

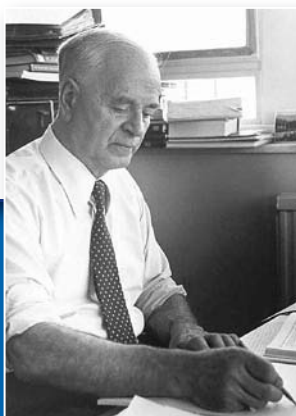
THE BIRTH AND FIRST YEARS OF THE SCIENTIFIC COMMITTEE ON OCEANIC RESEARCH (**SCOR**)

By Torben Wolff

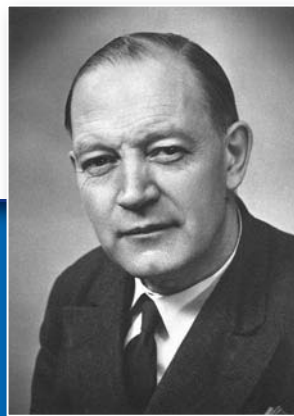


SCOR History Report #1

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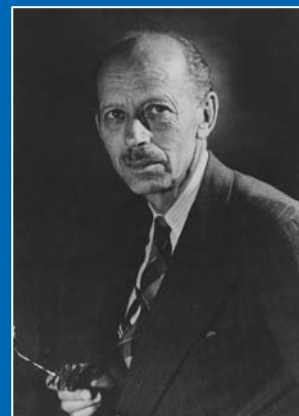
George Deacon



Anton Bruun



Roger Revelle



Harald Sverdrup

**THE FOUR
FATHERS
OF SCOR**

Front Cover: The Four Fathers of SCOR

Roger Revelle (1957): *caljsioa_85-8-07-1851b_m.jpg*.

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George Deacon – provided by the National Oceanography Center, Southampton, UK

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Harald Sverdrup (1946) by Paul Williams: *caljsioa_mc50001_m.jpg*.

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The Birth And First Years Of The Scientific Committee On Oceanic Research (SCOR)

ABSTRACT

In 1951, the International Council of Scientific Unions (ICSU) reorganized its five-year-old International Joint Commission on Oceanography (JCO), whose remit was to concentrate on the deep seafloor. The commission suggested deep-sea exploration, initiated the periodical *Deep-Sea Research* and formulated the tasks of a proposed permanent Bureau, "The International Deep-sea Council". Much to the surprise of its members, JCO was suddenly disbanded by ICSU in 1954. Instead, ICSU appointed a small Special Committee to consider what problems, of a joint biological and geophysical nature, could usefully be studied in co-operation with ICSU's biological and geophysical unions (IUBS and IUGG). ICSU eventually implemented the recommendations of the committee by appointing a Special Committee on Oceanic Research, the precursor of SCOR. ICSU decided that SCOR's task would be to continue oceanographic programs initiated during the International Geophysical Year 1957 to 1958 (IGY) for a 5-year period, and disappear after its assignment. At a meeting in Gothenburg, Sweden in January 1957, where the oceanographic investigations during IGY were discussed, a SCOR Bureau meeting was held and attended by almost 50 oceanographers. They agreed on the need for a new organisation to promote international marine research, but without any limitation of a 5-year period and this was accepted by ICSU.

The first SCOR General Meeting was held later in 1957 at Woods Hole, Massachusetts, USA, where Roger Revelle was elected as the first SCOR Chairman. Thirteen SCOR members, representing relevant ICSU unions, recognized three long-range problems needing international and interdisciplinary collaboration: the deep sea as a sink for waste products, the role of the ocean in climatic changes, and the sea as a source of protein. The largest unknown area on Earth, the deep Indian Ocean, was suggested as a promising field for a combined assault. Moreover, the meeting decided to set up working groups to review special problems, new techniques, etc. The second meeting (Paris 1958) accepted the first five working groups and recommended formation of National SCOR Committees. However, ICSU's confidence in SCOR was not really established until after the third meeting in New York in 1959 in conjunction with the First International Oceanographic Congress. Here, general plans for the International Indian Ocean Expedition (IIOE) were presented and discussed. In 1960, there were two SCOR meetings, in Copenhagen in connection with an intergovernmental conference on the establishment of an Intergovernmental Oceanographic Commission under UNESCO, and the Fourth Meeting of SCOR at Helsinki with election of George F. Humphrey, Australia, as President to replace Roger Revelle. After co-ordination of preparations for the IIOE, the large effort was now well prepared to become SCOR's major obligation during the following years.

This review also contains an account of the history of the International Advisory Committee On Marine Sciences (IACOMS) under UNESCO, consisting of 9 members. After preliminary meetings in Rome in May and in Tokyo in October 1955, IACOMS held 5 sessions: in Peru (1956), Bangkok (1957), Paris (1958), New York (1959) and Copenhagen (1960), where it was apparently dissolved. Major items discussed were an international research ship and courses in marine biology. The review ends with a short statement of the last years of Anton Bruun, before his untimely death in 1961.

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Foreword

After the establishment of several councils and committees in the first decades of the Twentieth Century (Wooster 1980), cooperation and advances in ocean sciences during World War II mainly took place within the framework of navies of some of the belligerent nations. In the first decade after the war a certain standstill in activities in oceanography, nationally as well as internationally, was prevailing, except for the accomplishment of the deep-sea investigations by the Swedish Deep-Sea Expedition (1947-1948) and the Danish *Galathea* Expedition (1950-1952). This general stagnant stage changed dramatically during the second half of the 1950s, which saw not only the creation of the International Advisory Committee On Marine Science (IACOMS) in 1954 under UNESCO¹ and the Special Committees on Oceanic (1957) and on Antarctic Research (1958) (SCOR and SCAR) by ICSU, but also the accomplishment of the marine component of the International Geophysical Year 1957-1958. In the late 1950s the first plans for an Intergovernmental Oceanographic Commission under UNESCO were formulated and IOC was established in 1961.

Having for many years been a national delegate in the general meetings of IOC, I participated with great interest in the celebration of the IOC 25th anniversary in 1986 at UNESCO in Paris. Obviously, such an event brings about many memories of former days. Thus, during the meeting several persons requested me to write the history of SCOR, which the following year would pass its 30th anniversary. Particularly persistent were Liz (Elizabeth) Tidmarsh, Halifax, and Gerold Siedler, Kiel, the Executive Secretary and the President of SCOR, respectively, at that time.

My background for accepting the task was that—besides participation (as Deputy Leader) in the *Galathea* Expedition 1950-1952 and for many years attending SCOR general meetings (from 1980-1984 serving as Vice-President)—I have as one of my main research objects since the 1960s been engaged in the history of marine science, particularly the expeditions. This activity has resulted in a number of papers and a book on the Danish marine research enterprise from its early start in the 1760s, including, for example, the *Ingolf*, the *Dana* and the *Galathea* Expeditions (Wolff 1967). Moreover, I would have rather easy access to the files of Anton Bruun, my mentor and one of the key persons in the creation of SCOR. A year later my work was so well advanced that for the 4th International Congress on the History of Oceanography in Hamburg in September 1987, I could prepare an abbreviated version (Wolff 1990).

