C. Bentley).

The "Programme" and "Standing Resolutions" for the Working Group were reviewed and approved for continuation without change. The Working Group continues its endorsement of Recommendation 1983-GLAC-6. The recommendations stemming from this meeting are as follows:

- a) Recommendation SEG-1986-1 (modified from SEG-1982-1): Efforts should be continued to improve seismographic and magnetographic recording in the Antarctic. The use of standardized broadband seismometers and digital recording instruments should be encouraged in order to increase sensitivity of detection and flexibility of analysis techniques.
- b) Recommendation SEG-1986-2 (unchanged from SEG - 1982 - 2): The Working Group asks that gravity data, including station descriptions, continue to be sent to the Soviet Committee on Antarctic Research, Academy of Sciences of the USSR, Vavilova 44, Building 2, Moscow 117 333, USSR, as they become available.
- c) Recommendation SEG - 1986 -3 (unchanged from SEG - 1982 - 5): The Working Group, noting the need for an accurate geoid map of Antarctica so that heights above sea level can be deduced from geodetic satellite measurements, recommends that all nations: (1) determine mean sea level at their coastal stations; (2) make accurate (about ± 1 m) geodetic satellite elevation measurements at points of known height above sea level; and (3) extend such measurements around the continent with an aim of establishing a net of stations, where both geodetic satellite elevations and heights above sea level are known, at a spacing of no more than 500 km.

- (d) Recommendation SEG-1986-4: (modified from SEG-1982-7): The Working Group recommends that all marine geologists and geophysicists lodge their sample, station, and traverse locations with the World Data Centers within one year using the International Geological/Geophysical Cruise Inventory (IGGCI), to assist others in planning forthcoming data collection cruises.
- (e) Recommendation SEG-1986-5: (modified from SEG-1982-9): Digital multichannel seismic reflection profiling is essential to the study of the geological structure of Antarctica and its margin. The Working Group urges the expansion of this activity, with the data being made freely available, in a usable format, as soon as possible.
- (f) Recommendation SEG-1986-6: (new): The Working Group recommends that the tracks and types of measurements of all airborne geophysical surveys are lodged with the World Data Center.
- (g) Recommendation SEG-1986-7: (replaces SEG-1982-3 and SEG-1982-4): The Working Group recognizes the great importance of NASA's Geopotential Research Mission (GRM) for studying the Antarctic lithosphere and gravity and magnetic fields, notes that for the current generation of geoscientists, the GRM satellite data may well represent the most comprehensive and consistent gravity and magnetic coverage that can be made available for Antarctica and adjacent marine regions, and recommends that NASA continue its efforts to implement the GRM satellite program as soon as possible and makes available to the scientific community the results of this mission in a timely fashion.

Nineteenth Meeting of SCAR, San Diego, California, USA
WORKING GROUPS ON GEOLOGY AND SOLID EARTH GEOPHYSICS
JOINT MEETING FRIDAY 20 JUNE 1986

Present. Members: P. Barker, United Kingdom; P. Barrett, New Zealand; C.R. Bentley, USA; C.O. Berbert, Brazil; K. Birkenmajer, Poland; F.J. Davey, New Zealand (Chairman); R. del Valle, Argentina; D.H. Elliot, USA; O. Gonzalez-Ferran, IAVCEI; F. Herve, Chile; D.R. Hunter, South Africa; M. Keller, Argentina; Y. Kristofferson, Norway; J. LaMeyre, France; H. Miller, FRG; L. Nicolaysen, South Africa; J.C. Parra, Chile; P.G. Quilty, Australia; V.K. Raina, India; M. Thomson, United Kingdom; F. Thyssen, FRG; R.J. Tingey, Australia (Secretary).

Observers: J. Behrendt, USA; D. Blankenship, USA; W. Cassidy, USA; I.W.D. Dalziel, USA; L. Lawver, USA; Z. Li, China; M. Manzoni, Italy; C. Palomo, Spain; C. Rinaldi, Argentina; A.C. Rocha-Campos, Brazil; J.H. Stel, Netherlands; R. Watts, USA; P. N. Webb, USA.

1. Amalgamation of the Working Groups. The meeting unanimously rejected the idea of merging the Working Groups. It was felt that the scope of earth science was too broad to be dealt with by single national representatives and it was pointed out that this was reflected in existence of two ICSU unions in the earth sciences.
2. Frequency of Joint Meetings. It was resolved that the Working Groups should meet together at least every two years. It was recognized that the meetings should be convened at appropriate international symposia so as to promote direct contacts with the wider Antarctic and general earth science communities, as well as at formal meetings of SCAR. The desirability of organizing workshop meetings in conjunction with these SCAR meetings was emphasized.
3. 5th International Symposium on Antarctic Earth Science, Cambridge, U.K. August 1987. The Symposium convenor Dr. Thomson informed the meeting of progress with symposium arrangements. After discussion the Joint Working Groups nominated the following International Steering Committee for the approval of SCAR:

