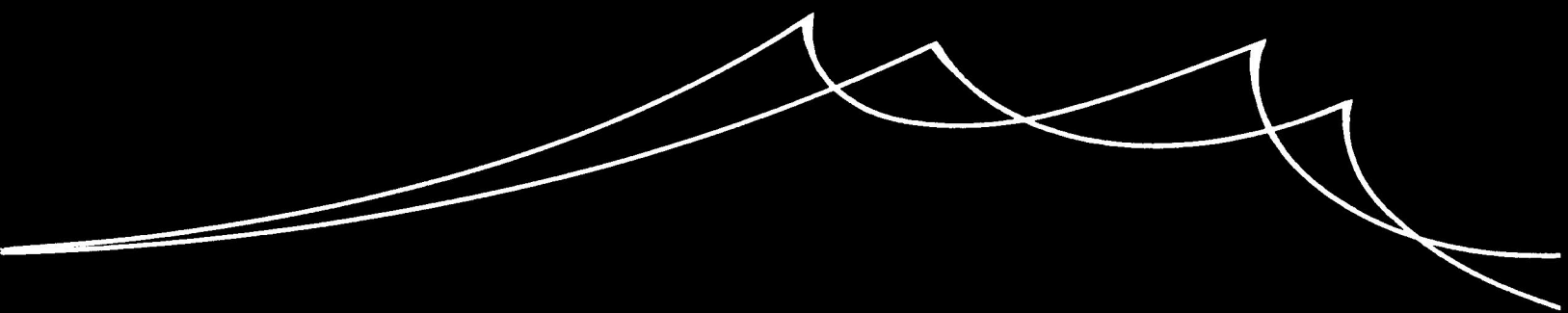


SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH



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INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS

SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

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NOTE: Membership as of October 1967; a revised list for 1968 will appear in the next issue.

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**PROCEEDINGS
OF THE
SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH**

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SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH

Report of the Executive Committee Meeting

Warnemunde, 11-13 October 1967

The meeting of the SCOR Executive Committee was held at the Institut für Meereskunde (Deutsche Akademie der Wissenschaften zu Berlin), Warnemünde, German Democratic Republic, 11-13 October 1967, with the President, Captain Luis Capurro, in the chair. During this period, Dr. Klaus Voigt, Director of the Institut für Meereskunde, provided an opportunity to visit laboratories of the Institut and to inspect the research vessel Professor Albrecht Penck. There was also a visit to the Soviet research vessel Akademik Kurchatov in the shipyard at Wismar. After the Meeting, on 14 October, there was an excursion along the southern Baltic shore to the Darss Peninsula, including a visit to the Marine Observatory of the Geophysical Institute of the Leipzig University, at Zingst.

A list of those who participated in the Executive Meeting is given in Annex I. The agenda of the meeting serves as an outline for the report which follows:

1.0 Organization and Finance

1.1 Report of the Secretary

Publication of the Proceedings has proved to be a useful mechanism for communicating the results of SCOR activities. An issue appears in connection with each Executive or General meeting (i.e. usually twice each year), and it is desirable for publication to occur as soon as possible after conclusion of the meeting. To effect this it was agreed to continue offset printing and to abandon the practice of justifying the right-hand margin. It is also desirable to decrease the costs of printing and distribution; to accomplish this the Secretary will explore the possibility of reducing the type size (i.e. reducing the number of pages) and the weight of cover and paper. In the interest of speedy distribution, air-mail will continue to be used for most copies.

Consideration was given to ways of expediting SCOR business so that meaningful progress can be made in the half-year periods between meetings. Important delays occur in correspondence with members, national committees and cooperating organizations. The problem has been particularly serious in the formation of new working groups. Improvement in the situation is in large part out of SCOR's control, since it depends on more effective operation of the national committees and organizations concerned.

A related problem is the development of more effective means of formulating SCOR advice to UNESCO and IOC. At present, some problems are referred to members and to national committees; replies are discussed by the Executive Committee which then agrees on a statement. Often members and national committees do not respond, and the Executive Committee itself formulates the advice. A more effective means has been the establishment of working groups on specific problems, whereby an appropriate group of scientists can study the problem in depth. An attempt has been made to utilize a broader part of the scientific community on these working groups, and further steps in this direction should be taken.

Other means of improving the formulation of SCOR advice include the following:

1. Questions addressed to national committees should be more specific; in some cases questionnaires would be appropriate.

2. Special meetings should be organized on topics of particular significance.
3. The advice of individual specialists should be sought.
4. Interested National Committees, on behalf of SCOR, should be asked to study certain problems in depth.

1.2 Budget

An estimate of SCOR finances for 1967 through 30 September 1967 is given in Annex II. There appears to be no need to request increased national contributions in 1968.

2.0 Working Groups

Information on the membership and terms of reference of active working groups is given in Annex III.

2.1 Report on existing groups

WG 10. Oceanographic Tables and Standards (with ICES, IAPSO and UNESCO)

This group met in Bern on 4-5 October 1967 on the occasion of the IAPSO General Assembly. Expenses of the meeting were met by UNESCO; in addition, SCOR supported the participation of Professor Carl Eckart (Scripps Institution of Oceanography, La Jolla) and Mr. G. Girard (Bureau International des Poids et Mesures, Sèvres). A detailed report of the meeting will be published by UNESCO early next year; the next meeting will probably be in 1969.

The following additions to the International Oceanographic Tables are envisaged for the future:

1. Refractive index/salinity (J.S.M. Rusby, NIO) - in press.
2. Oxygen saturation values for sea water (E. Green, MIT and K. Grasshoff, Kiel) - ready for printing.
3. Chlorosity from salinity and chlorinity (F. Hermann, M. Menaché and K. Grasshoff) - to be compiled.
4. Specific gravity from salinity or conductivity (Mr. McCartney, NIO) - probably ready in late 1968.
5. Absolute electrical conductivity of sea water (C. Clayson, M.J. Tucker and the late R.A. Cox, NIO) - probably ready in 1969.

Mr. Hermann was elected Chairman in place of the late Dr. Cox. New members have been nominated by ICES (Dr. F. Culkin, UK) and UNESCO (Mr. M. Menaché, France); Professor Dietrich requested to be replaced, and SCOR agreed to designate Dr. K. Grasshoff (FRG).

During the working group meeting, Professor Eckart and Dr. Fofonoff discussed the equation of state from a thermodynamic point of view, an approach that provides a physical basis for the empirical relationships being established in the laboratory. Professor Eckart agreed to prepare a paper clarifying and elaborating this point of view. The Executive Committee, recalling the earlier comments of SCOR on this matter (Proceedings, vol. 2, p. 4), decided to re-examine at its next meeting the desirability of establishing a working group jointly with IAPSO to deal specifically with the physical aspects of the equation of state of sea water.

The Executive Committee also adopted the following statement on the definition of salinity:

"The Executive Committee concurred with ICES and IAPSO in endorsing the new definition of salinity contained in the Introduction to Table Ia of the new International Oceanographic Tables. This definition consists of (a) an arbitrary relationship between salinity and chlorinity, and (b) an empirical relationship between salinity and conductivity ratio at 15° C. Redefinition was necessary because of the difficulty in precise determination of total salt content, because of the greater precision of measurement now available with conductivity apparatus, and because it became possible to use a large number of samples from many parts of the world ocean to establish the empirical relationship. The new definition is compatible with previous definitions with respect to earlier data of lower precision."

WG 13. Zooplankton Sampling Methods (with ICES and UNESCO)

Dr. Fedorov reported that the final report of this working group, together with papers resulting from the Symposium on the Hydrodynamics of Plankton Samplers, is now in press and will be published in the near future.

WG 15. Photosynthetic Radiant Energy (with UNESCO and IAPSO)

The working group proposed to hold sea trials in the Gulf of California in the Spring of 1968 for the purpose of intercalibrating several kinds of instruments for measuring photosynthetic radiant energy underwater. R/V "Ellen B. Scripps" is being furnished by the Scripps Institution for the period 28 April to 25 May 1968. Four members of the working group, each accompanied by an assistant, would be brought to La Jolla to join Mr. Tyler in this work. It is estimated that approximately \$10,000 will be required for the transportation and per diem of participants. Additional funds will be required for shipment of equipment to be used.

Dr. Fedorov reported that UNESCO support would probably not exceed one-third of the travel expenses. Some support may be forthcoming from IAPSO, and it is hoped that national funds will be available for shipping equipment. The Executive Committee, in view of the importance of the proposed work, accepted the responsibility to find the additional funds required.

It is further proposed that full-scale sea trials involving the correlation of radiant energy measurements and measurements of primary productivity should be conducted in the area between the Canaries and the coast of West Africa in June 1969 (two to three weeks in the area are required). Detailed planning of this operation can await the outcome of the 1968 trials, but it seems desirable to initiate negotiations for the use of a suitable research vessel. Representatives of the Royal Society agreed to explore the possibilities in the United Kingdom.

The WG Chairman has suggested that consideration of the proposed symposium on hydro-optics be deferred since it does not seem practicable to hold this meeting until 1969.

WG 17. Determination of Photosynthetic Pigments

It will be recalled that at the Eighth General Meeting it was decided to discharge this group and to ask Dr. Humphrey to serve as rapporteur, to keep the matter under review and, at the appropriate time, to present recommendations for future action. Dr. Humphrey reported that there are several new developments in this field, including the increased use of fluorimetry and continuous measurement techniques, and the separation of two chlorophyll c pigments. Discussion of these matters will be stimulated during the next year, after which it may be desirable to establish a new working group.

WG 19. Micropaleontology of Bottom Sediments

The symposium "Micropaleontology of Marine Bottom Sediments" was held on 10-18

September 1967 at the University of Cambridge, England. Major expenses for the symposium were divided between UNESCO and SCOR, with UNESCO contributing \$5,000 to cover interpretation costs and travel and subsistence for invited speakers; SCOR expenses were about \$6,200, mostly for travel and subsistence of WG members and invited speakers. Meeting facilities were provided by the University of Cambridge, and the Royal Society and British Petroleum shared the expenses of interpretation equipment. The results of this meeting are reported in Annex IV.

The Executive Committee congratulated the Working Group and its Chairman, Professor Seibold, on the success of the Symposium, and expressed great satisfaction with the arrangements for publication by the Cambridge University Press. With regard to the Working Group's recommendations, it was agreed to pass these to National Committees and to IUGS whose attention should be drawn particularly to Recommendation 3.

Dr. Fedorov pointed out the need for a world index of sea bottom cores. The Executive Committee felt that this was a task for the World Data Centers and that the IOC Working Group on Data Exchange should examine the problem.

WG 21. Continuous Current Velocity Measurements (with IAPSO and UNESCO)

The first meeting of this group was held in Wormley (UK) on 18 April 1967; during the period of 6 July to 2 August 1967, members met in Woods Hole to carry out an intercomparison of current meters used in studies of the variability of ocean currents. The following types of current meters were employed: Bergen, Geodyne, Plessey and Tiefenstrommesser. Unfortunately, at the last minute neither the USSR participants nor their Alekseev meters were available. Available meters were calibrated in a towing tank, and three moorings were laid and recovered. A preliminary report of this work is given in Annex V.