My original plan had been to cover the entire period up to 1964 when Warren Wooster became SCOR Secretary and, at the request of ICSU, inaugurated the *SCOR Proceedings*. Unfortunately, many other obligations and advancing age have prevented the fulfilment.

The present account is based on relevant archives, mainly the Joint Commission on Oceanography (JCO), IACOMS, and SCOR files of Anton Bruun in the Danish State Archives and the SCOR files of Roger Revelle at Scripps Institution of Oceanography, La Jolla, California; the latter comprise the years 1955-1960, but nothing was available between September 1955 and January 1957 (Gothenburg Meeting). Additional material was received from UNESCO, ICSU, the SCOR Secretariat, and from Sir George Deacon's files, then at Wormley, England. Moreover, the few still surviving key persons, mentioned in the early preparation of this history, particularly Roger Revelle, provided additional details.

¹UNESCO's official interest in oceanography was first documented in 1950 when the 8th Session of its General Conference in Montevideo, Uruguay, authorized the Director General to promote the coordination of research on scientific problems relating to a number of fields including oceanography and marine biology (Roll 1979). However, as mentioned in Chapter 1, UNESCO encouraged the International Council of Scientific Unions (ICSU) to take action even earlier.

CHAPTER 1

Joint Commission on Oceanography (JCO)

Establishment of JCO by ICSU

The initiative to create an international body to secure co-operation in deep-sea research and co-ordination of the results was taken by Hans Pettersson in 1946 when planning the Swedish Deep-Sea Expedition (Ovey 1953). Pettersson's approach was favourably received by Julian Huxley, then Director General of UNESCO, who in view of recent technical advances (echo-sounding devices, Kullenberg's core sampler, etc.) agreed with Pettersson in visualizing far-reaching results in future investigations of the deep seafloor.

Encouraged by UNESCO, the International Council of Scientific Unions (ICSU)², the International Union of Geodesy and Geophysics (IUGG) and the International Association of Physical Oceanography (IAPO)³ established a Joint Commission on Oceanography in 1948. The first President was Hilbrand Boschma (Leiden), and Lt. Col. Robert Beresford Seymour Sewell (London) was Secretary.

Reconstitution of JCO

It was soon felt that the JCO programme was becoming too wide, indeed far wider than suggested by Pettersson. As a consequence, it was proposed at the IXth Assembly of IUGG in Brussels in August-September 1951 to reorganize the Commission with new membership and new terms of reference. The selected members were as follows:

Dr. John Dugdale Holt Wiseman, British Museum of Natural History, London (President)
Provisional Secretary: Mr. Cameron D. Ovey, British Museum of Natural History, London
Dr. Anton F. Bruun, Zoological Museum, Copenhagen
Prof. Maurice Ewing, Dept. of Geology, Columbia University, New York
Prof. Louis Fage, Inst. Océanographique, Paris
Prof. P. Kuenen, Geological Institute, Rijke University, Groningen
Prof. Hans Pettersson, Oceanographical Institute, Gothenburg
Prof. Roger Revelle, Scripps Institution of Oceanography, La Jolla
Dr. Mary Sears, Woods Hole Oceanographic Institution

Prof. Harald U. Sverdrup, Polar Institute, Oslo
Advisory Councilor: Vice-Admiral John Dodd Nares,⁴
International Hydrographic Bureau, Monaco.

JCO's proposed terms of reference stated that its work was to be restricted to the investigation of the deep seafloor:

- (a) *The morphology and stratigraphy of the deep-sea floor*
- (b) *The general properties of the sediment carpet and its substratum*
- (c) *The properties of the water layer next to the deep-sea floor*
- (d) *The abyssal fauna inhabiting the deep-sea floor*
- (e) *The organisms and processes important to deep-sea sediments.*

The continuation of the JCO with the above membership and terms of reference was approved by the Executive Board of ICSU in October 1951.

JCO's first task was to act upon the recommendations of an "ad hoc" committee on the study of the micro-morphology of the deep seafloor. This committee, chaired by E. Leloup, had met during the 1951 Brussels IUGG meeting and recommended an increase of detailed echo-sounding profiles of the micro-relief by asking naval and weather ship authorities in a number of specified countries to release their data; careful labelling of echograms and recording on microfilms for easy distribution; and coordinated tests of instruments for the study of the micro-relief to be made at designated oceanographic institutions.

In preparation for the discussions at the reconstituted JCO's first meeting, which was scheduled at Monaco in August 1952, Wiseman requested that the members should write concise papers stressing the object and important results that were likely to be forthcoming from investigations on the items included in the terms of reference. After circulation of these papers, Wiseman and Ovey would prepare a synopsis to be submitted to JCO members for their consideration and constructive criticism. Replies were received from six JCO members. In view of later trends in deep-sea research, these statements are interesting in

² Now the International Council for Science.

³ Now IAPSO, the International Association for the Physical Sciences of the Ocean.

⁴ Nares was the son of George Stron Nares, the captain of the U.K. Challenger Expedition, the first global oceanographic survey.

showing which major problems were identified at the time; therefore the statements will be summarized briefly.

Ewing was mainly concerned with the impact of turbidity currents on the morphology of the ocean floor, study of the thickness and physical characteristics of sediments by means of explosion seismology, measurements of thermal gradients and heat flow, study of crustal layers through dispersal of earthquake surface waves, the physical and chemical changes after sedimentation and the significance of taking measurements and samples of water right down to the bottom. In the study of the abyssal fauna he recommended a combination of photography and dredging.

Kuenen particularly stressed the difference in constitution between the rocky substratum of the deep seafloor and of the continents, as well as the study of past geological events, especially climate changes, by means of long, uninterrupted sediment cores.

Correns asked for the establishment of a centre for exchange of experiences between the different branches of deep-sea research. He also identified as important the following: research on transformation of sediments after displacement, the thickness of the sediment carpet, and the importance of increased core sampling for the study of geochronology by micro-fossils, by radium-ionium (i.e., thorium-230) identifications or by volcanic ash deposits.

Pettersson's reply was very extensive. He gave detailed advice on the development and application of echosounding and proposed the publication of a manual on the best procedures. Similarly, he outlined a number of prerequisites for efficient core sampling, specified the components of the cores to be analyzed, and recommended publication through the JCO of a manual on the provision and subsequent treatment and conservation of long cores. Seismic work, both by the reflection and refraction methods, should be encouraged. The sharp transition in properties, the fine stratification of particles and the relationships between bottom currents and particle distribution were amongst the features to be studied in the water layers immediately above the ocean floor. Finally, he noted that the recent successful trawling of abyssal fauna by the Swedish ship *Albatross* and the Danish ship *Galathea* should be continued and extended, with special attention given to the ways in which deep-sea animals obtain their food; again, the JCO might take the initiative to draw up a manual for deep-sea trawling.

Bruun stressed the importance of fast publication of echographs for the benefit of planning of deep-sea research. Attention should be given to macro-sediments such as plant remains, which in places may contribute significantly to the

content of seafloor organic matter. He recommended that investigation of the fauna down to the greatest depths with heavy gear should be further developed, as well as the food and feeding habits of the animals, including bacteria as a possible source of food. Finally, Bruun recommended that the abundance of holothurians (sea cucumbers), which disturb stratification of sediments by feeding and movement, should be documented.