M.R.A. Thomson (Convenor; Chairman United Kingdom Organizing Committee)
 J. Bradshaw (New Zealand)
 D.H. Elliot (USA)
 G.E. Grikurov (USSR)
 J.B. Jago (Australia)
 Y. Kristofferson (Norway)
 J. Lameyre (France)
 A. Rocha-Campos (Brazil)
 F. Thyssen (FRG)

The Steering Committee was selected to achieve representation of as wide a range of discipline specializations as possible. It is expected that the Steering Committee will provide general guidance on the content and direction of the symposium, oversee and approve the expenditure of SCAR allocations to the symposium, and review and approve abstracts of papers and the publication of proceedings

4. Future Symposia. It was suggested that if meetings are to be "focussed" as the Cambridge Symposium is regarded, then more symposia are required in order to achieve adequate coverage of Antarctic earth science. Several speakers emphasized the importance of developing links with the wider earth science community, as well as strengthening those within the Antarctic community, and the desirability of involving prominent non-Antarctic specialists in symposium sessions. However, the meeting agreed that symposia providing for a broad general coverage of Antarctic earth science and the participation of scientists from all SCAR nations should continue to be held at about 5 yearly intervals. The Joint Working Groups agreed to invite Prof. Y. Yoshida (Japan) to develop a plan for the 6th International Symposium on Antarctic Earth Science in Japan (in about 1992) and submit it to Working Group meetings in Cambridge in 1987. The groups also endorsed the following symposia:
 - (1) Seventh International Gondwana Symposium, Sao Paulo, Brazil, July 1988 (contact Prof. A.C. Rocha-Campos)
 - (2) Symposium on Antarctic Meteorites, (in conjunction with XX SCAR) Hobart, Australia, Sept.-Oct. 1988 (Prof. W. Cassidy, USA)
 - (3) Southern High Latitudes Ocean Drilling Conference with special reference to the late Mesozoic and Cenozoic (title has yet to be decided). It is anticipated that a formal proposal will be submitted by F.R.G. for hosting this symposium at the Alfred Wegener Institute.

It is anticipated that significant numbers of Antarctic earth scientists will attend these meetings. The Working Groups also recommended that the organizers of these symposia should invite SCAR recognition.
5. Antarctic Treaty Minerals Regime. Dr. Behrendt (USA) described progress with the Antarctic Treaty negotiations towards what is commonly known as an Antarctic Minerals Regime. Possible implications for Antarctic earth science were discussed. Arising from this discussion Rec. GEOL SEG-1986-1 was formulated.
6. Antarctic Mapping. The Joint Working Groups noted that the provision of base maps for Earth science research is an important concern to Antarctic scientists and agreed with the conclusion of the Working Group on Geodesy and Cartography that satellite imagery appears to offer the most practical solution for Antarctic mapping requirements. They also emphasize the importance of the

acquisition of geodetic control for rectifying and compiling maps from satellite imagery. The Joint Working Groups are unable to agree with the apparent suggestion (W.G. Geodesy and Cartography REC-1984-G/C 1) that requests for technical studies and needs in the application of satellite imagery techniques be forwarded through the Working Group on Geodesy and Cartography. In view of the very wide range of earth science applications for satellite imagery, the Working Groups believe that Antarctic earth scientists should acquire and use satellite imagery in the manner most appropriate to research needs.

The Working Groups also discussed the cost of acquiring copies of some satellite data of importance in earth science. Recommendation GEOL SEG-1986-2 refers.

7. SCAR Groups of Specialists on the Structure and Evolution of the Antarctic Lithosphere. The Joint Working Groups, having regard to the information presented and research questions discussed at the Workshop Session in San Diego on 18 June 1986, and recognizing that

- (i) the Antarctic plate is one of only seven major plates forming the global lithosphere;
- (ii) 99% of the Antarctic continental landmass is ice covered; and
- (iii) the task of determining its geologic structure is beyond the capability of any one nation,

recommend to SCAR that it establish a Group of Specialists on the Structure and Evolution of the Antarctic Lithosphere in order to develop an international initiative to address these problems.

Terms of reference for the Group of Specialists would be:

1. To organise and coordinate an international multidisciplinary program of data acquisition that would use modern geophysical and geological techniques adapted to Antarctic conditions, be concentrated in well defined corridors (transects) crossing major structural features of the continent, and be designed to improve substantially understanding of the evolution of the Antarctic lithosphere.
2. To respond to the request of the Inter-Union Commission on the Lithosphere of ICSU for SCAR involvement in the Global Transect Program by organizing construction of Antarctic lithospheric transects using existing data.
3. To organize appropriate workshops and symposia for the purposes of communicating research results to the Antarctic and wider earth science communities and reviewing research strategies.

The Group of Specialists should be established for an initial period of 5 years.

The Working Groups recommended that Dr I.W.D. Dalziel (USA) be invited to convene the group.