In discussion, Dr. Voigt described continuous current velocity measurements, including the use of Alekseev current meters, carried out by Baltic oceanographers during two weeks in 1964 (repetition of such measurements is planned in 1969). The results of the 1964 experiment are available and will be printed by ICES with the support of UNESCO. Dr. Voigt also recommended that various types of current meters be tested in hydraulic channels. Professor Stewart emphasized the need for comparisons both in the laboratory and at sea; in the latter case, the influence of the mooring on the resulting current measurements must be ascertained.

The Executive Committee noted with satisfaction the results of this work to date and encouraged the group to complete the processing and analysis of the July measurements and to meet again when this is required. With regard to the desirability of organizing a second field intercomparison, the Executive Committee agreed to support this when recommended by the group.

WG 23. Zooplankton Laboratory Methods (with UNESCO)

Establishment of this group was decided at the last Executive Meeting, and the intervening time has been spent in organization of the group and its work. Membership is now complete (see Annex III), and the first meeting will probably take place early in 1968.

Professor Raymont suggested that the working group should consider methods of preserving zooplankton material for subsequent biochemical analysis; it was agreed to draw this to the group's attention.

WG 24. Estimation of Primary Production under Special Conditions (with IBP)

After decision of the SCOR Executive Committee to establish this group, IBP/PM agreed to joint in sponsoring its activities. Membership has now been completed (see Annex III), and work by correspondence has been initiated.

WG 25. Nutrient Chemistry

Membership was completed in July (see Annex III); it is anticipated that the first meeting will take place during the first half of 1968.

WG 26. Implementation of UN Resolution on Resources of the Sea (with ACMRR and WMO/AC)

The first meeting of this group occurred in Helio Cabala and Rome, Italy, on 17-21 July 1967. A report, entitled "International Ocean Affairs", was published and distributed by SCOR in September. Subsequent action is discussed later, under section 3.1.

2.2 Consideration of new groups

Although no proposals for new working groups had arisen within SCOR itself, discussions with UNESCO, IOC and IAPSO had led to the suggestion of SCOR affiliation with the two groups discussed below. In both cases, the Executive Committee agreed to sponsor the groups. In each case, however, it was considered necessary to clarify the terms of reference and to establish which members would be nominated by SCOR. The Secretary was instructed to negotiate these matters with appropriate officers of the other sponsoring bodies.

WG 27. Deep Sea Tides (with IAPSO and UNESCO)

A working group on deep sea tides was established by IAPSO in May 1965. Reports of this group have been published in SCOR Proceedings (see vol. 1, no. 2, p. 78; vol. 2, p. 54; vol. 3, no. 1, p. 56). The latest report deals with a meeting in La Jolla, 16-20 January 1967, for which SCOR provided financial assistance. Sponsorship by SCOR is appropriate because of the scientific interest of the problem and its relation to matters on which SCOR is called to advise UNESCO and IOC.

The working group met during the IAPSO General Assembly in Bern, when the situation to date was reviewed. The original hope that a deep sea program could now be scheduled has turned out to be unrealistic. At the same time, it is fair to say that a number of programs now underway would probably not have been started had it not been for the efforts of the working group. It has also developed that the transition problem, concerning the tidal behavior between the deep sea and the coast, deserves special consideration; on account of its inherent interest and the relatively simpler problems of instrumentation involved, one can expect considerable progress in this particular field during the next two years. (see also Munk and Zetler, Science, 158:884-886, 1967).

WG 28. Ocean-Atmosphere Interaction (with IAMAP and IAPSO)

During the June 1965 meeting of the Executive Committee, there was a discussion of the various groups concerned with problems of ocean-atmosphere interaction; the following conclusions were reached:

"It was generally agreed that there were already too many working groups dealing with this problem, that membership and terms of reference of these groups appeared to overlap, and that SCOR's efforts might best be directed towards simplification of the organizational structure." (Proceedings, 1(1):6).

Subsequent events have justified this point of view, and at a meeting in Lucerne, 27-28 September 1967, the IOC Working Group on Ocean-Atmosphere Interaction proposed that there should be only one non-governmental scientific group and one intergovernmental group dealing with the problem. The former group would be constituted by IAMAP, IAPSO and SCOR. Because of SCOR's advisory responsibilities, participation seems essential.

3.0 Relation with United Nations Organizations

3.1 Advisory matters concerning UNESCO/IOC

The Agenda for the Fifth Session of IOC included an item for matters presented by SCOR, and several other items pertain to matters on which SCOR comments had been invited. Therefore, the Executive Committee discussed the substance of a formal report to IOC, which was subsequently prepared and presented to the Session (see Annex VI). The report contains recommendations on variability, future oceanographic congresses and on proposed investigations in the South Pacific, Caribbean, North Atlantic and Southern Ocean.

In addition to matters contained in this report, Dr. Fedorov discussed several questions on which UNESCO would welcome SCOR advice. Problems continue to arise concerning geological and geophysical investigations, and jurisdiction for such studies within the United Nations family. Although SCOR membership includes experts in these fields, Dr. Fedorov thought it would be useful to have a specific panel of experts to whom requests for advice could be directed. The Executive Committee recognized the importance of this problem, but was reluctant to establish a new mechanism for providing advice in a single field of oceanography until the inadequacy of the present mechanism was established. As an immediate action, it was decided to request Professor Seibold to work with the UNESCO Office of Oceanography, to study UNESCO programs and plans in this area and to clarify the question for consideration by SCOR at its next meeting.

The IOC Bureau, at its Seventh Meeting, had asked SCOR to make a careful study of the most effective way of organizing any future oceanographic congress. In a discussion of comments received from National Committees, the Executive Committee concluded that large congresses served several useful purposes but should not be held more frequently than every five or six years. To be most effective, congresses should be more tightly organized and facilities must be more adequate than has been the case in the past. Detailed recommendations are given in Annex VI.

Dr. Fedorov also referred to a series of questions that had been directed to WG 26. The question of how advice can be most effectively formulated is discussed above (see 1.1). The other questions concerned how scientists can be adequately informed on the use of international organizations and channels, the optimal form of national coordination, the balance between fundamental and applied research and the application of their results, the conflict between standardization of methods and the development of improved methods, and the problem of facilitating the application of new knowledge to man's benefit. It was agreed that these questions were fundamental to the problem of improving international cooperation. Although in part they are philosophical in nature, some practical suggestions are contained in various sections of the report "International Ocean Affairs". An effort should be made to provide scientists with more adequate information on the nature and functions of international organizations, both non-governmental and intergovernmental; it might be useful to prepare a guide to international organizations in the field of marine science and its applications and if possible to distribute this with the International Directory of Oceanographers (see 6.2).

With regard to the Working Group on Implementation of the UN Resolution on Resources of the Sea (see 2.1, WG 26), it was noted that the report "International Ocean Affairs" had been a basic document for discussions of the IOC Working Group on the same subject (and later for the Fifth IOC Session) and that establishment of the group by SCOR, ACMRR and WMO/AC had ensured that the views of scientists concerned with international oceanography were brought to the attention of the UN Secretary-General.

Subsequent to the Executive Meeting, the Fifth Session of IOC took place in Paris (19-27 October 1967). A list of IOC Resolutions with implications for SCOR is given in Annex VII.

3.2 Relation with FAO/ACMRR

The successful meeting of WG 26 referred to above was greatly facilitated by the arrangements and secretarial support provided by FAO Secretariat. After publication by SCOR of the English version of "International Ocean Affairs", FAO arranged for the translation and publication of this report in French and Spanish. In general, cooperation between SCOR and ACMRR has been most effective.

3.3 Other matters

Upon invitation of the United Nations, SCOR was represented by its Secretary at the first meeting of the Secretary-General's Group of Experts on the UN Resolution 2172. SCOR is also cooperating with the Secretary-General by furnishing information on its activities pertinent to the comprehensive survey of activities being made in accordance with that resolution. SCOR was asked to answer several questions dealing with increased efforts in international activities and with the need for improved coordination between international organizations concerned; comment on these questions has been furnished in the form of the report of WG 26.

The WMO was represented at the last Executive Meeting. WG 26 represents the first example of a joint working group with SCOR where the WMO Advisory Committee has been a co-sponsor; WG 26 has recommended that additional joint efforts of this sort be organized where appropriate. The WMO Secretary-General has shown interest in plans for cooperative studies of the South Pacific.

There have been few SCOR contacts with other UN bodies concerned with ocean affairs (such as IAEA and IMCO).

4.0 Relation with ICSU and constituent bodies

4.1 Relation with ICSU

The ICSU Secretariat furnishes important support for SCOR by collecting national contributions and by furnishing periodic financial statements. In turn, the SCOR Secretary attempts to furnish information and reports requested by ICSU. The ICSU Executive Board, in its meeting on 9-10 October 1967, approved the small constitutional amendment proposed at the last SCOR Executive Meeting.

4.2 Relation with Unions and constituent bodies

SCOR has been represented by Professor Stewart on the IUGG Committee on Atmospheric Sciences and on related groups concerned with problems of ocean-atmosphere interaction. Establishment of the joint IAMAP/IAPSO/SCOR group (WG 28) and discharge of the IUGG Committee should simplify SCOR efforts to participate in useful action on this problem.

It is noted that although IAPSO, IABO and the Commission of Marine Geology of IUGS are now represented by ex-officio members on the SCOR Executive Committee, such members have not attended Executive Meetings and have not corresponded on SCOR matters. An attempt will be made to involve these members actively in SCOR affairs.

SCOR was represented at the 14th IUGG General Assembly and the associated meeting of IAPSO (Switzerland, 25 September - 7 October 1967). Important actions, with implications for SCOR, are summarized below:

1. In order to strengthen its activities in marine geophysics, marine chemistry and meteorological oceanography, IAPSO changed its name to The International Association for the Physical Sciences of the Ocean (IAPSO).

2. IAPSO created Commissions on Marine Geophysics, Marine Chemistry, and Physical Oceanography, maintained two Scientific Advisory Committees (on Tides and Mean Sea Level, and on the General Bathymetric Chart of the Oceans), and established two Working Groups (on Bibliography and Classification, and on Symbols, Units and Nomenclature of Physical Oceanography). Other working groups will continue to be sponsored jointly with other organizations.

3. In connection with transformation of the Comité International de Géophysique into a WDC Steering Committee, IAPSO proposed a joint appointment with SCOR to this committee (subsequently Dr. I. Beloussev was appointed).

4. IAPSO resolved to convene its next General Assembly jointly with SCOR, IABO, the Commission on Marine Geology of IUGS, and with IAMAP, and requested its Executive Committee to study the desirability and feasibility of establishing an International Union of Marine Sciences.

4.3 Relation with Special and Scientific Committees

Mr. Hemmen reported that the papers presented at the SCAR/SCOR/IAPSO/IUBS Antarctic Oceanography Symposium (Santiago, 13-16 September 1966) would be published in early 1968. With regard to the SCAR proposal for a joint working group on the Antarctic Convergence, the Executive Committee felt that the proposed IOC Coordination Group for the Southern Ocean (see Annex VI) would be the most effective way to handle this matter.