Fage recommended comparing the contents of organic matter in the sediment with the richness of its fauna at different localities and investigating the utilization of organic matter, particularly bacteria, by the animals. The isothermal conditions in the Mediterranean Sea might make it possible to bring deep-sea animals up alive for such studies. The influence of salinity and temperature on the *in situ* transformation of organic matter and bacterial activity might be illustrated by comparative studies in the Mediterranean Sea and in corresponding open ocean areas.

JCO Monaco Meeting, 22-25 September 1952

This meeting was well attended, by Wiseman, Ovey, Bruun, Fage, Kuenen, Pettersson, Revelle, Sears, and as Advisory Councilors, Nares and the newly elected Dr. Fritz Koczy (Gothenburg), Commandant J. Rouch (Monaco) and Prof. Harold C. Urey (Chicago).

Since most of the above statements were received shortly before the Monaco Meeting (e.g., Bruun returned from the *Galathea* Expedition in late June), Wiseman and Ovey were unable to prepare a synopsis before the meeting. The statements were, however, the background for a detailed discussion in Monaco. This discussion formed the basis for an excellent survey article by Wiseman on recent scientific developments in deep-sea research, appearing as the first paper in the first issue of the journal *Deep-Sea Research* (Wiseman 1953).

Another major discussion item during the meeting was scientific use and representation of data on bathymetric charts. The necessity for up-to-date bathymetric charts was already stressed at the 1951 Brussels Assembly of IUGG. The Monaco meeting recognized that with its present budget the International Hydrographic Bureau (IHB) could produce only one sheet of the General Bathymetric Chart of the Oceans (GEBCO) per year, corresponding to a cycle of about 20 years per edition. To reduce this to a 5-year period (four sheets per year) an additional \$7,500 would be required. As a beginning the JCO recommended an annual grant from ICSU of \$2,500, which would permit publication of one more sheet per year.

In other resolutions, JCO requested that the IHB

recommend to its member states that every effort be made to increase the scientific and navigational value of GEBCO and to speed up its rate of production of bathymetric charts. Deep-sea soundings and echo-traces should be made freely available for morphological studies and plotting sheets should be available for expert use.

The historical development of bathymetric charts from Matthew Maury's first chart in 1855 to the present day was outlined by Wiseman (1953), and Nares (1954) cited the meeting's recommendations and explained the immediate future plans, following the allocation of \$2,000 by ICSU, provisionally, for the year 1954.

Perhaps the most far-reaching result of discussions during the meeting was the later establishment of the periodical *Deep-Sea Research*. In a resolution to ICSU, the Commission recommended that a journal should be started as part of the function of JCO in carrying out its terms of reference (Ovey 1953). Following the approval by the Bureau of ICSU and largely due to the energetic action of Harold C. Urey, who had become an Advisory Councilor to JCO, and of Dr. Ronald Fraser, Administrative Secretary of ICSU, the Pergamon Press in London bravely undertook to publish the journal. The three editors, Mary Sears, Louis Fage and Cameron D. Ovey, were chosen from the Commission, whose other members all joined the journal's Editorial Advisory Board.

It was also at the 1952 Monaco meeting that the first seeds of a permanent international organization for the advancement of ocean sciences were sown, eventually leading to the establishment of SCOR. A resolution was passed on the need for international cooperation in deep-sea research. It emphasized that "recent developments in electronics, physics and chemistry, and in methods of detailed surveying and sampling of the deep seafloor have made possible a new level of scientific understanding of the oceans which can be of the greatest importance to all fields of natural science". It was therefore urged that research on the problems of the deep sea should be given widespread support. Moreover, since great expenses were involved in equipping and maintaining deep-sea research, this field was one of the most favourable for international collaboration. Scientists of different nations should, wherever possible, participate both in planning the scientific program, in carrying out the work at sea, and in working up the data and collections. The Commission noted with satisfaction the recent efforts made in this direction by the Scandinavian countries and, in the United States, by the Scripps Institution of Oceanography.

It was agreed at the meeting that the best way of promoting international collaboration would be to establish a permanent, non-governmental organisation, under the title

"The International Deep-sea Council". Its tasks would be the following:

1. to stimulate international collaboration in fundamental research in the problems of the deep sea;
2. to act as central organization for the storage and distribution of echogram records;
3. to assist in the scientific preparation of Bathymetric Charts;
4. to act as the Official Body concerning the International Nomenclature of Ocean Bottom Features;
5. to publish a journal, which should become self-supporting;
6. to provide advice for the planning of expeditions;
7. to collect and disseminate information concerning new instruments and methods;
8. to consider other purposes as may arise from time to time.

Part of the Commission's future work would be to explore the possibilities for such an organization and potential sources of financial support for it.

The confidence with which members of JCO looked upon an early establishment of the Council is reflected in Ovey's circular letter in November 1952 on the new *Journal of Deep-Sea Research*: "The possible title might be 'Deep-Sea Research' (ultimately becoming, in its subtitle, the Transactions of the International Deep-sea Council)...".

Finally, the Commission recommended to ICSU that a symposium entitled: "The Deep-Sea Floor and the History of the Earth" be held at Liverpool in 1953. A subvention of \$3,500 for participants and \$500 for publication was applied for.

Dr. Carl W. Correns (Göttingen, FRG) replaced Prof. Sverdrup as member of JCO. In addition to the four Advisory Councilors present at the meeting, Prof. Francis Bernard (Algiers), Prof. Claude ZoBell (Scripps) and Sverdrup were appointed as Advisory Councilors.

The minutes of the Monaco meeting were published in *Bull. Inform. U.G.G.I.*, News Letter No. 4, Oct. 1953, pp. 879-881.

Symposium on the "Deep-sea Floor and the History of the Earth" in 1953

The Symposium was held on 1-2 September 1953 in conjunction with the meeting in Liverpool of the British Association for the Advancement of Science, thus securing good participation. Figure 1 shows the JCO members and others.

The thirteen papers presented at the symposium embraced results of research on deep-sea sedimentation from geological, geophysical and biological standpoints, with evidence for possible changes in ocean volume and climate in the past. Also included were morphology of the deep seafloor, interpretation of continuous echo-sounding records and the preparation of bathymetric charts. The focus of the conference was on the contribution of the various lines of work to the elucidation of Earth's history. Apart from Edward Bullard, Maurice Hill and G.M. Lees, all speakers were members or councilors of JCO, whose secretary also was secretary of the Symposium.

It was announced in *Deep-Sea Research* (Vol. 1, p. 64) that the papers and discussions of the Symposium would be published in that journal. However, only five of the papers (by Bullard, Lees, Nares, Correns and Brouardel and Fage)

were actually published there (*Deep-Sea Res.* 1, 1953, pp. 65-97 and 192).