8. SCAR Group of Specialists on the evolution of Cenozoic Palaeoenvironments of the Southern High Latitudes.

The Joint Working Groups, noting the information presented and research questions discussed at the Workshop Session in San Diego on 19 June 1986, and recognizing

(i) that Antarctica has been glaciated for more than half of all Cenozoic time,

(ii) that periodic expansions and contractions of continental ice sheets have exerted a major role in the development of terrestrial and marine palaeoenvironments in Antarctica, the Southern Hemisphere and the Earth at large, and

(iii) the extent and complexity of these glacial influences, recommend to SCAR that it establish a Group of Specialists on the Evolution of Cenozoic Palaeoenvironments of the Southern High Latitudes. The principal objectives of the Group of Specialists would be:

1. To promote the integration and correlation of the Antarctic terrestrial and marine Cenozoic Palaeoenvironmental records with those of the Southern Hemisphere lower latitudes.

2. To evaluate and define such important global Cenozoic palaeoclimatic, palaeoceanographic and tectonic events as are deduced from Antarctic geological research.

3. To encourage relevant workshops, symposia, and publications.

This Group of Specialists would be a principal focus for Antarctic Earth science contributions to the ICSU International Geosphere Biosphere Program (IGBP). The Working Groups recommend establishment for an initial period of 5 years and that Dr P.N. Webb (USA) be invited to convene the group.

9. Review of Joint Recommendations. (SCAR Bulletin 77, p. 232). The joint meeting agreed that Recommendation GEOL-SEG-1982-1 is essentially covered by items 7 and 8 above and should be withdrawn. The statement recorded during the 1982 meeting was endorsed.

10. Recommendations The Joint Working Group endorsed the following recommendations:

Recommendation GEOL SEG-1986-1 Data from mineral resource investigations.

Recalling that the Antarctic Treaty was founded on the principle of free scientific investigation,

Anticipating that any future economic mineral resource investigations may generate a large amount of geological and geophysical data from the Antarctic continent and its margins, Recognizing that these data would constitute an important component of information about the tectonic, geochemical and climatic evolution of the Antarctic region.

The Working Groups recommend that such data should be made freely available as soon as possible. A maximum time limit of three years from the time of acquisition is recommended for the confidentiality of such data. After this time, these raw data should be made available at a price no more than the cost of reproduction to all who request them.

Recommendation GEOL SEG-1986-2 Satellite Data. The working groups recommend the unrestricted release of all satellite data collected south of 60°S to interested scientists at the cost of reproduction of data tapes.

Recommendation GEOL SEG-1986-3 Scientific Ocean Drilling Program.

Recognizing the likely gains to our knowledge of the paleoenvironmental history and tectonic evolution of Antarctica from scientific ocean drilling, the Working Groups on Geology and Solid Earth Geophysics:

- 1) strongly support scientific drilling already planned by the Ocean Drilling Program in the Southern Ocean;
- 2) strongly endorse further scientific drilling in high southern latitudes, including drilling on the Antarctic Continental Shelf.

11. Next Meeting. The Working Groups resolved that SCAR approval be sought for a joint meeting in conjunction with the 5th International Symposium on Antarctic Earth Science in Cambridge, United Kingdom, in August 1987.
12. Future Meeting. The Working Groups resolved that SCAR approval be sought for a further joint meeting in conjunction with XX SCAR in Hobart, Australia in 1988 for the purpose of reviewing the progress of the Groups of Specialists recommended at items 7 and 8. They recommended that appropriate workshop meetings be arranged for the occasion; the possibility of a Workshop on Antarctic Meteorites was supported in principle.
13. Acknowledgements. The meeting expressed its appreciation to the United States Polar Research Board, and to D H Elliot (USA) and B. Molnia (USA), for local arrangements for the Working Group meetings in San Diego with special reference to the Workshops of 17 and 18 June 1986. It also passed a vote of thanks to Drs Wallewender and Abbott of San Diego State University for leading the informative and enjoyable field inspections on 16 and 21 June respectively.

Geology Working Group — Solid Earth Geophysics Working Group

Workshop Sessions 17-18 June 1986

The Working Groups organised two workshop sessions on 17 and 18 June to address major problems in Antarctic Earth Science and how to resolve them. These meetings were very successful and laid the basis for the recommendations by the Joint Working Groups for groups of experts on lithospheric studies and on Cenozoic geology. The proposed high latitude drilling sites in the Antarctic region by the Ocean Drilling Program and the importance of the results obtained at these sites for the two study areas mentioned earlier led to a discussion meeting on the sites and possible future drill sites during the evening of 17 June.