SCOR is represented on SCIBP by Dr. O.H. Oren who attended the meetings of that body and of IBP/PM on 28-31 March 1967 in Paris. During that meeting, Dr. Ketchum, Chairman of IBP/PM was asked to confer with the Chairman of SCOR WG 25, on Nutrient Chemistry, and was empowered to make such arrangements as he considered necessary to ensure adequate representation of IBP in these studies. It was also agreed to join SCOR in establishing a working group on Primary Production under Special Conditions (WG 24), and Professor Krey was appointed to represent IBP/PM in the arrangements for the proposed symposium on biological results of the IIOE, to be sponsored by SCOR, UNESCO/IOC, FAO/ACMRR, and IBP.

With regard to this symposium, Dr. Humphrey reported that his enquiries had shown that the meeting should be in 1969, that it should consist mainly of invited papers, and that the number of participants might be between 50 and 250 depending on where the meeting was held. It was agreed that the symposium should be entitled "Biological Results of the International Indian Ocean Expedition", and that Dr. Humphrey should continue to explore questions of location and other arrangements with Professor Krey, Dr. Ketchum, Mr. Currie (of IABO) and with UNESCO and FAO. National Committees could be asked to suggest names of speakers and to pay for their participation. It was estimated that expenses might amount to \$15-20,000. If languages other than English are to be used, translations should be circulated; for papers in English, it would be useful to distribute abstracts in extenso.

5.0 Relation with other international organizations

Mr. A.J. Lee represented SCOR at the meeting of the ICNAF Research and Statistics Committee in Boston, 29 May - 2 June 1967.

Because of the unfortunate conflict of the SCOR Executive Meeting with the 55th Statutory Meeting of ICES it was not possible for a member of the Executive to attend that meeting. Dr. J.H. Fraser served as SCOR observer, particularly with reference to the Plankton Committee.

SCOR was represented at the Ninth International Hydrographic Conference by Captain Capurro.

6.0 Other business

6.1 Publication of Variability Symposium

As recommended at the last Executive Meeting, arrangements are being made to publish the papers of this symposium in "Progress in Oceanography", an annual publication of the Pergamon Press. The Italian Research Council has agreed to subsidize the publication by assuring purchase of 175 copies for their own uses and for distribution to SCOR members and national committees. Professor Stewart reported that editing of the papers had been slower than anticipated, in part because of Professor Braarud's illness, that most manuscripts were now in the editor's hands, that the last paper would be sent in a week or so, and that the earliest date of publication would be in February 1968.

6.2 International Directory of Oceanographers

At the last Executive Meeting, it was agreed that publication of such a directory could most effectively be undertaken by UNESCO, that SCOR and ACMRR should advise on criteria for inclusion and on mechanisms for assembling the required information, and that the matter should be explored in correspondence among the secretariats of SCOR, UNESCO and FAO. This correspondence has indicated that the directory is considered useful, that national lists can best be prepared by SCOR National Committees or equivalent bodies, that an editorial board should be established, and that UNESCO should handle the details of publication. It is essential to establish relatively simple and objective criteria for inclusion. Information on specialization of each individual should be included.

The Executive Committee had the following comments and recommendations on preparation and publication of the Directory:

1. Purpose of directory - the principal purpose is to provide a reference list of scientists involved in oceanographic work. Secondary purposes include the indication of oceanographic activity in various specialties and countries, and the provision of addresses of laboratory directors and holders of office in international organizations.
2. Criteria for inclusion - listed scientists should have their principal interest in some field of marine science and should have published scientific papers in this field during the last several years. Laboratories and international organizations, whose directors or officers are listed, should be devoted primarily to some aspect of marine science.
3. Sources of names - appropriate national bodies should furnish lists of names based on the above criteria, together with a brief characterization of each person's interests. It was agreed that SCOR might solicit its national committees and obtain names from other countries outside the UN system, while UNESCO and FAO might cooperate in soliciting the other countries. In some cases SCOR committees are not closely associated with fishery scientists of the country; these committees should make a special effort to include such scientists in their lists.
4. Assembly and editing of directory - if the soliciting of lists of names were divided between SCOR, UNESCO and FAO as proposed above, some central group would need to assemble and edit the accumulated material. This responsibility should be assumed by the agency (or agencies) responsible for publication, perhaps with the advisory services of SCOR and ACMRR.
5. Publication - ideally this should be a joint venture of UNESCO and FAO. If such joint action is not practicable, UNESCO should take the responsibility.

Dr. Ruivo suggested that the Directory should be of "marine scientists" or of "experts in marine science" rather than "oceanographers" to avoid misunderstanding about its coverage.

6.3 Organization of the Ninth General Meeting

An invitation has been accepted from the U.S. National Academy of Sciences to hold the Ninth General SCOR Meeting at the Scripps Institution of Oceanography, La Jolla, 17-21 June 1968. It is proposed that a business meeting be held on 17 June, and that the period 18-20 June be devoted to a Symposium on Scientific Exploration of the South Pacific. On 21 June it will undoubtedly be necessary for the Executive Committee to meet.

The U.S. National Committee has appointed a Program Committee which has developed a proposal for organization of the symposium and the selection of speakers. Possibilities for publication of a symposium volume are being investigated. The Executive Committee endorsed the proposals of the U.S. Committee and encouraged them to proceed with organizations of the symposium.

In view of the statutory provisions for membership, the Secretary was instructed to communicate with each National Committee requesting them to renominate national members prior to the meeting. It was also noted that election of officers would take place and that several members of the present Executive Committee were ineligible for reelection.

6.4 Treatise on Oceanographic Instruments

In correspondence Professor Aliverti had pointed out the serious need for a comprehensive and critical treatise on oceanographic instruments. "The book should present an exhaustive discussion of the principles on which the instruments are based, describe them, point out their limits, their most important scientific and technical characteristics, eventually should point out their deficiencies."

The Executive Committee agreed that such a treatise is needed, for oceanographers in general and particularly for teaching and in countries with few experienced oceanographers. The text should emphasize principles of measurement of various parameters; useful detailed descriptions of instruments may be difficult because of the rapid obsolescence of instruments. It is also difficult to obtain objective and critical information on the performance of various commercial instruments. The Executive Committee hoped that an author for such a treatise could be found, possibly through the assistance of a National Committee.

It was also noted that a compilation of national institutions and facilities for testing and calibration of oceanographic instruments would be useful for scientists in developing countries requiring assistance in such operations. Preparation of such a list would seem an appropriate task for the UNESCO Office of Oceanography, with publication in "International Marine Science".

At the conclusion of the meeting, Captain Capurro expressed his gratitude and that of the other participants for the generous hospitality of the Deutsche Akademie der Wissenschaften zu Berlin, and the Institut für Meereskunde, Warnemünde, and particularly to the Director of the Institut and Member of SCOR, Dr. Klaus Voigt.

ANNEX I

SCOR EXECUTIVE MEETING
Warnemünde, 11 - 13 October 1967

List of the Participants

MEMBERS OF THE EXECUTIVE COMMITTEE

Captain Luis R.A. Capurro	(Argentina)	President
Dr. George F. Humphrey	(Australia)	Retiring President
Professor Warren S. Wooster	(U S A)	Secretary

OTHER MEMBERS OF SCOR

Professor G. Aliverti (Italy)	Professor S. Szymborski (Poland)
Professor H. Postma (ICSU)	Dr. K. Voigt (Germany, GDR)
Professor R.W. Stewart (Canada)	

REPRESENTATIVES OF INTERNATIONAL BODIES

Dr. K.N. Fedorov (UNESCO/IOC)
Dr. M. Ruivo (FAO/ACMRR)

OTHER PARTICIPANTS

Dr. A. Aksenov (USSR)	Professor E. Seibold (Germany, FRG)
Professor E. Bruns (Germany, GDR)	Dr. R. Schemainda (Germany, GDR)
Mr. G.E. Hemmen (UK)	Vice Admiral Ying Srihong (Thailand)

ANNEX II

ESTIMATE OF SCOR FINANCES, CALENDAR 1967
(through 31 October 1967)

BALANCE as of 1 January 1967

In Rome	\$ 12,103.03 *
In La Jolla	6,999.04
	<hr/>
	\$ 19,102.07

* of which \$633 are in Indian Rupees

INCOME

UNESCO Contracts	\$ 12,500.00
ICSU Subvention	4,000.00
National Contributions	11,410.73
Sale of Publications	1.00
	<hr/>
	\$ 27,911.73

EXPENDITURES

Publications	\$ 1,617.06
Office Expenses	2,084.31
Representation, Other Organizations	1,449.71
Executive Expenses	6,947.58
WG Expenses	12,901.46
IAPO WG Deep Sea Tides	2,500.30
	<hr/>
	\$ 27,500.42

BALANCE as of 31 October 1967

In Rome	\$ 4,833.38 *
In La Jolla	14,680.00 **
	<hr/>
	\$ 19,513.38

* of which \$1,132.38 are in Indian Rupees

** \$10,000.00 in savings account at 5% per year

SCOR WORKING GROUPS
MEMBERSHIP AND TERMS OF REFERENCE

WG 10. Oceanographic Tables and Standards (with ICES, IAPSO and UNESCO).

Terms of Reference: To carry out all the necessary preparatory work for publishing new oceanographic tables; to advise on the certification of the standard sea water; to advise on such further investigations as may be desirable.

Members: nominated by ICES: F. Herman, Denmark (Chairman); O. Saelen, Norway. nominated by UNESCO: G.N. Ivanoff-Frantskevich, USSR; M. Menaché, France. nominated by IAPSO: N.P. Fofonoff, USA; W. Kroebel, FRG. nominated by SCOR: F. Fisher, USA; G. Grasshoff, FRG.

WG 15. Photosynthetic Radiant Energy (with UNESCO and IAPSO).

Terms of Reference: To identify exactly what measurement of irradiance is required by biological oceanographers; to recommend apparatus and procedures for measuring the variable defined above.

Members: nominated by IAPSO: J. Tyler, USA (Chairman); N. Jerlov, Denmark. nominated by UNESCO: A.A. Ivanoff, France; Y.E. Ochakovsky, USSR; J. Steele, UK. nominated by SCOR: H.R. Jitts, Australia; Y. Saijo, Japan; E. Steemann Nielsen, Denmark: ex-officio: T.R. Parsons, Canada (Chairman, WG 24).

WG 19. Micropaleontology of Bottom Sediments

Terms of Reference: To prepare a symposium on marine micropaleontology; to consider comments submitted on activities of the working group; to recommend further action in this field.

Members: E. Seibold, FRG (Chairman); G. Deflandre, France; B.M. Funnell, UK; T. Kanaya, Japan; W.R. Riedel, USA; A. Zhuze, USSR.

WG 21. Continuous Current Velocity Measurements (with IAPSO and UNESCO)

Terms of Reference: To design, and propose means of carrying out, and intercomparison at sea of the principal current measuring systems now employed for the continuous recording of current velocity on moored stations.

Members: nominated by SCOR: J.C. Swallow, UK (Chairman); K.A. Chekotillo, USSR. nominated by IAPSO: T. Kvinge, Norway; G. Siedler, FRG. nominated by UNESCO: N.P. Fofonoff, USA; B. Shekhvatov, USSR.

WG 23. Zooplankton Laboratory Methods (with UNESCO)

Terms of Reference: To suggest methods for preserving zooplankton samples for taxonomic study and for biomass determination.

Members: nominated by SCOR: V. Hansen, Denmark (Chairman); J. Beers,

USA; H. Flugel, FRG; E. Paasche, Norway (Consultant); H.F. Steedman, UK. nominated by UNESCO: B. Kimor, Israel; T. Tokioka, Japan; M. Vinogradov, USSR.