Last meeting of JCO at Rome, September 1954

The Commission met again at the FAO headquarters on 13-14 and 18 September 1954. Attending were the President (Wiseman) and Secretary (Ovey), the members Bruun, Håkon Mosby (Geophysical Inst., Bergen, newly elected), Pettersson, Revelle and Sears, and the Advisory Councillors Bernard, Koczy, Nares, Sverdrup and Urey.

The meeting resulted in four resolutions and six recommendations. The Commission resolved

1. that the \$2,500 donated by the U.S. National Science Foundation to JCO should be accepted and set aside for covering the expenses of the preparatory work for the establishment of a permanent body, as well as for its initial expenses⁵;
2. that it is in entire agreement with resolution of the Bureau of ICSU to the Director General of UNESCO;
3. that, if so desired by IUGG, the name of the Commission might be altered.

The fourth resolution, addressed to ICSU, strongly urged that the articles on the continental shelf, being prepared by the UN International Law Commission, should ensure the traditional freedom of scientific research in shelf areas.



Figure 1. Members of the Joint Commission on Oceanography and others at the Symposium on "Deep-sea Floor and the History of the Earth" in Liverpool on 1-2 September 1953. From left: Cameron D. Ovey, unknown, J. Proudman, Shackleton, John D.H. Wiseman, Ronald Fraser, Hans Pettersson, Anton F. Bruun, P.H. Kuenen, Claude ZoBell, J.D. Nares, Edward Bullard, Fritz Koszy and Carl W. Correns. (Ovey, Wiseman, Pettersson, Bruun, Kuenen and Correns were Members, and ZoBell, Nares and Koczy were Advisory Councillors of JCO). (Bruun's Archive)

⁵ Revelle had applied to the U.S National Science Foundation for this support. He had previously told Wiseman that he might procure \$2,500 in the United States, provided an equivalent sum was raised elsewhere. In January 1954, Wiseman informed Revelle that it seemed highly probable that another \$2,500 could be raised. He urged Revelle to proceed with his application, since he regarded finance as the great hurdle. Obviously, the provision of raising \$2,500 from other sources was dropped somewhere en route.

To ICSU and IUGG, the Commission recommended a continuation of the present membership, but to add as Advisory Councilors Sir Edward Bullard (Cambridge), Dr. Leslie H.N. Cooper (Plymouth), Dr. George E.R. Deacon (Wormley), Prof. Albert Defant (Innsbruck), Dr. Charles A. Fleming (Wellington) and Dr. Maurice N. Hill (Cambridge), all acting on the Advisory Board of *Deep-Sea Research*, and Dr. Th. Monod (Paris/Dakar).

Another recommendation was on GEBCO; JCO requested IHB to bring about improvements recommended by the International Committee on the Nomenclature of Ocean Bottom Features and asked ICSU to cover the expenses involved by allocating \$2,500 for two years. To IUGG it was recommended that during the International Geophysical Year samples of water should be collected at different depths to study the radioactive content in the vertical and horizontal circulation of the oceans. In addition, it was recommended to the Pan American Institute of Geography and History that oceanographic centres be established near major coastal cities in South America and to consider setting up a Pacific Laboratory in the Galapagos Islands. The key issue of the meeting was, however, a continuation of the deliberations in Monaco on the establishment of a permanent Bureau, "The International Deep-sea Council" (cf. p. 7). After long discussions a recommendation to ICSU and IUGG was agreed upon. It reads as follows:

Proposal for the Continuation of the Work of the Joint Commission of Oceanography

Recommendation To ICSU and UGGI

The Joint Commission on Oceanography, being aware of the great developments in the basic sciences, considers that by an application of recently developed techniques to the oceans, a new level of understanding of the earth and of living organisms is possible.

In the field of biology, the genetics and physiology of individual organisms, the dynamics of populations, the problems of reproduction, growth and adaptation, all require greater knowledge of oceanic plants and animals and of their environment. Such knowledge will throw a new light on the results of many years of study of terrestrial organisms. In the study of the earth, problems of the origin and history of continents and ocean basins, of forces deep within the interior of the earth which form mountains and bring about earthquakes and volcanism, and of processes and changes in the atmosphere and hydrosphere, cannot be solved

without extensive exploration of the oceans. The solution of these problems would in the realm of biology give a far better understanding of the evolution and distribution of plants and animals.

To attain these goals international collaboration between scientists of many different disciplines has already proved fruitful and will be more necessary in the future. There is at present no permanent international organization which can promote such international collaboration. The Joint Commission on Oceanography recommends to the International Council of Scientific Unions and the International Union of Geodesy and Geophysics that an organization should be established. This organization which might take the form of an International Council of Marine Sciences should at first be small and avoid duplication of functions of existing organizations.

The primary function of this Council would be to foster international cooperation in the many problems that require knowledge from diverse fields of marine sciences, as well as in marginal problems which can be solved only by assistance from other disciplines. To accomplish this, the Council would endeavour:

- 1. to enlist the participation in marine research of scientists of many disciplines who have developed techniques which show promise of application to problems of the sea;*
- 2. to organize symposia at which topics of interest to many different disciplines would be discussed, the symposia preferably to be arranged in cooperation with the sponsoring unions or with other scientific organizations;*
- 3. to promote and sponsor publications in which scientists of different disciplines concerned with problems of the oceans could communicate with one another;*
- 4. to further international collaboration in the use of teaching and research of existing facilities, especially research vessels and laboratories.*

The Joint Commission on Oceanography recommends to ICSU and UGGI the early consideration of the establishment of a Council of Marine Sciences in order to carry out these functions. If this recommendation is agreed to in principle, further problems remain as to the composition, method of selection of the Council, the scope and duties as well as to the financing of the organization. The JCO hopes to submit at an early date proposals concerning these problems.

In view of the later development it is interesting to compare this version to the draft which is in the Bruun files and had probably been prepared by Wiseman. The draft heading, “Proposed Establishment of an International Deep-sea Council and Bureau”, was changed to the heading above. The proposal was apparently not originally conceived as a recommendation, since the sentence in the middle of the third paragraph (the JCO recommendation to ICSU and IUGG that an organization should be established) was added at the meeting. On the other hand, the draft contained, besides the four points listed, another four which were deleted:

- to encourage at a national or regional level the development of oceanographic research and teaching facilities and to sponsor investigation of specific problems of particular importance;
- to support and give scientific guidance for the production of up-to-date bathymetric charts and for the best use of echograms;
- to act as the international body for the nomenclature of deep-sea features;
- to assist in formulating international scientific opinion concerning legal and political problems of the seas which may effect the conduct of free scientific research.

There were some minor corrections and additions to the draft. A comparison between the tasks of the Council, as envisaged at the Monaco meeting (p. 6), and the above recommendation shows the following alterations: symposia have been included, the collection of information on new methods is now directed to the individual scientists, establishment of a journal has meanwhile been undertaken and is therefore left out, storage and distribution of echogrammes are abandoned (also in the draft), and involvement in bathymetric charts and nomenclature was dropped at the Rome meeting.

The following account of what happened during the subsequent meeting of IAPO and during and after the subsequent IUGG Assembly in Rome has been compiled from a series of letters in November-December 1954 between members of JCO.