- a) Crustal Structure Workshop, 17 June. The workshop contained 14 papers with about 6 poster presentations. The papers covered a broad range of regional earth science investigations with an emphasis on geophysical surveys and their interpretation in geological terms. Several papers put these results into the framework of geoscience transects and thus provided a forum for the discussion of Antarctic geotransects, their requirements and the existing data base.
- b) Ocean Drilling Program and Southern Ocean Drilling, 17 June (evening). This evening discussion was in two main parts. The Ocean Drilling Program and its operation, especially with regards to Southern Ocean drilling, was reviewed and the planned program for the Weddell Sea, South Atlantic, Prydz Bay, and Kerguelen Plateau regions outlined. This was followed by an outline and discussion of proposed drill sites and their rationale for the Ross Sea, Wilkes Land margin, Antarctic Peninsula margin and general southern South Pacific Ocean.
- c) Cenozoic Geology Workshop, 18 June. The workshop contained 13 papers and 2 poster presentations. The papers dealt with a wide range of Cenozoic geological problems particularly covering the northern Antarctic Peninsula and the Transantarctic Mountains and noting major problems in accurate dating and in interpretation of glacial episodes. These papers formed a very important background to the subsequent discussions of the Working Groups on problems in Cenozoic Geology.

All sessions provoked lively discussion and led to a very useful exchange of ideas from workers in different disciplines and to the identification of some of the most important problems for study in earth science. A more detailed report on the workshops will be circulated to all participants and working group members shortly.

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Nineteenth Meeting of SCAR, San Diego, California, USA
WORKING GROUP ON UPPER ATMOSPHERE PHYSICS
 20 June 1986

Present: M. J. Rycroft, UK (chairman); H. Fukunishi, Japan (vice-chairman); E. Bering, USA; G. Fiocco, Italy; A.J. Foppiano, Chile; H. Gernandt, GDR; J.A. Gledhill, South Africa; G.P. Gregori, Italy; He Changming, PR China; R.A. Helliwell, USA; T. Hirasawa, Japan; L.J. Lanzerotti, USA; N.M. Paes Leme, Brazil; C.G. MacLennan, USA; A.P. Mitra, India; B.M. Morlet (France); T. Nagata, Japan; A. Pellegrini, Italy; L.R. Piazza, Brazil; G.M. Pillet, France and URSI; T.J. Rosenberg, USA; N. Sato, Japan; A.J. Smith, UK.

1. Scientific activities of the Working Group on Upper Atmosphere Physics, San Diego 16-20 June 1986

The chairman reported that the several sessions at which had been discussed scientific results arising from the Working Group's programmes had been most beneficial. He was enthused by the activities of the Working Group and thanked all concerned for their many and varied contributions. The annex 1 attached provides a resume of these sessions.

Concerning publication of the papers presented, Prof. T. Hirasawa and Dr. N. Sato undertook the task of trying to arrange for their publication in a special issue of *Memoirs of the National Institute of Polar Research, Japan*. If this proves to be possible, Dr. N. Sato will write to all authors, giving information on layout of the manuscripts, etc. Manuscripts should be sent to Dr. N. Sato, to be received before 31 October 1986.

Concerning the Data Analysis Workshop for SCAR Intervals of Special Interest, two papers are to be submitted to Dr L.J. Lanzerotti by 1 January 1987; the remaining four papers are to be completed and agreed with co-authors before discussion at the IUGG (International Union of Geodesy and Geophysics) General Assembly in Vancouver, Canada, 9-22 August 1987. All papers have several authors from several countries. Prof J.A. Gledhill will write to the Secretary General of IAGA (International Association of Geomagnetism and Aeronomy, part of IUGG), requesting an evening session of the Inter-Divisional Commission of Antarctic Research (IDCAR) during the first week of the Assembly, to finalise these papers. Prof J.A. Gledhill invited contributions for the IDCAR session on New Results from Antarctic and unmanned stations. He will inform Dr M.J. Rycroft of the date of this meeting. An IDCAR newsletter will soon be circulated.

2. Membership of the Working Group on Upper Atmosphere Physics

The chairman reviewed changes in the membership since the meeting in Bremerhaven, FRG. Dr A. Foppiano is the member for Chile, Dr T. Hirasawa for Japan, and Prof A. Egeland for Norway. The representative for COSPAR is Prof K. Labitzke (FRG) and, for SCOSTEP, Dr M.J. Rycroft (UK), a position previously held by Prof

T. Nagata (Japan). Prof Nagata proposed, and the meeting agreed, that the member for MAP activities should be Prof T. Hirasawa (Japan).

3. Recent activities of the Working Group on Upper Atmosphere Physics

The chairman noted that a report on the Bremerhaven meeting had been published in SCAR Bulletin No. 80, pp 606-610, May 1985.

He outlined the main points of recent activities provided by Dr A.V. Shirochkov (USSR); 2. The meeting asked the chairman to write to the USSR Permanent Delegate to SCAR, inviting Dr A.V. Shirochkov and Dr A. Zaitzev to attend the next meeting of the Working Group.