WG 24. Estimation of Primary Production under Special Conditions (with IBP/PM)

Terms of Reference: To review and suggest the best methods for estimating primary production under special conditions, such as those found beneath the polar ice, and the turbid conditions found in estuaries, heavily polluted waters and exceptionally eutrophic or oligotrophic waters.

Members: nominated by SCOR: T.R. Parsons, Canada (Chairman); S. Ichimura, Japan; O. Koblenz-Mishke, USSR. nominated by IBP/PM: S.Z. Qasim, India; P.D.V. Savage, UK

WG 25. Nutrient Chemistry

Terms of Reference: To advise SCOR on the most effective steps it could take to stimulate effective activity in the standardization and/or intercomparison of nutrient analyses, including the practicability of designating reference methods.

Members: N.W. Rakestraw, USA (Chairman); A.N. Bogoyavlensky, USSR; K. Sugawara, Japan.

WG 26. Implementation of UN Resolution on Resources of the Sea (with ACMRR and WMO/AC)

Terms of Reference: To advise the IOC and the executive heads of FAO and WMO on the scientific aspects of implementation of UN Resolution 2172 (XXI); to consider the following points: (a) identification of problems in marine science and technology that require some form of international cooperation for their effective investigation and for the effective application of their results; (b) examination of the forms of cooperation required and of their impact on the scientists and institutions concerned; (c) examination of the manner in which existing international organizations deal with the problems and forms of cooperation referred to above.

Members: nominated by SCOR: A.J. Lee, UK (Chairman); L.R.A. Capurro, Argentina; V.G. Kort, USSR; R. Revelle, USA; H.U. Roll, FRG; K. Yoshida, Japan. nominated by ACMRR: A.S. Bogdanov, USSR; W.M. Chapman, USA; B. Diop, Senegal; M. Fontaine, France; C.E. Lucas, UK; N.K. Panikkar, India. nominated by WMO/AC: V.A. Bugaev, USSR; G. Cressman, USA; C.H.B. Priestley, Australia.

WG 27. Deep Sea Tides (with IAPSO and UNESCO)

Terms of Reference: To encourage and assist with the design of instruments for measuring tides on the continental shelf and in the deep sea; to establish criteria concerning precision, sampling times and related considerations; to coordinate the observational programs and ultimately to bring about some uniform analyses of the deep sea data.

Members: nominated by IAPSO: W.H. Munk, USA (Chairman); L.R.A. Capurro, Argentina; G.C. Dohler, Canada. nominated by SCOR: D. Cartwright, UK; J.R. Radok, Australia; T. Teramoto, Japan. nominated by UNESCO: W. Hansen, FRG; M. Eyries, France; S.S. Voit, USSR; W. Horn, FRG.

WG 28. Ocean-Atmosphere Interaction (with IAMAP and IAPSO)

Terms of reference and membership being determined.

REPORT OF THE WORKING GROUP 19 SYMPOSIUM
"MICROPALAEONTOLOGY OF MARINE BOTTOM SEDIMENTS"
CAMBRIDGE, 10-18 SEPTEMBER 1967

The Symposium was held at the Department of Geology, Downing Street, Cambridge. Out of about 125 invited colleagues actively working in this field, some 75 were able to come.

The principal aims of the Symposium were:

1. to improve contact between these micropaleontologists,
2. to discuss new methods e.g. statistics, isotopic approaches, paleomagnetic stratigraphy, scanning electron-microscopy, etc., and new results,
3. to improve systematics, and deep sea stratigraphy, and
4. to make possible exchange of specimens, demonstrations under the microscope, etc.

Altogether 46 hours were spent on lectures by invited specialists and short reports about "New Advances", 12 to 20 hours on Group Discussions and Demonstrations. Informal discussions about methods and some results from USA- and USSR-samples (exchanged and distributed at the Second International Oceanographic Congress, Moscow 1966) were also carried on. Further exchange of micropaleontological material was organized. Accommodating the participants in Harvey Court and bringing them together during meals in Gonville and Caius College Hall, greatly facilitated personal contacts. About 25 microscopes and laboratory facilities were very useful for demonstrations. The lecture hall with projection facilities and the multitone system for simultaneous translations English/Russian and vice versa were technically perfect. The interpreters Helena Kotrchova, Irene Zaiontchec and Alexandre Andreyev did very well in this very specialized field.

Cambridge University Press is prepared to publish the proceedings of the Symposium, ie. the given lectures and manuscripts on which discussions were based. The volume (s) will have some 750 printed pages (illustrations included).

The members of Working Group 19 therefore think that the Symposium was totally successful and wish to express their gratitude to SCOR along with Dr. Wooster, to UNESCO along with Dr. Fedorov and Dr. Hurley - the latter was also able to attend -, to the Royal Society of London and BP London for financing the Multitone system, as well as to the Department of Geology, Cambridge University with Dr. Funnell and his assistants for their effective arrangements.

Working Group 19 regards its functions as having been discharged, with the exception of its responsibility to edit the Symposium Volume, and recommends:

1. that SCOR should consider the possibility of organizing a Second Symposium in the same field before the end of five years.
2. that SCOR should facilitate international collaboration in the study of Quaternary sequences of microfossils in the oceans by recommending to national committees that they

establish post-doctoral fellowships (tenable in their own or another country), for the study of a particular microfossil group in selected cores from the Atlantic, Pacific and Indian Oceans. The best basis for such a study would probably be meridional series of cores, as proposed, for example, by the Soviet Project "M e r i d i a n". For initial study it is envisaged that conventional cores would be provided by one or more institutions. At least part of these investigations by post-doctoral fellows should be carried out at these institutions in collaboration with others.

Recognizing the significance of microfossil studies for deciphering the pre-Quaternary history of the oceans, Working Group 19 also recommends:

3. that SCOR request IUGS to assist in working out an improved general biostratigraphic zonation of the Cretaceous and Cenozoic as a basis for correlation in marine geology.

Small specialist groups should meet to exchange views and research material and, if necessary, carry out joint field and laboratory research with the purpose of,

a. Clarification of zone boundaries and sequences, and

b. Isotopic dating and the application of paleomagnetic data to biostratigraphically zoned sequences of strata.

4. that each oceanographic institution with substantial collections of pre-Quaternary sediments from the sea floor should deposit several large samples (containing both calcareous and siliceous microfossils) of various ages in a few major museums (e.g. British Museum of Natural History, U.S. National Museum and a Museum in the USSR).

Portions of these samples should be distributed to qualified research workers on request, in order to correlate zonations of different types of microfossils.

Professor Dr. Eugen Seibold
Chairman, Working Group 19
Kiel, 29 September 1967

REPORT OF SCOR WORKING GROUP 21
ON
CONTINUOUS VELOCITY MEASUREMENTS

Terms of Reference:

To design, and propose means of carrying out, an intercomparison at sea of the principal current measuring systems now employed for the continuous recording of current velocity on moored stations.

Sponsorship:

Jointly by SCOR, UNESCO and IAPO.

Members:

K.A. Chekotillo (USSR)	nominated by	SCOR
N.P. Fofonoff (USA)		UNESCO
T. Kvinge (NORWAY)		IAPO
B. Shekhvatov (USSR)		UNESCO
G. Siedler (FRG)		IAPO
J.C. Swallow (UK)		SCOR (Chairman)

Summary of activities:

The Group has met twice this year, but before the first meeting it had been agreed by correspondence that the most effective way of meeting the terms of reference was, first, to attempt a modest intercomparison experiment within the framework of the Woods Hole buoy program. Consequently, the main purpose of the first meeting of the Group, held at the National Institute of Oceanography, Wormley, Godalming, on 18 April 1967, was to plan such a comparison in detail.

The minutes of that meeting (attached as ATTACHMENT I) may be summarized briefly as follows. All members were present, and agreed that for this first attempt at an intercomparison only the following types of current meters should be used: Alekseev (to be provided by Chekotillo and Shekhvatov), Bergen (Kvinge), Geodyne (Fofonoff), Plessey (Swallow) and Teifenstromeier (Siedler). It was proposed that two Geodyne meters and one of each of the other types should be put closely spaced near 500 m depth in each of three moorings, to be laid a few miles apart near WHOI site "D" (39° 20'N, 70° W), and left in place with the meters running at their maximum sampling rate for 5 days. The moorings could then be laid for a second 5-day period, with the option of some rearrangement of meter positions.

In the second meeting, at the Woods Hole Oceanographic Institution and at sea in the R.V. "Gosnold", during July 1967, this intercomparison experiment was carried out. It is too early for a full report to be written, but an account in the form of a cruise report is attached as ATTACHMENT II, and the main features are outlined here. It was unfortunate that K.A. Chekotillo and B. Shekhvatov were unable to attend, and no Alekseev meters could be included in the intercomparison. The rest of the Group met as arranged at Woods Hole on 6 July, and, after re-calibrations in the towing tank sailed in the "Gosnold" for Station "D". Three moorings were laid on 16-17 July and recovered on 24 July.

On returning to Woods Hole, the records were rapidly processed and it was possible to compare some of the results before the Group dispersed on 2 August.

Conclusions:

The terms of reference have been met in the sense that an intercomparison experiment was designed, and the means proposed (and employed) for carrying it out were adequate to produce some data suitable for further analysis. The aim of the experiment was, of course, to obtain records from a variety of current meters, placed in the sea in a situation where they might be expected to behave similarly, and to see to what extent any differences in the results could be accounted for by the known characteristics of the instruments. Any further variations might then be interpreted either as unexpected differences in response of the meters or as real differences of current. First, though, the moorings have to be laid, the current meters have to work properly, and then they have to be recovered. With some good luck the first and last of these three basic requirements were met, but more than half of the current meters developed faults of varying degrees of seriousness during only a week's run. The first conclusion from our intercomparison experiment is, that more attention should be paid to designing for reliability in routine production of current meters. Fortunately at least one of each kind of instrument gave some useable output, and a rough preliminary comparison showed an encouraging similarity in the results.

Proposals:

More detailed comparison must await further processing of the data, and it seems desirable that the Working Group should meet again when this has been done, in a few month's time.

The Working Group recognizes that this intercomparison was a very limited one, both in duration and in numbers and variety of current meters used. Further comparisons are needed. We should like to hear from anyone who has made similar experiments or is planning to do so in the future.

Acknowledgements:

The Group wishes to express its gratitude to its sponsoring bodies, for providing funds for travelling and subsistence and, to some extent, for transport of equipment. At the same time, we are even more indebted to the Woods Hole Oceanographic Institution and the U.S. Office of Naval Research for their support of the actual intercomparison experiment itself. We wish to acknowledge the indispensable help of Captain H. Seibert and the crew of the R.V. "Gosnold", and of James Gifford and Clayton Collins of the Woods Hole buoy group, who did most of the work of laying and recovering the moorings. We are grateful also to Ferris Webster and John Maltais for their capable handling of data from the current meters and for their continuing contributions to its analysis.

ANNEX V
ATTACHMENT I

Minutes of Meeting of SCOR Working Group 21, on Continuous Velocity Measurements
18 April 1967

SCOR Working Group 21 held its first meeting on 18 April 1967 at the National Institute of Oceanography, Wormley, Godalming, Surrey, U.K. All the members of the Group were able to attend. Informal discussions took place on the preceding and following days.