The minutes and recommendations of the JCO meeting were submitted to a meeting of IAPO on 21 September 1954. There were long and occasionally harsh discussions, particularly between representatives of IAPO from the United States (Revelle and Urey) and Britain (Deacon, Director of the National Institute of Oceanography, Wormley and Proudman of Liverpool University and the Tidal Institute, President of IAPO). The two latter criticized the whole concept of the proposals for a Council, claiming

that these deliberations had been sprung on them in the last minute.

As a consequence, the recommendations were greatly modified, the final form being the following (Resolution No. 53, *Bull. Inform. I.U.G.G.*, News Letter No. 10, June 1955, p. 312):

The International Union of Geodesy and Geophysics,

Considering the fact that under existing statutes the Joint Commission on Oceanography can only exist in its present form for approximately three years,

Considers it desirable to lay plans for the continuance of its work after that time by some other suitable body,

Recommends accordingly that the Joint Commission on Oceanography be reconstituted to further the work it is already doing.

In the remaining three years consideration will be given to what form the future body should take in order to avoid overlapping.

The report and recommendation were approved by a majority of the members of IAPO at a subsequent meeting on 23 September 1954. They were duly forwarded by Sverdrup, the acting Chairman, via Mosby and the Secretary General of IAPO, to Georges Laclavère, Secretary General of IUGG. In his report to IUGG of 25 September 1954, Proudman stated that there was only one IAPO recommendation: that JCO “be reappointed on the same terms as before and with the same membership as before”.

The waters part: The assassination of JCO

The next move was dramatic. On 1 November 1954, Ovey wrote the following letter to the members of the JCO and the Advisory Councilors:

Disbandment of the Commission

The following communication has been received from the Secretary General of ICSU:

“The Report of the Joint Commission on Oceanography which you submitted to the Executive Board of ICSU, was carefully considered by the Board at its meeting in Naples on October 5.

I am sorry to have to tell you that the recommendations put forward by the Commission were not accepted by the Board.

Moreover, the Board considered that the Commission had gone so far beyond its terms of

reference in making these recommendations, and in other matters, without due consultation with the parent Union, that the Board resolved that the Commission be disbanded forthwith under Rule 5.3 for Joint Commissions. Both decisions were unanimous.”

In confidence, it is only fair to point out that, as a matter of routine, all documents and reports concerning the affairs of the Commission were communicated to the Secretary General of the Mother Union (UGGI). Some of them have been published in the UGGI News Letters.

Subsequent significant correspondence between JCO members (Sears, Pettersson, Bruun, Urey, Mosby and Ovey) clearly demonstrates the embarrassment, disappointment, and surprise with which this disbandment of JCO was received. Sears was especially shocked because of the tone of the note. Particularly Pettersson, Sears and Urey felt certain that somebody wanted to slaughter JCO and apparently conceal the true background for the dismissal.

First, it was considered obvious that what the ICSU Board members had before them in Naples could only have been the original JCO report with the recommendations referred to above (p. 6) and not the greatly modified report which was approved by IAPO on 23 September, but apparently withheld somewhere on its way after having been duly forwarded by IAPO to IUGG. Only under these circumstances would the ICSU Executive Board have been correct in reproaching JCO with not having consulted with the parent Union⁶.

Second, Mary Sears pointed out that “our downfall” could not have been due to lack of communication. If it were correct that JCO members went “so far beyond its terms of reference” she would have believed that Dr. Ronald Fraser, the Administrative Secretary of ICSU, would have told them about it at the first meeting in Monaco. All documents had been sent promptly to the parent Union and some of them published in the IUGG News Letter and *Deep-Sea Research*. Thus, the British criticism that the deliberations were sprung upon them at the last minute was unfounded. In Pettersson’s opinion, JCO overstepped its terms of

reference in one case only, namely when advocating freedom of research in shelf areas, but this resolution had been rather forced upon JCO by A.V. Hill, the Secretary General of ICSU, under Pettersson’s protest.

Sears could not help thinking that part of the disagreement arose from the fact that IAPO wanted to keep the Commission on the ocean bottom without appreciating that the processes important to the deep-sea sediments were not confined to the bottom. Misunderstanding might also arise from the difference in defining and understanding “oceanography”, the British (and probably the French) being more limited in their viewpoint in this respect than the Scandinavians and the Americans and less willing to appreciate collaboration between all branches of oceanography or rather oceanology.

A final reason why the British could not accept the recommendations was, in Mary Sears’ opinion, British consideration of oceanographic research within the limits of the Commonwealth. A Commonwealth Oceanographic Conference was going to take place the following month (18-22 October) at Wormley, with the main tasks to review the progress until then and to discuss what measures might be taken to promote oceanographic research throughout the Commonwealth (Anon. 1954).

Neither Mary Sears nor Pettersson express any doubt that Deacon was responsible for the failure in Rome. Pettersson attended the meetings of IAPO on 21 and 23 September and remembered the militant way in which Deacon behaved, rousing Revelle’s and Urey’s indignation. Deacon did in no way conceal that the issue was a question of power.

In a letter to Bruun, Pettersson said that after returning from Rome and further travel abroad he had intended to ask Bruun whether Bruun would be willing to take over as President of JCO at the same time that Wiseman, the President, and Pettersson himself would retire as members. He believed that this reconstruction should already have been undertaken in Rome, but since he had learned there that the life of JCO might be prolonged another three years the change might well be postponed until after the meeting. Looking back in March 1955, Louis Fage (in a letter to Bruun) felt sure that the re-election of the same president

⁶ Actually, it is obvious from the reports of the Naples meeting that the ICSU Executive Board and Bureau must have considered both the original report with its six resolutions and the final, modified report with the recommendation for a continuation for three years. The report of 6th Meeting of the ICSU Executive Board states that JCO, “which had submitted a report and a series of recommendations arising out of its meeting in Rome on September 13 and 14”, should not have its mandate renewed since JCO had gone far beyond the terms of its assignment. However, in the report of the ICSU Bureau meeting it is stated that “the Bureau felt unable to press the recommendation [of IUGG] that it be given a further 3 years’ life” and therefore unanimously voted to disband JCO.

and secretary and the proposed nomination of too many councilors had contributed to ICSU's ill-feeling.

Finally, on 11 December 1954, Pettersson sent a letter to the members of JCO explaining in detail why the charge against JCO—the lack of due consultation with the parent Union—was erroneous and proposing that JCO should be reappointed. This did not meet with the approval of the other JCO members. One reason was well expressed by Mary Sears: “While it is frustrating to be so summarily dismissed, and without any kind words for one's efforts, I believe that JCO served to clear the air... Even were the misunderstandings cleared up, the members of the JCO, I believe, could never function smoothly and forthrightly again, as a result of the manner in which they were dismissed”. The other reason for not acting was the expectations of a small committee that had meanwhile been set up by ICSU and which will be dealt with in the following chapter.