The chairman had prepared a contribution for the SCAR review of Antarctic science. At the meeting Prof R.A. Helliwell had kindly provided some comments on this; these would be incorporated in the chapter of a book to be published by Oxford University Press. An earlier draft had been published in the New Scientist, 29 November 1985, entitled "A view of the upper atmosphere from Antarctica."

4. Future activities

Being responsible for liaison between SCAR and COSPAR (Committee for Space Research), the chairman will make a brief statement, not only on activities of the Working Group, but also on remote sensing of Antarctica, at the COSPAR Plenary meeting in July 1986.

All contributions for the SCAR Upper Atmosphere Physics poster display for the ICSU General Assembly should be with the chairman by 15 July 1986.

Prof K. Labitzke and Dr M.J. Rycroft are organising a meeting at the IUGG General Assembly on "North-South differences of the middle atmosphere," cosponsored by SCAR.

For the SCAR meeting in 1988, to be held in Hobart, Tasmania, it was agreed that the Working Group would arrange:

1. Symposium on "Ozone and other trace constituents in the Antarctic middle atmosphere"
2. Discussion of reports of the three working parties being established
3. Workshop on "Recent results in ionospheric and magnetospheric physics."

The chairman will invite Prof K.D. Cole (Australia), Dr F. Jacka (Australia) and Dr A. von Biel (New Zealand) to give review papers. He will also contact other colleagues in Australia and New Zealand, informing them of the meeting.

It was noted that, in some countries, the responsibility for ozone programmes lies with meteorological organisations. The terms of reference of the SCAR Upper Atmosphere Physics Working Group should be broadened somewhat to include recent work on the middle atmosphere. Rather than suggesting a change of name of the Working Group, it was agreed that "current important problems in Antarctic atmospheric and space science" defined the Working Group's interests.

5. Future international programmes

The Working Group is keen to participate in:

1. The Polar Auroral Dynamics (PAD) project (1986-89) of SCOSTEP,
2. The World Ionosphere/Thermosphere Study (WITS), 1987-1992, of SCOSTEP,
3. The International Solar Terrestrial Physics (ISTP) programme of the three space agencies NASA, ESA and ISAS.
4. The International Geosphere-Biosphere Program (IGBP) of ICSU.

Some discussion ensued on the April 1986 Report, entitled "A program for the study of the long-term behavior of the upper atmosphere and near-space environment," prepared by Prof J.G. Roederer (USA). The Working Group considers that this is very relevant to its activities and that SCAR should play an important role in this programme. It is important that the correct balance is struck in the allocation of resources between long-term monitoring experiments, "new and exciting" experiments, data analysis, data interpretation, theory and numerical modelling. The list of experimental techniques (space-borne and ground-based) given is not comprehensive; for example, several important types of radars are omitted. Neither is the list of important observatories nor the list of important scientific problems to be tackled comprehensive. It should be stressed that the topics discussed in the report should be regarded as being illustrative, and not all embracing.

6. Discussion concerning recommendations

- i. It was noted that the 1985 General Assembly of IAGA passed a recommendation supportive of Antarctic scientific research.
- ii. The Working Group considered that the Site of Special Scientific Interest (SSSI) No. 2 at Arrival Heights, whose date of expiry is 31 December 1987, should be extended by ten years. It is important this site be protected from man-made electromagnetic interference over a range of frequencies from 10^{-2} Hz to 10^8 Hz since it is a most valuable site for the study of natural electromagnetic phenomena of relevance to ionospheric and magnetospheric physics.
- iii. Recalling REC-XVIII-UAP-6, the Working Group confirmed that, by stimulating international collaboration, the concept of periods of special interest was valuable. However, the Working Group considered that papers arising from the June 1982 intervals of special interest to SCAR should be completed before any new periods of special interest were defined. Dr E. Bering would write individually to colleagues who might have data available for joint analysis with data collected between 16 December 1985 and 16 January 1986 using balloons launched from the South Pole. The Working Group noted that the recent PROMIS campaign would provide opportunities for more internationally collaborative analyses.

iv. The Working Group discussed the value of having instruments, such as ionosondes, appropriately distributed at Antarctic stations. Accordingly, the Working Group, noting the interests shown in ionospheric phenomena as evidenced by the installation of an ionosonde at Marsh (Chile) and by the joint analysis of Halley (UK) and Siple (USA) digital ionosonde data, recommends that the equipment needed to collect such observations should continue operation and should be further improved.

v. Further, the Working Group, noting the growing problem of both atmospheric pollution and electromagnetic interference on sensitive equipment (such as pyrhelimeters and ionosondes, respectively) installed at nearby stations in Antarctica, recommends that, when deploying new instruments, each nation should, as far as possible, avoid duplication with and interference to instruments at nearby stations operated by other nations.

vi. Following discussion at the meeting (see annex 1), the Working Group agreed that three Specialist Working Parties (or Sub-Committees) should be established to consider the international aspects of three distinct scientific investigations, of topical interest:

1. on the depletion of ozone over Antarctica,
2. using new methods of sounding the ionosphere (see REC-XVIII-UAP-2 and 5), and
3. using Automatic Geophysical Observatories (see REC-XVIII-UAP-1)

The background to, and the objectives of, each Specialist Working Party are given as annex 2, 3 and 4, attached.