1. The chairman recapitulated what had already been agreed by correspondence, i.e. that we should in fact try to make an intercomparison experiment, since this appeared to be the most practical way of meeting our terms of reference. It was already agreed that this might best be done within the framework of the Woods Hole buoy program, and Dr. Fofonoff has tentatively assigned two weeks of ship time in the "Gosnold" to this purpose. The main task before the meeting was, to agree on a plan for this experiment, and also to consider in what ways a more ideal intercomparison might be made.

2. It was noted that certain limitations are imposed by choice of area (Station "D", $39^{\circ} 20'N$, $70^{\circ} W$) and choice of ship. For example, the "Gosnold" can carry a maximum of 4 moorings, and cannot handle loads exceeding 2 tons. Choice of area is limited by time available and ship's speed, but Station "D" has the advantage that other moorings are laid there. The choice of depth at which to put the current meters is limited, not only by the nature of the vertical distribution of current, but also by the strength of the pressure cases of the instruments. At shallow depths, where currents are relatively strong, giving a good signal to be measured, the shear may be so large that comparison of even closely spaced current meters could be difficult. Dr. Fofonoff showed an example of differences of current of as much as 50 cm/sec, in 2 meters vertical separation, at a depth of about 100 meters at Station "D". The shear may be expected to be much less at greater depths, but the current itself will be less and may sometimes be below the threshold of the current meters.

3. Bearing in mind the existing plans and limitations outlined above, more detailed plans were discussed and the following conclusions were reached:

4. It was agreed that only the following types of current meter should be used in this summer's experiments:

Alekseev	(Chekotillo, Shekhvatov)
Bergen	(Kvinge)
Geodyne	(Fofonoff)
Plessey	(Swallow)
Tiefenstrommesser	(Siedler)

The group was of the opinion that only well-tried types of instruments, familiar to at least one member of the group, should be used. There is still some doubt about the suitability of the Plessey meter in this respect, but it has some features (propeller instead of Savonius rotor, and bracket mounting) that make it attractive for use as a comparison meter.

5. It was agreed that three meters of each type would be a practical number to use in the comparison experiment, and that three moorings would be needed.

6. The manner in which the current meters should be arranged in the moorings was discussed. In correspondence, it had been proposed that frames should be constructed that would enable three or four meters to be suspended at the same depth in the moorings. Although such arrangements would help to avoid the difficulty due to strong vertical shear, the idea was reluctantly abandoned for the following reasons: such a frame would be difficult to handle from the "Gosnold", it might induce extraneous oscillations not normally present in the mooring, and there could be masking of one current meter by another. It was decided that the only practical

way to arrange the meters would be in closely spaced vertical arrays, putting Geodyne meters (which will be available more plentifully than the other kinds) at the top and bottom of each array.

7. Choice of depth for the vertical arrays of current meters was discussed. A region of small shear is desirable and Dr. Fofonoff undertook to obtain STD profiles at Station "D" to help in this choice. A depth of 500 meters was provisionally suggested, and Drs. Chekotillo and Shekhvatov agreed that it would be desirable to use three of the deep version of the Alekseev meter, despite the extra weight involved. Bearing in mind the possibility of currents being sometimes too weak at 500 meters depth, an alternative arrangement was proposed in which two arrays of four meters each were used in each mooring, one array at 200 meters and one at 500 meters. The final choice of depth was left open, since the mooring wire can be made up suitably at a day's notice.

8. With three of the five types of meter being mounted on brackets instead of in line with the mooring wire, and with the likelihood of long vertical arrays of 6 meters having to be handled, a majority of the group were in favour of laying the moorings anchor-first. The usual practice in the "Gosnold" is to lay moorings anchor-last, but Dr. Fofonoff agreed that the anchor-first method might be practicable and that it should be given further consideration and trial.

9. On the question of using surface or subsurface floats, it was agreed that both types should be tried since both are in common use. It is useful to have at least one surface float as a radar mark for the ship. A spacing of 2 miles between moorings was considered to be the minimum advisable at Station "D" (water depth 2600 meters).

10. The number and duration of moorings was considered, and it was agreed that three moorings should be laid, recovered after 5 days, then laid again for another 5 day period. All meters should be run at their highest sampling rates consistent with a recording duration of 5 days. Mr. Kvinge had doubts about the significance of individual 5-minute readings of speed with the Bergen meter, since a change of 1 bit in the coded rotor count in 5 minutes corresponds to several cm/sec, but he agreed to consider the possibility of using a smaller gear ratio in the rotor gear box, which would help to improve the situation.

11. The group discussed the calibration of the current meters in the two tanks at Woods Hole. It was agreed that members should calibrate their meters beforehand so that only a few steady runs would be necessary on each at Woods Hole for checking calibrations. Dynamic tests should be made on one of each type of speed sensor and compass, perhaps by photographing the sensors with a cine-camera attached to the towing carriage. The group was of the opinion that one week would be needed at Woods Hole, before going to sea, for adjusting and calibrating the current meters.

12. To ensure that the current meters being brought to Woods Hole can be incorporated conveniently into the W.H.O.I. moorings, members agreed to supply Dr. Fofonoff with drawings of the meters showing the methods of attachment provided, and materials used, as well as overall dimensions of current meters. Dr. Fofonoff agreed to have brackets made at WHOI for the Alekseev current meters, on receiving a drawing of a suitable bracket from Dr. Shekhvatov.

It was noted that the breaking strain of the tie rods or brackets of the current meters, which are inserted in the mooring line, should be not less than 7000 lbs. (3300 kg).

13. It was agreed that rapid processing and evaluation of the records obtained was most important, and that the group should plan to spend one week at Woods Hole after the cruise in analysing the results. Dr. Chekotillo and Dr. Shekhvatov estimated that the Alekseev records could be read by eye in two or three days. The records from the Bergen and Plessey meters will need to be machine-read, and may have to be sent across the Atlantic. Mr. Kvinge and

Dr. Swallow agreed to supply samples of the data format from these types of records to Dr. Fofonoff. Dr. Siedler thought that it should be possible to develop and read the Tiefenstrommesser records quickly at Woods Hole.

14. The four weeks, 5 July to 2 August, were proposed as a suitable time for the experiment, using the "Gosnold" from 12 to 26 July. These dates are only tentative since the ship's program has to be arranged with other users in mind.

15. Transportation of current meters to Woods Hole presents some problems. The heavy parts will have to be sent by sea but the delicate parts of the recorders must be carried by air. Approximately 800 kg of equipment will have to be shipped across the Atlantic and back. This will cost something like \$800 for the sea passage alone. The Alekseev meters will have to be sent first to Bergen or Hamburg for onward shipment to Woods Hole. There will be no time to spare for delays in customs.

16. In order to carry out the planned intercomparison experiment, the Working Group asks for the following support from SCOR, UNESCO and/or IAPSO: (a) air travel for Dr. Chekotillo, Mr. Kvinge, Dr. Shekhvatov and Dr. Swallow to Woods Hole and back (Drs. Fofonoff and Siedler will be there already); (b) subsistence for two weeks ashore for the four persons first named above; (c) cost of shipping equipment from Europe to U.S.A. and back (rough estimate only); (d) any help that UNESCO can give in explaining the importing and exporting of these current meters to the U.S. customs.

17. The group agreed that a further meeting will be needed, after the data has been processed and examined, a few months after the Woods Hole meeting.

18. In considering how an intercomparison experiment might be done better, the group agreed that, in the present state of development of the use of moorings, a more extensive program of comparison would seem to be too ambitious, and that the present somewhat modest proposal was within the capability of all concerned and had reasonable hopes of yielding useful results. The members of this group hope that other comparisons between closely spaced current meters, either of the same or different types, will be made independently by any laboratories engaged in moored buoy work.

19. On the question of the form in which raw current meter data should be exchanged, the group were inclined to think that instrument development was proceeding too rapidly at present for any rigid scheme to be laid down, though clearly such voluminous data must be exchanged in a form suitable for automatic processing. With any time series such as current measurements, it is most useful to assign a time to each sample, for identification, even if the time usually has to be interpolated.

For most purposes, however, the data can be distributed in a much condensed form, e.g. power spectra, trajectories, and mean values, as has been done in the compilations made by Webster and Fofonoff (WHOI unpublished reports 65-44 and 66-60), for example.

20. The group did not have any very firm recommendation to make in answer to Professor Munk's inquiry about near-bottom current meters, but were inclined to think that, initially, any of the existing self-recording current meters could be tried in a buoyant mooring above the bottom pressure gauge, rather than undertaking the development of another type of current meter that could use the same data logger as the tide gauge. It is not obvious that the near-bottom currents will be extremely slow, especially if readings above the boundary layer are needed, and a conventional existing meter may be sufficient in many cases.

K.A. Chekotillo
N.P. Fofonoff
T. Kvinge
B. Shekhvatov
G. Siedler
J.C. Swallow

ANNEX V
ATTACHMENT II

Report on Meeting of SCOR Working Group 21, on Continuous Velocity Measurements
6 July - 1 August 1967

Introduction:

The second meeting of SCOR Working Group 21 took place, partly at the Woods Hole Oceanographic Institution and partly at sea in the R.V. "Gosnold", during the period 6 July - 1 August 1967. The following members were present; N.P. Fofonoff, T. Kvinge, G. Siedler, J.C. Swallow. Unfortunately K.A. Chekotillo and B. Shekhvatov were not able to attend.

Our aim in this second meeting was to make an intercomparison of current meters, by calibrating them in a tow tank and by putting them out in closely spaced moorings, as proposed in the minutes of the first meeting of the Group, and to see to what extent the differences between the various current meter records could be explained in terms of the response characteristics of the instruments themselves.

Three of each of the following types of current meters were available:

Geodyne	(tape recording)	(Fofonoff)
Geodyne	(film recording)	
Bergen		(Kvinge)
Tiefenstrommesser (TSM)		(Siedler)
Plessey		(Swallow)

Calibration:

The most striking differences between the types of meters available are in the following features:

- (a) sampling rate (every 5 sec. for Geodyne, 5 min. for others) and related differences in rate of response of speed and direction sensors.
- (b) method of suspension, related to type of speed sensor (bracket mounting for Plessey and TSM, using propellers; in line with mooring for Geodyne and Bergen, using Savonius rotors).
- (c) threshold speeds (ranging from 2 cm/sec for Geodyne to 3-5 cm/sec for Plessey) and nonlinearity of the relationship between speed and rate of rotation of speed sensor.

Previous observations with Geodyne meters at the proposed site showed that the energy of horizontal motions with periods shorter than 5 minutes would probably be too small to contribute a serious amount of noise in the records from the meters sampling at 5 minute intervals, even if the extra filtering action of their direction sensors compared to the Geodyne vane was ignored. It seemed likely therefore that item (c) above would be a more important source of differences in the results than (a) and (b), and most of the towing tank trials were aimed at determining the shape of the speed calibration curve and threshold speeds for each type of meter. The Bergen, Plessey and TSM instruments were calibrated, at about a dozen speeds in the range 2-35 cm/sec, though the size of the TSM compared to the cross-section of the tank made the absolute value of its calibration doubtful. Some crude visual measurements were made, with each meter, of the acceleration of the speed sensor when released from rest while being towed at various steady speeds. Calibration runs were made on this occasion on only one Geodyne rotor, since this sensor had already been studied in great detail (Fofonoff and

Ercan 1967). Check calibrations were made on one Bergen and one Plessey meter, after the moorings had been recovered and the instruments had been in the sea for approximately one week.