There were no comments from Roger Revelle, another member of JCO and a key person at the IAPO meetings. After having read my preliminary account of the history of JCO, Revelle responded (October 1986) to my request for a comment on the motivation for ICSU's action and he later approved citation from his exposition. His own suggestion is that the Commission was killed by Deacon, who perhaps enlisted Proudman as an accomplice. “In those days ICSU could have almost been described as a European Association for the Advancement of Science, dominated by the British and, to a lesser extent, by the Scandinavians. Americans and other “lesser breeds without the law”, including the Canadians and Australians, were tolerated, but clearly kept in the background. The Japanese and Russians were not even there, and the Germans played little part. I believe George Deacon thought all this was perfectly appropriate and, in addition, he took a very dim view of J.D.H. Wiseman and Cameron Ovey, let alone Admiral Nares, who were the only Englishmen on the Commission. In those days also, George was somewhat ambivalent about the virtues of international oceanographic cooperation.

Every now and then he would burst out with some such statement as ‘These international committees are wasting time and money that could be better devoted to research’.”

As appears from the following chapters, Deacon's attitude regarding the virtues of oceanographic cooperation by means of a specific organization must have changed remarkably once he became a member of the small ICSU Committee that was established after the disbandment of JCO. In later comments, Revelle also characterized Deacon as a loyal member of UNESCO's International Advisory Committee On Marine Sciences and later of SCOR. He also recognized his hard work (with Bruun and Revelle) on the plans for the International Indian Ocean Expedition in Copenhagen in 1960 (p. 65) and as a member of the four-man committee that did the preliminary work for the Intergovernmental Oceanographic Commission (with Vladimir Kort, John Lyman and Revelle).

In any case, the JCO died. At least formally this was due to the fact that the ICSU Executive Board had taken into account a number of recommendations that had not been approved by IAPO, but replaced by another very different recommendation. It is strange how such a misunderstanding could occur, and it is sad that JCO was dismissed without a word of recognition from its parents, except for the praise of JCO expressed by Laclavère on the first day of the JCO meeting. Mary Sears very appropriately phrased the apparent reason for the demise: “It is amusing to think that the earlier JCO was dismissed for inaction and we for too much!”

A nice small obituary by Ovey, the Secretary, appeared in *Deep-Sea Research* (Ovey 1954). He stated that although JCO had not had its term of office renewed, “it has at least achieved some good and has made it clear that a more permanent body is desired by many of those fundamentally concerned with problems of the deep sea”.

The role that the work of JCO played in the establishment of SCOR is significant and not generally acknowledged.

CHAPTER 2

The Fathers of SCOR: Work of the “ICSU Special Committee On Deep-Sea Research”

A.V. Hill's letter to Bruun, Deacon and Sverdrup

Even before the official announcement of the disbandment of JCO, the Secretary General of ICSU, Professor A.V. Hill, had sent the following letter, dated 25 October 1954, to Bruun, Deacon and Sverdrup:

At the recent meeting in Naples of the Executive Board of ICSU the following decisions were taken:

- 1. that the present Joint Commission on Oceanography should be brought to an end from 31st October 1954*
- 2. that a small committee be appointed to consider what problems of deep sea research, of a joint biological and geophysical nature, could usefully be studied in cooperation by the International Union of Biological Sciences and the International Union of Geodesy and Geophysics*
- 3. that this committee, established under the sponsorship of ICSU, should consist of the following members:*

*Professor A.F. Bruun
Dr. G.E.R. Deacon
Professor H.U. Sverdrup*

together with two recognized oceanographers, one a biologist and one a geophysicist, to be proposed by the members named

- 4. that this committee be advised to make contact with UNESCO, and with international or national organizations that carry out research in the oceans, such as the International Council for the Exploration of the Sea (the N. Atlantic international fisheries commission), etc.*
- 5. that this committee should submit a report to the Executive Board of ICSU for consideration at its next meeting in Oslo (August 1955).*

As regards (1), the secretary of the Joint Commission on Oceanography has been so informed. As regards (3), I am to ask whether you are willing to serve. If you are, it will then be necessary to arrange a preliminary meeting, and I should be glad of suggestions (a) of where and when the committee might meet, (b) of the names of the other two members suggested and (c) of how the business of the committee could be conducted.

It was clearly the intention of the Executive Board of ICSU that the purpose of such proposals as the committee might make should refer to the overlapping fields of the two Unions concerned: each Union separately will continue to look after its own special field.

On 10 November all former members and councilors of JCO were informed accordingly, the only differences from the above version being that the introduction was “The Executive Board of ICSU recommends” and that the two last paragraphs were left out⁷.

The establishment of this committee was welcomed by Sears and Pettersson in letters to Bruun. The former was pleased that “the new committee seems to have been set up so that it does not have the divided responsibilities of the JCO - to ICSU, IUGG, IAP0 and IUBS, etc.; in that way it is in a much stronger position”.

After the Rome meeting, but prior to the disbandment of JCO, Bruun had in a letter to Ovey anticipated “some hard work before we get our Deep Sea Council”, because in Rome “a number of people did not appreciate the necessity of collaboration between all branches of oceanology”. Bruun therefore intended to go to London to meet with A.V. Hill, who “is most important if we want to get along with our proposals”.

Bruun did meet A.V. Hill and Ronald Fraser in London in early November, now in his capacity as a committee member. In a letter he told Mary Sears that Hill and Fraser were “quite hopeful that the new committee should arrive

⁷ In the report of the Executive Board meeting the recommendation is termed a “Resolution”, proposed by Prof. Noyes and seconded by Col. Herbays.

at something positive more or less on the lines laid down by JCO”.

Hill suggested that Bruun might take the initiative in consulting the committee and finally call it together. It is uncertain whether Hill’s phrase: “He seemed ready to do so” (in a letter to Deacon) indicates any slight reluctance on Bruun’s side....

Bruun also met Deacon. In view of Deacon’s decisive role in the failure in Rome, Bruun’s approach is interesting (letter to Mary Sears): “We had a long talk which I think cleared up a good deal, because I started something like that I knew beforehand how friendly he would be towards a collaboration between biological and physical sciences in oceanography, since he had started his career under the leadership of Stanley Kemp. And therefore I was very happy when he without knowing my suggestion mentioned Revelle as another member”. Deacon readily accepted Bruun’s proposal of Th. Monod as the second member (biologist). In a subsequent letter to Hill, Deacon gave his reasons for suggesting Revelle: a representative of the United States was needed, he had a wide experience and a “reasonable conviction of the need for more activity than he considers possible within the existing unions”. Moreover, Deacon thought it would be “very beneficial if IUBS had an active association of marine biology although ICES, the International Council for the Exploration of the Sea, serves somewhat the purpose”.

In Sverdrup’s letter of 8 November 1954 to Hill, he accepts to serve on the committee “although it has been given a very difficult task that may require considerable of my time”. Sverdrup finds the selection of two additional committee members difficult, “particularly because these should be from European countries, because of time and costs involved”. As the biologist he suggests Professor Johannes Krey (Kiel), as the geophysicist Mr. M.A. Gougenheim (Paris) or Dr. Börje Kullenberg (Gothenburg). Finally, he expresses some concern about the attitude of, for example, ICES to a possible new international body, “because within such organizations excellent cooperation exists between physicists, chemists and biologists in the fields of importance to the organizations”.