Arising out of annex 2, the chairman of the Working Group proposes that SCAR, noting that the spring-time depletion of ozone over a large part of Antarctica is a matter of considerable environmental concern, recommends that the plans of individual nations to study this phenomenon be coordinated on an international scale.

7. Election of officers

The following officers were elected unanimously:

Dr M.J. Rycroft (UK) as chairman,
 Dr T.J. Rosenberg (USA) as vice-chairman, and
 Prof H. Fukunishi (Japan) as secretary.

Annex 1: Report of scientific sessions held at San Diego, USA
16-20 June 1986

The activities of the SCAR Upper Atmosphere Physics Working Group consisted of:

1. The Nagata symposium on geomagnetically conjugate phenomena (3 half-day sessions),
2. A special session discussing possible future projects (1 half-day session),
3. A data analysis workshop for SCAR intervals in June 1982 of special interest (2 half-day sessions),
4. A workshop on Antarctic middle and upper atmosphere physics (3 half-day sessions), and
5. A business meeting (1 half-day session).

1. Fifteen papers, comprising five invited review papers and ten contributed papers, were presented in a successful symposium dedicated to Prof T. Nagata, the first chairman of the Working Group. In the opening paper, Prof T. Nagata reviewed observations, commencing during the International Geophysical Year (IGY), of whistlers, auroral charged particles, and hydromagnetic resonances at opposite ends of geomagnetic field lines. Dr D. Rees dwelt upon differences in thermospheric behaviour in northern and southern hemispheres, particularly those associated with North-South asymmetries of the geomagnetic field. The results obtained using new CCD camera images of conjugate auroral forms were presented by Dr N. Sato. Dr T.J. Rosenberg and Dr S. Krishnaswamy considered conjugate riometer observations.

Prof R.A. Helliwell, considering that VLF hiss and chorus are "kissing cousins", reviewed recent results obtained using the controlled VLF transmitter at Siple, Antarctica, and one-hop signals received in Quebec, Canada. He discussed experiments in which "quanta" randomly distributed in the frequency-time domain were injected into the magnetosphere, and interpreted these in terms of a cyclotron resonance mechanism between waves and electrons. Dr D.L. Carpenter considered the related aspect of VLF emissions structured in the frequency-time plane and charged particle precipitation. Dr N. Sato considered the seasonal variation of polar chorus observed at geomagnetically conjugate stations. Dr A.J. Smith presented new results on duct movements and the filling of the plasmasphere derived from studies of one-hop whistler mode signals from VLF transmitters located in the northern hemisphere.

Dr R. Gendrin reviewed the conjugate behaviour of ULF waves. ELF/VLF waves, magnetospheric structures only a few hundred kilometres in extent, and the convection electric field, as determined from observations made aboard GEOS-1 and -2. Dr N. Sato reported the characteristics of a new type of emission near 1.5 Hz exhibiting a finger-print-like structure in the frequency-time plane. Dr. L.J. Lanzerotti covered hydromagnetic waves observed both aboard spacecraft and on the ground. The ionospheric signatures of flux transfer events (FTEs) at the magnetopause are particularly interesting. Dr A. Wolfe considered pc 3, 4 and 5 pulsations observed at the feet of field lines through the cusp to be due to Kelvin-Helmholtz instabilities on the magnetopause. Finally, Dr M.J. Rycroft outlined the results of a paper submitted by Dr A. Shirochkov on riometer observations in the

cusps region. He also gave a report, prepared by Dr A. Zaitsev (USSR) on the symposium on polar geomagnetic phenomena held at the end of May 1986 at Souzdal, near Moscow.

2. Dr H. Gernandt (GDR), Dr V. Wickwar (USA) and Dr J.H. Doolittle (USA) led a discussion on possible programmes in Antarctic atmospheric physics of wide interest. Arising out of these discussions, three Specialist Working Parties were formed, as reported in annex 3, 4 and 5.
3. An extremely valuable set of informal discussions of data obtained by many techniques (ionosonde, magnetometer, riometer, optical, ELF/VLF radio and satellite) in Antarctica during the SCAR intervals of special interest, namely 10 to 13 and 27 to 29 June 1982, was chaired by Dr L.J. Lanzerotti. Plans were formulated for the preparation of six internationally authored papers.
4. The workshop on Antarctic middle and upper atmosphere physics was opened by Dr M.J. Rycroft who reviewed his philosophy for carrying out research on geospace phenomena. He particularly considered the magnitude of the magnetic flux, leaving the southern polar cap, into the interplanetary medium via the geomagnetic tail. Dr E.A. Bering outlined his experiences during a balloon campaign at the South Pole to observe electric fields. Prof T. Hirasawa gave two papers on images derived from a new auroral television system installed at Syowa station. Prof U.S. Inan reviewed the effects of charged particle precipitation on the lowest ionosphere, as studied from changes of the phase and/or amplitude of signals propagating in the Earth-ionosphere waveguide. Dr L.R. Piazza reported Polar Cap Absorption (PCA) effects and Dr Chingming He presented initial results of whistlers observed at the Great Wall station, Antarctica.