In converting the recorded rotation of a speed sensor into current, a simple linear relationship (not necessarily through the origin) is usually adopted, characteristic of a particular type of current meter. Departures from linearity occur mainly at speeds below 10 cm/sec, and fortunately speeds in this range were encountered during most of the intercomparison period. Variations of individual meters, from the mean for that type, were of the order of 1 cm/sec. Fuller details of the calibrations will be given in a later report.

Narrative of cruise:

The "Gosnold" left Woods Hole p.m. 13 July and reached site "D" the next day. With two kinds of current meters being bracket-mounted, and with the hope of getting the moorings more closely spaced, it was proposed to lay the moorings anchor-first. This had not been done before with the equipment available, and it was soon evident that the drums of pre-cut mooring wire would have to be re-spooled more tightly before they could be used. This took about 12 hours, and then an attempt was made to lay the first mooring, on 15 July.

The 680 kg. Stimson anchor, having considerable drag when rigged normally, caused excessive fluctuation of tension in the wire while lowering, in only a moderate swell, and before long the wire broke, causing the loss of an acoustic release but fortunately nothing more. Subsequent anchors were rigged with their narrowest side downwards, to minimize drag, and on 16 July the first two moorings were laid successfully. There was no difficulty in handling the various current meters closely spaced in the moorings, in fact the 2 m nylon spacers, put in below the bracket-mounted meters, could have been shortened to only 1 m without inconvenience. The only untoward incident was the breaking of a nylon tag line which could have caused the loss of 5 current meters, but luckily a stopper had been hooked on in time, and it held. The third mooring was laid without incident on 17 July. The positions and general arrangement of moorings and current meters are shown in Figs. 1-3. More gasoline had been used than had been expected, in driving the winch for re-spooling the wire, and the "Gosnold" returned to Woods Hole for more supplies. On returning to site "D" a.m. 20 July, the moorings were found in their expected positions, approximately in a right-angled triangle with short sides 1.5 and 2.2 km. During the next four days, several observations were made with a lowered sensing digitizer (LSD) through the depth range occupied by the current meters. The LSD records temperature, conductivity, pressure and relative current at 2 second intervals in digital form. Water samples were taken during some lowerings. Positions are shown in Fig. 1. Fixes were made on the acoustic beacons, and on beacons belonging to other moorings in the area, and the depths of the three subsurface floats were determined by echo-sounding. From the latter, the actual depths of the current meters in each mooring have been inferred. They are listed in Table I below.

TABLE I
Corrected Depths on SCOR - 21 Moorings

Moorings Number	1	2	3
Geodyne (Tape)	477 m	492	500
Bergen	478	493	501
Plessey	481	496	504
TSM	485	500	508
Geodyne (Film)	488	503	511
Bottom	2589	2594	2591

All three moorings were recovered on 24th July, the first two without incident. The acoustic release of the third one did not fire when triggered, but the timed release worked as planned. There were no difficulties in handling the current meters from the "Gosnold". It was an advantage being so close to the water (about 1 m) with the closely spaced current meters.

None of the instruments showed any obvious external signs of corrosion or fouling. Some corrosion had however occurred on galvanized fittings in the neighborhood of the stainless steel parts of the Bergen and Plessey meters, despite precautions taken to insulate them. Two of the Plessey current meters had leaked slightly, about 5 cm³ of water in each.

The "Gosnold" arrived back in Woods Hole P.M. 25th July.

Data Processing:

A special effort was made to get the records processed quickly. The tapes and films from the Geodyne meters were read by the Geodyne Company and returned to Woods Hole. The films from the TSM's were developed at Woods Hole and read by eye, cards being punched for each 5-minute reading. The tapes from the Gergen and Plessey meters were sent to Bergen and London respectively for reading, and output lists were returned to Woods Hole by 31 July. Cards were then punched from these lists.

Not all the current meters had worked satisfactorily. A first impression of the quality of the records is tabulated below:

TABLE II
Quality of Records (as of 1st August 1967)

Moorings No:	1	2	3
Geodyne (tape)	Short tape	Good	Stuck Compass?
Bergen	Good	Good	Good
Plessey	No data	Mainly good	Fragmentary data
TSM	Good	No speeds	No speeds
Geodyne (film)	Weak film	Weak film	Weak film

It is expected that useful data may be extracted from some of the imperfect records. The Geodyne film records, which gave excessively scattered results when machine-read, can be read at 5-minute intervals by eye. The TSM's with no speed output have produced useable direction records. The records from the two Plessey meters that had leaked slightly (on moorings 1 and 3) were very weak, and it seems possible that they may have been partially demagnetized by leakage currents through the recording head while the tapes were being rewound, but parts of the record from No. 3 may be useable.

By 1st August it was possible to make rough visual comparisons of some preliminary analyses of the data from at least one of each kind of current meter. Progressive vector diagrams had been plotted showing the cumulative movement of water past the current meters, which were encouragingly similar both in overall displacement and in smaller detail. Histograms were plotted, of the speeds and directions recorded in each 2 hour period by one of each type of current meter, to provide another compact presentation of the data for comparison. Convenient means of making these and other analyses of current meter data have been developed at Woods Hole (e.g. Webster and Fofonoff 1965, 1966).

What needs to be done now is, first, checking and editing of the data. Subsequent analysis to allow intercomparison may include, besides the methods mentioned above, compu-

tation of shear between data from different meters (to locate systematic deviations), comparison of vector average and arithmetical average speeds (to reveal systematic differences due to varying fluctuations of recorded direction), comparison of spectra (may reveal instrumental differences in frequency response).

There is also the possibility of comparing these data with the records from two long-term moorings, at site "D" throughout the intercomparison period. It seems likely that, after this further analysis of the data has been made and circulated to members of the Working Group, a third meeting may be necessary for discussion before a full report can be written.

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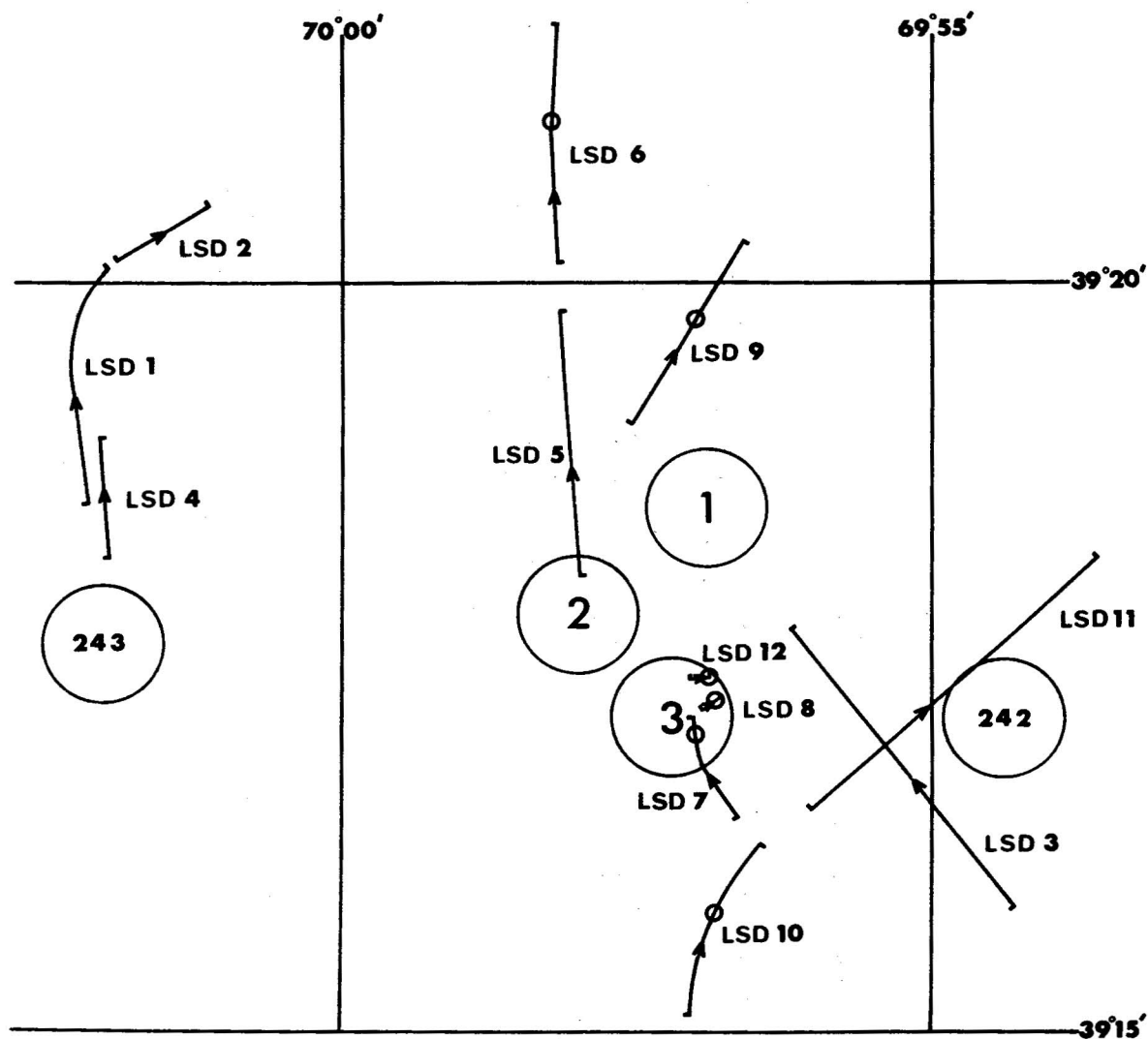


Figure 1.

W.H.O.I. Site "D" July 1967

1, 2, 3: SCOR-21 moorings

242, 243: existing moorings

→○←: LSD lowerings. Arrow shows direction of drift. Circle shows where water samples were taken.