After having been informed by Bruun that Deacon and Bruun had agreed on Revelle “without discussion” and that Monod should be preferred to Krey “because of Monod’s great experience in international collaboration”, Sverdrup consented happily. The end of Bruun’s letter—“If anything should come out of our considerations, I naturally agree that Germany also should be represented”—appears to be more prophetic than he could anticipate: Günther Böhnecke

from Hamburg served as Secretary of SCOR during its first seven years, longer than anybody else ever since!

Sverdrup’s concern vis-à-vis ICES had also been raised independently by Deacon. In his letter to Deacon, Hill agrees: “There may, as you say, be difficulties in doing anything which might seem to take the bread out of the mouth of ICES. F.S. Russell could probably advise”. Hill also suggested that the committee might discuss and report on the idea of IUBS setting up an Association of Marine Biology. Following Hill’s invitation, Revelle and Monod joined what Ronald Fraser soon entitled the “ICSU Special Committee on Deep Sea Research”.

Statements of Bruun (JCO), Sverdrup and Deacon

Even before the membership of the committee had been finally settled, Sverdrup and Deacon produced a statement each—both called “Remarks on Co-operation within the Marine Sciences”—and Bruun circulated the statements discussed at the JCO meeting at Monaco in 1952 (p. 6).

Sverdrup’s statement (dated December 1954) first notes the interdependence of the marine sciences, for example, problems of ecology and marine geology often requiring knowledge from each other and from chemistry and physics. He believed that cooperation on the national level was concerned mainly with local problems, often due to lack of financial resources and facilities. Most countries to which fisheries are important have established fishery research stations. They often work in collaboration with marine biological stations, which also have their own programs of integrated research in near-shore waters. Only three institutions have sufficient personnel and vessels for a long-range study of the open ocean: the National Institute of Oceanography (UK), the Scripps Institution of Oceanography, and the Woods Hole Oceanographic Institution (USA). Large, nationally organized oceanographic expeditions have, since the *Challenger* Expedition, investigated many aspects of the ocean, previously mainly on an exploratory basis, but in recent years planned and equipped with specific problems in mind.

Organized *international* cooperation was at present limited to fisheries research: ICES, the Commission for the Scientific Exploration of the Mediterranean (CIESM), and the Indonesian Fisheries Council. Since fishery research must remain in close contact with general marine research to obtain new impulses and recruit academically trained personnel, marine biological institutes take an active part in the work of the councils by arranging cooperative projects, participating in the regular council meetings, etc.

In open ocean research no corresponding international organization existed. IAPO was limited in scope, particularly since it did not consider marine biology. Although the large oceanographic institutions invited outside specialists to take part in their work and foreign guests were invited to participate in national expeditions, there was a need for strengthening international cooperation.

From time to time the creation of an International Union of Oceanography had been proposed, but it would be so large that it would have to be split up into sections, “whereby the very purpose of its establishment would be defeated”. The same objection applied to a Congress of Oceanography, although it would represent a more flexible organization.

In Sverdrup’s opinion co-operation might best be advanced by arranging for carefully prepared symposia, with preferably invited speakers and invited and limited attendance, and dealing with broad problems which must be attacked by several of the marine sciences jointly. “If the arrangement of such symposia can be made under the auspices of the Unions of Biology and of Geodesy and Geophysics, a small joint committee (or commission) may be appointed to prepare the first symposium on a selected topic. At that symposium a topic to be dealt with next may be selected and a new committee appointed to prepare this and so on. From such a modest beginning a firmer structure may develop if that appears desirable, or experience may point towards possibilities which at present cannot be visualized”.

Deacon’s statement (January 1955) is an outstanding outline of problems of both biological and geophysical nature. Like Sverdrup, he believed that they may best be studied at symposia where biologists and physicists met for joint discussions. Since Deacon’s statement served as a guideline for part of the later work of the committee I have found it appropriate to cite it in full:

Remarks On Co-Operation Within The Marine Sciences

Interest in marine biology is turning more and more to the deep ocean, and to the quantitative study of the distribution, migrations and life-histories of marine animals in relation to their environments, and there are an increasing number of problems of a joint biological and geophysical nature which might usefully be studied in co-operation between the International Union of Geodesy and Geophysics and the International Biological Union.

For example, the problems of plant and animal distribution begin to need precise understanding of the water movements which distribute eggs, larvae and adults from their spawning grounds and at the same time allow the stocks to be maintained. It is important to know the speeds and fluctuations of the water movements and the processes that determine them, to learn the effects of changes in the physics, chemistry and biology of the circulating water, and to study the possible consequences of deviations and interruptions of the normal pattern of circulation. Studies of variations in productivity, such as the rate of change of environment and its effect on the plants and animals, also need to be expressed in figures. The same is true in problems of vertical migration, vertical distribution, patchiness of horizontal distribution, and shoaling of plankton and fishes: these all need close collaboration between biologists and physicists. Submarine geology is of interest to both, if only because detailed knowledge of bottom topography and physics, chemistry and biology of the sea floor and bottom sediments is needed for the study of the water circulation and biological processes. Nutrient cycles and geochemistry also afford joint interest.

The two unions, of Biology and Geodesy and Geophysics, can probably help most by arranging joint discussions which would compel physicists to describe as much of their work as possible in a form and language that can be appreciated by biologists, and the biologists to do all they can to express their arguments on distribution, migrations and populations as precisely as possible. Such discussions would help to crystallize what are still rather vague problems, and to co-ordinate the advances and ideas of specialists in all aspects of the subject, and help to circulate information and to stimulate enthusiasm and fresh ideas. After a time they might attract specialists who had not thought of applying their special skill to marine problems, and should call attention to the whole field of investigation.

It is very doubtful whether the existing councils and associations are adequate. The fisheries councils, including the International Council for the Exploration of the Sea, are too official in their outlook and membership to offer the same opportunities as a scientific union. They serve their purpose and do much to stimulate work on the fishing grounds mainly in shelf regions, but they have little chance of pursuing a fundamental problem into the deep oceans, and, in marine

physics, cannot do much to encourage new approaches which are bound to appear very academic for a few years, however essential they may be for the future of the subject. It is not unfair to conclude that the councils must be the meeting place of the same men, charged with the same responsibilities of advising and supporting official action year after year, and they cannot have the scope of a scientific union for new blood, fresh ideas and unrestricted argument. The Pacific Science Congress is perhaps the most promising body, but its meetings are never very accessible to Europeans.

The International Association of Physical Oceanography does not fill the requirement, but when allowance is made for the interests of the associations of Meteorology, Geodesy, Seismology, Magnetism, Hydrology, Glaciology and Volcanology, which meet at the same time, the Union of Geodesy and Geophysics affords good facilities for describing and discussing all aspects of oceanography except Biology.

The International Biological Union also does not fill the requirement. Its Sections discuss marine as well as land animals, and its Policy Board has recognized the truly international character of marine biology by calling an international conference, following its next General Assembly, with the idea of forming a permanent international body to facilitate intercommunication and collaboration among institutions and individuals concerned with marine biology.