Prof T.J. Rosenberg reviewed current understanding of riometer absorption observed at the South Pole in terms of the changing position of the auroral oval with respect to the station. Dr S. Krishnaswamy gave analyses of long-term riometer records at Siple and South Pole. Prof J.A. Gledhill reviewed satellite observations of charged particle precipitation in the South Atlantic Geomagnetic Anomaly region, and contrasted precipitation over the northern and southern polar caps. Dr A.J. Foppiano presented first results obtained using an ionosonde at Marsh station. Siple and Halley ionosonde data were compared by Dr F.T. Berkey, and related to model calculations.

The session on the middle atmosphere began with a review, by Prof H. Fukunishi, of observations made from the ground, balloons, rockets and satellites at Syowa station during 1985. An impressive data set has been collected using the latest technology. Prof T. Hirasawa concentrated upon observations of aerosol layers and reducing ozone values during the month of October. Dr S. Solomon reviewed competing theories claiming to explain the ozone depletion, published in the current issue of Nature. These involve the catalytic destruction of ozone by chlorine, which could be derived from man-made chlorofluorocarbons (freons). Dr H. Gernandt presented new results on balloon measurements of ozone and temperature profiles obtained at 71°S, 12°E from May to December 1985. Finally, he reviewed ground-based observations of aerosol optical thickness at several Antarctic stations.

Annex 2: SCAR UAP WG Specialist Working Party on the Depletion of Ozone over Antarctica.

The spring-time depletion of the amount of ozone over Halley, Antarctica, reported in Nature in May 1985, has been confirmed by Syowa data and by NASA satellite data. These results show that, in October, the ozone content of the atmosphere over much of the Antarctic is about half that elsewhere. Values in October are now 30% to 40% less than they were a decade ago. This effect may be due to man-made pollutants. The breakdown of man-made chlorofluorocarbons (freons) in the cold, post-long-winter-night stratosphere is one mechanism which can explain this effect.

This is clearly a most important environmental issue. The Antarctic atmosphere is the ideal laboratory in which to carry out further research on chemical, radiative and dynamical effects in the atmosphere to improve understanding of the phenomenon.

The objectives of the Specialist Working Party on the depletions of ozone over Antarctica are:

- a) to effect international coordination of the present plans of individual nations to investigate both the ozone distribution itself and the atmospheric properties which determine this, over Antarctica, from 1986 to 1990,
- b) to stimulate observations comparing different techniques,
- c) to consider which experimental techniques (such as ground-based spectrophotometers, laser radars, infra-red and millimetre wave devices, balloon-borne ozonesondes, rocket-borne instruments and various satellite-borne instruments) are best suited to tackle the problem in the longer term,
- d) to consider the relative value of different theoretical and/or computer models of the Antarctic atmosphere devised by different research groups,
- e) to consider what further research (experimental and modelling) is needed to improve understanding of the causes of the observed distribution of ozone over Antarctica, and
- f) to produce, by correspondence, an agreed outline report, making specific recommendations for further work, for discussion at the SCAR meeting in 1988.

Preliminary list of names for SCAR UAP WG Specialist Working Party on the Depletion of Ozone over Antarctica

M.J. Rycroft (UK, chairman)
G. Brasseur (Belgium)
M. Chatterjee (India)
J.C. Farman (UK)
G. Fiocco (Italy)
H. Gernandt (GDR)
T. Hirasawa (Japan)
..... (Japan)

P. Johnstone (New Zealand)
V.W.J.H. Kirchoff (Brazil)
V.A. Kokin (USSR)
A. Krueger (USA)
G. Megie (France)
J.A. Pyle (UK)
S. Solomon (USA)
R. Stolarski (USA)
A. Tuck (UK/USA)

Accordingly the Working Group on Logistics recommends a meeting be conducted prior to the time of XX SCAR at which representatives of the offices responsible for conduct of national programs in Antarctica could discuss the matter of NGA's. This would be held in conjunction with the meeting proposed covering air operations.

7. Joint Meeting with Biology W.G.

The Groups met to discuss matters of mutual interest. There was general agreement on most matters of substance, the exception being the Report of the Joint IUCN/SCAR Working Group. The LWG considered this report to contain numerous errors of fact, be generally misleading, was unrealistic in many areas, and did not project a good image for SCAR especially as this report was to become a public document.