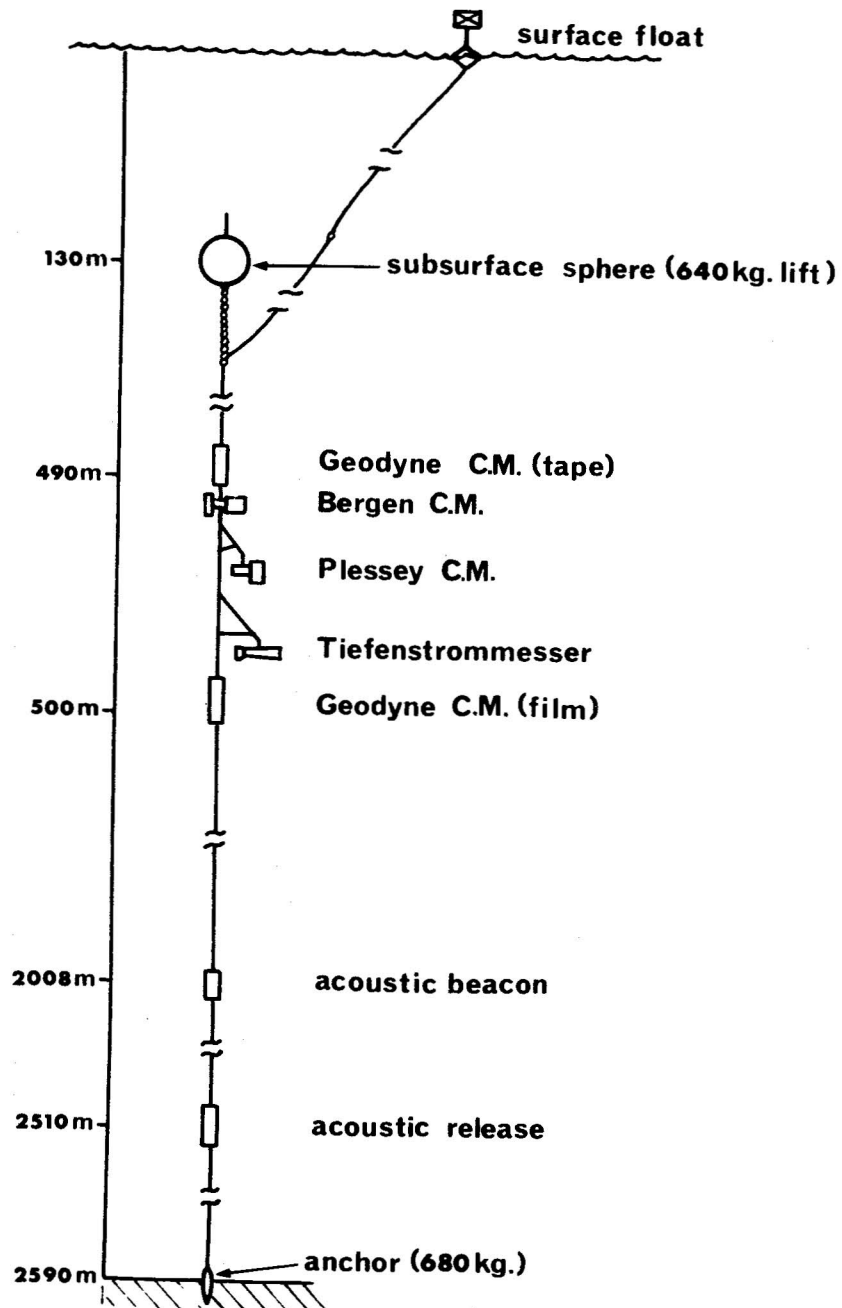


Figure 2

SCOR-21 mooring. (not to scale)

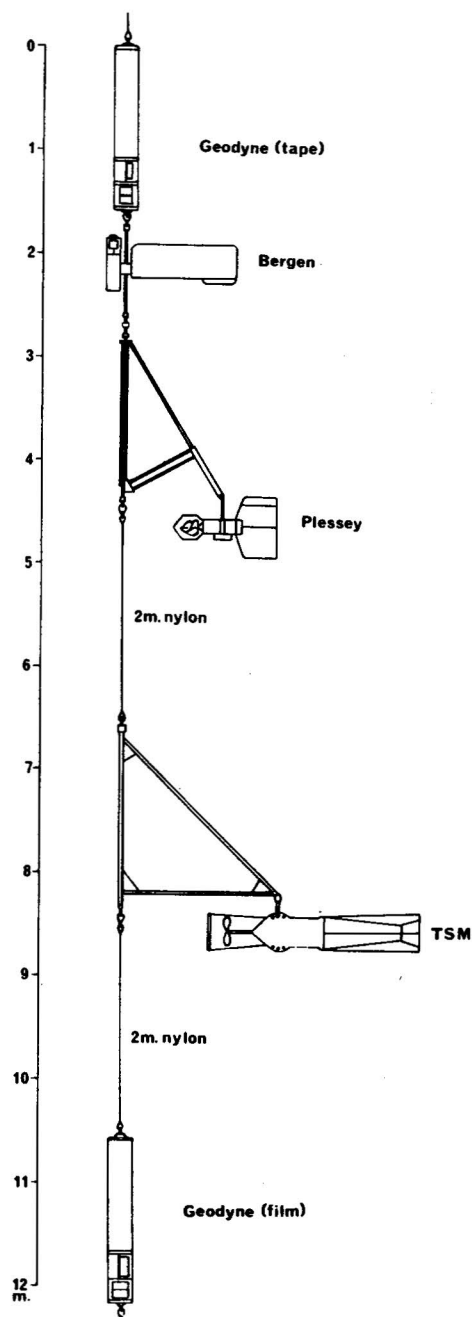


Figure 3 Enlarged diagram of relative positions and sizes of current meters in SCOR-21 moorings

REPORT OF THE SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH
TO THE
FIFTH SESSION OF THE INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION
(UNESCO, PARIS, 19-28 OCTOBER 1967)

During the Fourth Session of the Commission, and the two subsequent meetings of its Bureau and Consultative Committee, a number of specific questions were referred to SCOR for study and comment. The most important actions taken with regard to these matters are summarized below.

Air-Sea Interaction (Res. IV-1)

Resolution IV-1 urged SCOR, together with IAMAP and IAPO, to act vigorously in stimulating the scientific study of physical and chemical processes governing the exchange of energy and matter between the ocean and atmosphere and the development of satisfactory methods for estimating the flux of energy and matter between ocean and atmosphere. Subsequently, SCOR participated actively in the work of the IAMAP/IAPO Joint Committee on Atmosphere-Ocean Interaction and the IUGG Committee on Atmospheric Sciences. At its recent meeting in Warnemünde (11-13 October 1967), the SCOR Executive Committee decided to joint with IAMAP and IAPSO (formerly IAPO) in sponsoring the Joint Committee, in accordance with the recommendations of the IOC Working Group on Ocean-Atmosphere Interaction.

Variability (Res. IV-7, Rec. 7.24)

As indicated in Resolution IV-7, a Symposium on Variability in the Ocean was organized by SCOR in May 1966. Papers presented at this Symposium will be published early in 1968. As a result of discussions during the Symposium, SCOR recommended postponement of the proposed meeting of the IOC Working Group on Variability. A new SCOR Working Group (with IAPO and UNESCO) on Continuous Current Velocity Measurements was established and has since held two meetings, in April and in July 1967. During the second meeting, at Woods Hole, U.S.A., an intercomparison of several types of current meters was carried out at sea. Unfortunately, at the last minute neither the Soviet participants nor their equipment were available.

Meanwhile, a Working Group on Deep Sea Tides was organized by IAPO and met in January 1967 to discuss progress in developing suitable instrumentation and in designing a program of measurements for use when the instruments are available; the La Jolla instrument was tested at sea. SCOR contributed towards the expenses of this meeting, and has since decided to join IAPO and UNESCO in sponsorship of the working group.

SCOR considers that before an effective large-scale international experiment can be properly designed and carried out, much more research at the national level is required. This research will involve the perfection of instruments for making appropriate measurements, the analysis of existing time series data, and the design of critical experiments for describing variability. A proper role for IOC and UNESCO at the present time is to stimulate this work and to promote the exchange of views and experience on the scientific and technological problems involved.

Marine Pollution (Res. IV-10, Rec. 6.30)

Resolution IV-10 requested SCOR and ACMRR to assist the IOC Working Group on Marine Pollution. As noted in Recommendation 6.30, SCOR and ACMRR established a small panel of experts to assist the IOC Secretariat in preparing the first meeting of the IOC group. The panel met in December 1966 and prepared terms of reference, an agenda, a list of necessary

supporting documents, and an analysis of the major categories of marine pollution, all of which were subsequently used when the IOC group met.

Future Oceanographic Congresses (Rec. 7.34)

Recommendation 7.34 asked SCOR, in consultation with ACMRR, to make a careful study of the most effective way of organizing any future oceanographic congresses. SCOR Members and National Committees were asked to comment on this question which was then discussed at the Warnemünde meeting of the SCOR Executive. The following conclusions were reached:

1. Large oceanographic congresses serve several useful purposes, including the formal and informal exchange of scientific views and experience between investigators from many countries, the emphasis that can be given to interdisciplinary and international aspects of oceanography, and the opportunity to draw public attention to the interest and utility of marine research.

2. Thus future congresses should be organized, but at relatively infrequent intervals (not more often than each five or six years).

3. Congresses should be planned and organized by non-governmental organizations, such as SCOR, IAPSO, IABO, the Commission on Marine Geology of IUGS, the proposed new International Union of Marine Sciences (see later) or other appropriate constituent bodies of ICSU.

4. The financial support of intergovernmental bodies, such as UNESCO, FAO and WMO, is essential, particularly for organization, interpretation, translation and publication expenses, and for assisting invited lecturers and young scientists to participate.

5. The scientific program should consist principally of invited papers on interdisciplinary topics or on topics within a single discipline but with important implications for other fields. Careful selection of invited lecturers is critical for the success of the congress, and such lecturers should be identified more than one year in advance. Not more than three invited lectures should be given during each morning session, and no other meetings should be scheduled at the same time.

6. During the afternoons not more than four simultaneous sessions should be organized for the discussion of problems raised in the morning lectures and of selected written contributions submitted in the form of extensive abstracts and distributed in advance. During these sessions, a carefully selected convener (not one of the morning lecturers) would summarize the present status of the assigned subject, including the work described in the written contributions, and would guide the discussion of the group. Authors of selected written contributions would have the opportunity to comment briefly on their work, principally by using projected illustrations.

7. Much better facilities are required than have been available at previous congresses. Such facilities should include reliable projection equipment, afternoon meeting rooms in close proximity to each other and with easy access, and adequate acoustics with microphones for questions from the floor. Simultaneous interpretation is essential for the morning lectures; in the afternoon sessions if simultaneous interpretation is not practicable, consecutive interpretation would serve to facilitate discussion.

8. Congresses can be held in any city with suitable facilities. However, location of a congress far from the center of distribution of oceanographic laboratories can be expected to increase travel costs significantly or to reduce participation, particularly of young scientists.

The Executive Committee noted the recent proposal of the International Association for the Physical Sciences of the Ocean (formerly IAPO) to consider formation of an International

Union of Marine Sciences, which would contain associations dealing with marine geophysics and geology, marine chemistry, physical and meteorological oceanography and marine biology. If such a Union were formed, its meetings at six-year intervals would be International Oceanographic Congresses, thus simplifying the schedule of international scientific meetings, providing a machinery for the organization of oceanographic congresses, and giving them a new perspective.

United Nations Resolution (Rec. 7.8)

Recommendation 7.8 asked SCOR and ACMRR to advise IOC on the scientific aspects of implementation of the United Nations Resolution 2172 on Resources of the Sea. Accordingly a joint working group of SCOR and ACMRR (later joined by the WMO Advisory Committee) was established and met in Italy in July 1967. The report of this meeting, entitled "International Ocean Affairs", was considered at the Hague meeting of the relevant IOC Working Group and is available for further discussion at the Fifth IOC Session.

The SCOR Executive Committee agreed to endorse the report and to commend it to the IOC. It was noted that in addition to the recommendations contained in Section 10 of the report and commented on by the Hague meeting, there were numerous suggestions on specific problems contained in Section 8; the SCOR Secretary is preparing a summary of these suggestions for discussion at the Fifth IOC Session.

South Pacific (Rec. 7.26)

Recommendation 7.26 requested inter-alia that SCOR report on the progress in examining the scientific aspects of a possible cooperative study of the South Pacific. This region is considered to extend southward from the equator to approximately the position of the Antarctic Convergence. Discussions with scientists revealed considerable interest in the oceanographic investigation of the South Pacific; this interest is reflected in the increased number of cruises now taking place there. The SCOR Executive Committee decided that at the present time it was only necessary to draw attention to the desirability of more intensive investigations in the region. Accordingly a Symposium on the Scientific Exploration of the South Pacific is being held in June 1968 (in La Jolla during the Ninth SCOR General Meeting). A series of invited review papers will be presented and subsequently published. SCOR does not recommend any IOC action at the present time.

Caribbean (Rec. 6.38, 7.26)

In response to the invitation to comment on the scientific aspects of the proposed Caribbean project, SCOR published an outline of the program in its Proceedings and requested Members and National Committees to comment. Response was generally favorable, and the SCOR Executive Committee has agreed to endorse the proposal. It was noted that the Caribbean is close to centers of oceanographic activity, is relatively small and well delimited so that budgets of atmospheric and oceanic circulation could be determined, and is well enough known scientifically that effective measurement programs can be designed. Within the region there is a complex of scientific problems that could profitably be studied through international cooperation. There should be a greater emphasis on marine meteorology than is evident in the preliminary proposal.

It was agreed that the symposium on oceanography and marine resources of the region planned for November 1968 would be a valuable step in developing the scientific program of the investigation, and FAO and WMO were urged to join UNESCO in supporting the symposium.

North Atlantic (Res. IV-14)

Resolution IV-14 requested SCOR and ACMRR, in cooperation with other appropriate bodies, to study the possibility of developing cooperative investigations in the North Atlantic, and

to report to the Fifth Session, including if possible, suggested plans for the conduct of such investigations. The Vice President of SCOR, Professor V.G. Kort, was accordingly asked to prepare such a proposal; his report was then published in SCOR Proceedings and circulated to Members, National Committees and other organizations for comment. These comments were discussed by the SCOR Executive Committee during its Warnemünde meeting, and the following conclusions were reached:

1. The North Atlantic, although intensively studied for many years, contains many oceanographic features that remain poorly understood. Professor Kort's proposal describes these important problems and recommends methods for their investigation. The IOC should take these recommendations into account in considering how to facilitate a more effective program of investigation in the North Atlantic.

2. At the same time it must be noted that the effective oceanographic resources of the world (scientists, ships, equipment and facilities, funds) are limited and must be carefully allocated to projects of highest potential, strongly supported by active scientists, if steady progress is to be made. (The limitation of oceanographic resources was stressed in the comments of ACMRR and ICNAF).

3. The several working groups of SCOR, IAPO, ICES and other organizations concerned with methodological problems have demonstrated that much more research requires to be carried out on a national level before equipment of sufficient reliability and accuracy will be widely available for use in a large-scale study of this sort.

4. In the evolution of systematic investigations in the North Atlantic (or the North Pacific), activities such as the following should be strengthened:

a. Oceanographic measurements from Weather Ships, providing long time series at relatively fixed points.

b. Oceanographic observations from merchant vessels, particularly those carrying weather observers. These observations should become more feasible as the World Weather Watch is developed and with the availability of inexpensive expendable instruments, and could provide repeated sections of temperature and possibly other measurements through the surface layer (to a depth of 500 m).

c. Regional oceanographic surveys, such as those organized by ICES and ICNAF, providing repeated three-dimensional information in regions of particular interest.

d. Special studies of variability in selected regions under different natural conditions, such as those being carried out by Meteor.

It is, of course, essential further to develop theory and equipment for the description and understanding of space and time variations in the velocity field.

Southern Ocean (Rec. 7.26)

In considering the USSR proposal for comprehensive studies of the Southern Ocean, the SCOR Executive Committee noted that a full-scale attack on Antarctic oceanographic problems would require solution of methodological and theoretical problems referred to above. In addition, the difficulties and expense of working in high latitudes, particularly in winter and in the presence of ice, would always tend to restrict the level of Antarctic oceanography. At the same time, the scientific interest and importance of the region is great, and work on limited objectives should be encouraged until such time as a more general study is practicable.

Important scientific work is being conducted regularly by several of the large countries; smaller countries bordering the region are either carrying out their own research or are partici-

pating in the work of the larger countries. Thus it is desirable that information on future plans be exchanged and that some mechanism exist for the coordination of on-going programs. Accordingly SCOR proposes establishment of an IOC Coordination Group on the Southern Ocean. Members should include interested countries such as Argentina, Australia, Chile, France, Japan, New Zealand, South Africa, UK, USA and USSR, along with observers from SCOR, ACMRR and SCAR. In addition to the USSR proposal, the reports and recommendations of the Ninth Meeting of SCAR and its Symposium on Antarctic Oceanography should be considered.

Proposed terms of reference for the group are as follows:

1. To assemble and distribute details of firm oceanographic cruise plans in the Southern Ocean, preferably at least one year in advance.
2. To encourage the pre-allocation of blocks of time for oceanographic research on Antarctic supply vessels whenever practicable.
3. To develop means of coordinating existing and planned oceanographic research programs in the region.
4. To encourage the evaluation of existing oceanographic data from the region with a view to fostering specific studies of limited extent to fill gaps in present knowledge and capable of being carried out in the foreseeable future.
5. To encourage and review the development of relevant theory, methods and instruments, with particular reference to the problems of obtaining measurements in the winter and in the presence of ice.
6. To develop plans for the gradual evolution of a comprehensive study of the Southern Ocean.
7. To keep SCOR, SCAR, and the Governments signatory to the Antarctic Treaty informed of the group's activities.

ANNEX VII

FIFTH SESSION, INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION RESOLUTIONS WITH IMPLICATIONS FOR SCOR

V-3. Further Improvement of Cooperation as Regards the Ocean: takes note of the valuable advice and assistance provided by the joint ACMRR/SCOR/WMO(AC) Working Group (WG 26), encourages further joint working parties of these organizations on matters of mutual interest, supports recommendations in Section 8 of "International Ocean Affairs".

V-4. Cooperative Investigations in the Mediterranean: invites SCOR and ACMRR, as well as the IUGS, to participate actively in development of the scientific program of this study.

V-5. Coordination Group on Southern Ocean: establishes an IOC Coordination Group to consist of countries interested in Antarctic oceanographic research, and with observers from SCOR, SCAR, ACMRR, WMO and other interested organizations.

V-11. Cooperative Investigations of the Caribbean and Adjacent Regions: invites SCOR and ACMRR to continue to advise on the scientific aspects of the program.

V-16. Increase in Membership of IOC: invites SCOR and ACMRR to stimulate the preparation by well-known scientists of papers emphasizing the scientific and other advantages accrued as a result of the Commission's work and also the potential economic benefits of cooperative oceanic research, for publication in appropriate journals with wide-spread international distribution.

V-20D. Variability in the Ocean: requests SCOR and other organizations to nominate experts for appointment to an IOC Group of Experts on Ocean Variability.

V-22. Training in Oceanography: invites SCOR and ACMRR to designate representatives to participate in an IOC Working Group on Training and Education.

ANNEX VIII

MEETINGS OF SCOR AND ASSOCIATED ORGANIZATIONS IN 1968

12 - 14 February	Geneva (WMO)	ACC Subcommittee on Marine Science and its Applications
February	New Delhi, Cochin	6th meeting, IOBC Consultative Committee
4 - 8 March	New York (UN)	2nd meeting, UN Secretary-General's Group of Experts on Resolution 2172 "Resources of the Sea"
25 - 28 March	Honolulu	1st meeting, IOC International Coordination Group, Tsunami Warning System in Pacific
25 - 28 March	Teneriffe	ICES/FAO symposium "Living Resources of the African Atlantic Continental shelf between the Straits of Gibraltar and Cape Verde"
2 - 11 April	Paris (UNESCO)	WMO/IOC Panel of Experts on Coordination of Requirements
28 April - 25 May	La Jolla	SCOR/IAPSO/UNESCO WG 15, Photosynthetic Radiant Energy, field trials
29 April - 4 May	Honolulu	5th meeting, CSK Coordination Group and CSK Symposium
May or June	London	8th meeting, IOC Bureau and Consultative Council
17 - 21 June	La Jolla	9th SCOR General Meeting; Symposium on Scientific Exploration of South Pacific
20 - 27 June	Paris	ICSU General Assembly

2 - 5 July	Paris (UNESCO)	IOC WG on Integrated Global Ocean Station System
23 - 27 July	Aarhus, Denmark	ICES/FAO/ICNAF/UNESCO International Symposium on Marine Food Chains
23 - 27 September (tentative)	Paris (UNESCO)	IOC WG on Legal Questions related to Scientific Investigations of Resources of the Ocean
26 - 28 September	Copenhagen	ICES Symposium "Biology of Early Stages and Recruitment Mechanisms of Herring"
30 Sept. - 9 Oct.	Copenhagen	56th Statutory Meeting, ICES
31 Oct. - 8 Nov.	Curacao	IOC/UNESCO Symposium "Caribbean Sea and its Resources"
7 - 8 November	Curacao	IOC Coordination Group for Cooperative Investigations of the Caribbean and Adjacent Regions
2 - 4 December (tentative)	Paris (UNESCO)	IOC WG on Training and Education in Oceanography

not yet scheduled

Early in 1968	Geneva (WMO)	IOC/WMO Group of Experts on Telecommunications
?	?	SCOR/UNESCO WG 23, Zooplankton Laboratory Methods
?	?	SCOR/IBP WG 24, Estimation of Primary Production under Special Conditions
?	?	SCOR WG 25, Nutrient Chemistry

ABBREVIATIONS

ACC	Administrative Coordination Committee
ACMRR	Advisory Committee on Marine Resources Research, FAO
CSIRO	Commonwealth Scientific and Industrial Research Organization (Australia)
CSK	Cooperative Study of the Kuroshio
FAO	Food and Agriculture Organization of the United Nations
FRG	Federal Republic of Germany
GDR	German Democratic Republic
IABO	International Association of Biological Oceanography
IAEA	International Atomic Energy Agency
IAMAP	International Association of Meteorology and Atmospheric Physics
IAPSO	International Association of Physical Sciences of the Ocean
IBP	International Biological Programme
ICES	International Council for the Exploration of the Sea
ICNAF	International Commission for Northwest Atlantic Fisheries
ICSU	International Council of Scientific Unions
IIOE	International Indian Ocean Expedition
IMCO	Intergovernmental Maritime Consultative Organization
IOBC	Indian Ocean Biological Center
IOC	Intergovernmental Oceanographic Commission
IUBS	International Union of Biological Sciences
IUGG	International Union of Geodesy and Geophysics
IUGS	International Union of Geological Sciences
LSD	Lowered Sensing Digitizer
MIT	Massachusetts Institute of Technology
NIO	National Institute of Oceanography
SCAR	Scientific Committee on Antarctic Research
SCIBP	Special Committee for the International Biological Programme
SCOR	Scientific Committee on Oceanic Research
UN	United Nations
UNESCO	United Nations Education, Scientific and Cultural Organization
WDC	World Data Center
WG	Working Group
WHOI	Woods Hole Oceanographic Institution
WMO	World Meteorological Organization