Due to the late distribution of this Report, the LWG had not been given the opportunity to study it as carefully as it demanded. Representatives of the LWG met specially with representatives of the Biology W.G. to identify their main concerns and attempt to resolve these problems.

8. Buildings and Services

The Group exchanges information on extensions to existing buildings, extensions and construction methods. It was noted that proposals were under consideration for new stations at Dome C (France), vicinity of Ross Sea (Italy), Antarctic Peninsula (Uruguay) and vicinity of 3°E (Norway).

9. Transportation

Ships

Dr Orheim reported on the successful use of the Norwegian Coast Guard vessel KV Andenes on the 1984/85 expedition to the southern Weddell Sea. The 'Andenes' was modified to a multipurpose research vessel to meet the requirements of various scientific disciplines. Her basic data are:

Length: 107

Power: 14,000 SHp

Maximum Speed: 24 knots

Ice Breaking Capacity: 1 m at continuous speed

Accommodation: 120 total

Crew: 41

The ship was allocated to the Norwegian Polar Institute, which was responsible for the Antarctic operation.

A marketing representative from the Finnish shipyard Rauna-Repola presented information on a research and supply icebreaker currently designed for the Soviet Antarctic Expedition. The projected data are:

Length: 140 m
 Breadth: 23 m
 Draught: 8.5 m
 Power: 12 MW
 Maximum Speed: 16 knots
 Accommodation: 240

The double hull ice breaker of the Soviet ULA ice-category will be used for marine research, carrying passengers and cargo to the Soviet Antarctic stations.

Vehicles

A marketing representative of the Swedish manufacturer Haglund gave a presentation on an all-terrain vehicle currently used by some Antarctic nations. The vehicle was already presented at the XVIII SCAR general meeting. There were no experiences presented by the users.

The Soviet Union introduced a new tracked vehicle with a cargo capacity of 10 tons in 1985/86. A modified version with a capacity of 30 tons will be introduced in 1987. Dr Korotkevich also drew attention to another planned vehicle of 715 hp and 25 tons of thrust. A snow mobile, manufactured in Finland, was tested at Molodezhnaya Station, which can run up to 70 km/h and pull 600kg.

The Federal Republic of Germany, in 1986, has introduced a new traverse vehicle used for light and fast over-snow expeditions. The vehicle is powered by a 170 hp turbocharged, air-cooled diesel engine giving a tow-bar pull of 5 tons. The vehicle is used to tow sledge loads up to 20 tons and as mobile scientific laboratory. The transmission is hydrostatic. The vehicles are equipped with satellite navigation and radio communication.

Air transportation

The Soviet Union representative reported on the maiden flight of an IL 76 jet aircraft landing on wheels on the compacted snow runway of Molodezhnaya Station and on the ice runway of Novolavurevskaya Station.

Brasil introduced air transportation from its country to the Antarctic Peninsula.

The Federal Republic of Germany modified its Dornier 228 aircrafts to a higher range-payload ratio of 1000 nM and 1000 kg.

10. Secretary/Chairman

Mr Thomson informed the Group that having served in this capacity for 10 years he felt there was time for change and therefore he would prefer not to continue as the Group's Chairman.

The group discussed and agreed that future tours of service as Chairman should normally be limited to periods of four years to embrace two regular SCAR meetings.

Mr. J. Bleasel of Australia was unanimously elected and has taken up responsibility as Chairman of the Working Group on Logistics.

The other members of the group recognized Mr. Thomson's extraordinary service over a period of ten years as Chairman, and his consistently faithful and effective attention to the correspondence and planning as well as to the conduct of the six meetings. The members joined in an expression of gratitude to Mr Thomson for his unselfish devotion in the interests of SCAR and the Working Group on Logistics.

11. Next Meeting

The Group recommends that a special meeting under its auspices should be held in 1987 to consider the questions of Antarctic Air Operations and Non-Government activities (NGAs). The Group should then meet again at XX SCAR in conjunction with a Symposium on Antarctic Logistics to be organised by the Chairman.

SCAR REPORTS

This is an irregular series of publications, started in 1986 to complement *SCAR Bulletin*.

SCAR Bulletin carries reports of SCAR meetings and SCAR Executive Committee meetings, short summaries of SCAR Working Group meetings, notes, reviews, and articles and material from Antarctic Treaty Committee meetings, considered to be of interest to a wide readership. The *Bulletin* is published as part of *Polar Record*, the journal of the Scott Polar Research Institute, Cambridge, and is reprinted separately for distribution to SCAR National Committees and scientists directly concerned with SCAR. It is translated into Spanish by the Instituto Antártico Argentino.

The *SCAR Report* series has been established for the purpose of providing SCAR National Committees and others directly involved in the work of SCAR with the full texts of reports of SCAR Working Group meetings, which had become too extensive to be published in the *Bulletin*, and with more comprehensive material from Antarctic Treaty meetings.

As with the *Bulletin* reprints, this series is distributed mainly through SCAR National Committees and is not available on direct subscription.