It might appear desirable, at first glance, to start a new Union of Oceanography to deal with all aspects of the subject, but this might in the end do more harm than good. The development of Physical Oceanography would probably be retarded by any tendency to remove active research on the ocean out of the sphere of geodesy and geophysics. It is, for example, impossible to separate the physics of the sea from the physics of the atmosphere, and there are many other geophysical problems. Submarine geology and sedimentation are as much the concern of geodesists as oceanographers, and oceanographers and seismologists have a very well-defined joint problem in micro-seismic oscillations. There are plenty of other joint interests between oceanography, magnetism, hydrology, glaciology and volcanology. For the same kind of reasons any kind of steps which tend to isolate marine biology from the International Biological Union might prove short-sighted. The biochemistry, biometry, botany, cell biology, developmental

biology, ecology, experimental psychology, genetics, microbiology, physiology and zoology of marine life cannot be separated from similar work on land, and the marine biologists ought to meet with all the other biologists.

But the moving environment of the marine life introduces a strong element of physics into the problems and I believe that progress can be hastened by arranging symposia on those problems (outlined above) which can be usefully studied by biologists and physicists in co-operation. The symposia should be held just before or just after meetings of the Biological Union (or the international marine biological association which it may promote) and of the Union of Geodesy and Geophysics in turn. At the General Assembly of the Union of Geodesy and Geophysics the physical oceanographers would invite the marine biologists to a joint two-day symposium, and in return the biologists would invite the physicists to one arranged in connection with the next Assembly of the Biological Union. This should allow a useful meeting every three years. I think the arrangements should be made by a joint committee of four nominees from each union, the composition of the committee being changed substantially after one or two symposia.

I do not think that there is any need for an international authority to help in planning expeditions or other collaborative work. Such joint ventures depend on the personal enthusiasms of a few individuals and their ability to obtain public support. Such organizers would not go to an international authority for advice though they will seek financial support provided it does not entail appreciable interference with their plans. Because of the rapid development of new theories, techniques and methods, they have to rely primarily on the individuals who have most experience in the type of work they mean to do, and the only practical way to promote co-operation seems to be to encourage exchange of ideas and consolidation of plans at meetings where there is at least nominal obligation to do something.

Monod's comments and Deacon's reply

After joining the committee Th. Monod, in letters to Bruun and Deacon, expressed concern whether the work of the committee should be devoted to cooperation within the marine sciences (as indicated in Sverdrup's and Deacon's remarks) or to deep-sea research (as stated in the mandate of the ICSU Executive Board). He was also seeking a necessary distinction between regional and general

problems and, therefore, types of international organizations at various levels.

In his detailed reply of 23 February 1955, Deacon stated that the lack of distinction in both respects is “because we feel that joint studies of the basic processes which govern the movements of the water and the distribution of the animals ... offer the best hope of advancing these different approaches to the subject. More knowledge about, for example, water circulation, oscillations, interchange of energy between atmosphere and ocean, response of the sea surface to wind, and sedimentation and movements of sediments would promote a more effective attack on deep-sea as well as regional problems. In meteorology the emphasis had shifted from continuously setting up new observation stations to research on basic physical processes. It would be essential to make the best possible use of the always limited observations and samples to be made and to supplement with inferences from the meteorological conditions.”

Deacon believed that the difficulty of attracting sufficiently qualified and enterprising men and the rising cost of ocean science, particularly research vessels, made cooperation essential. He believed that the problems should be tackled on a “planetarian” rather than on a “regional” basis and finished by saying that even if the ICSU decision specifically mentioned deep-sea research he hoped that it also included the problems outlined in paragraph 2 of his “remarks” (cited above).

In his general statement (in French) of 14 March, Monod began by expressing his regrets that his comparative isolation prevented him from fully appreciating the liaison between the existing organizations. He perceived that the work of the committee should concentrate on:

1. overlapping fields of the two organizations IUBS and IUGG
2. problems of deep-sea research.

In his subsequent, rather philosophical, remarks on the nature of marine research, Monod pointed out that such research implied a considerable number of disciplines in which the most different ones have nothing more in common than their application to an identical environment. From the many branches of systematic zoology to the most mathematical aspects of physics, scientists study the same marine domain and its variations in space (three dimensions) and, with geologists and palaeontologists, in time. A corresponding interdependence is found within hydrobiology (limnology) which is, however, less complicated and geographically much more limited.

The marine sciences have until now primarily been organized on a regional basis and far too often with insufficient liaison between the hydrographic services, the fishery investigations and the marine laboratories. No doubt the large problems will have to be treated and solved on a planetarian scale. But the solution implies an enormous accumulation of local observations which even for the best studied regions appear to be insufficient.

By definition the marine sciences are truly international, and they are also expensive, thus justifying the need for cooperation across the borders.

Organization on the regional level demands a coherent parcelling out of the seas so that geographical limits of each international organization are duly defined, particularly in the tropical regions.

On the planetary level two types of institutions may be envisaged:

1. one type concerned with one discipline on a world level (e.g., the International Association of Physical Oceanography or the Association of Marine Biology to be established by IUBS), each with its specified object.
2. another type trying to unite various disciplines under a joint aim, in the present case the marine environment. This would correspond to existing committees like ‘Tropiques Humides’ and ‘Zones Arides’.

In view of the efficiency which Monod had experienced in the working of the latter committee, he had little doubt that a marine science committee would soon prove indispensable in bringing scientists together for discussions and planning of new programmes.

Monod felt it desirable to wait for the UNESCO meeting in Rome 9-10 May 1955 at which an “International Advisory Committee on Marine Sciences” would be discussed (this had been announced in a letter of 17 February 1955 to Bruun from Ronald Fraser, who believed that Bruun, Sverdrup and possibly Deacon would be invited to participate - cf. p. 18).

First Circular Letter and its consequences

By 4 March 1955, Bruun circulated a comprehensive letter to the members of the committee in which he outlined the terms of reference, briefly recorded the preceding

correspondence, outlined the tasks of the proposed UNESCO advisory committee, and asked for the members' opinion on A.V. Hill's proposal to establish a marine biology association under IUBS. Bruun also discussed the possibilities of a committee meeting in April or May in Copenhagen or Paris. Finally, in case the members regarded such contacts as necessary and useful, he asked Sverdrup and Deacon to address ICES, Monod to contact CIESM, and Revelle to approach the Standing Committee on Oceanography of the Pacific and other organizations in the Pacific area.

There are reply letters from Deacon, Sverdrup and Monod, who all comment on the dates of the committee meeting. As could be expected, Deacon's comments were extensive. Regarding the formation of an IUBS marine biology association, he thought this would be useful as a counterpart to IUGG's IAPO, just as IUBS's Section of Limnology has a physical counterpart in the Association of Hydrology. Most of the existing councils dealing with marine biology were intergovernmental bodies primarily concerned with immediate economic problems, and there was plenty of scope for a more open and academic forum. The meetings of IAPO went much deeper into physics than those of, for example, ICES, and the meetings of a new IUBS section might prove more appropriate for discussion of deep-sea biology⁸.

Referring to his previous statement, Deacon further stressed that the best thing to do would be to establish a committee to arrange a symposium on problems of joint biological and physical nature immediately preceding or following the General Assemblies of IUGG and IUBS, although he admitted that the next IUGG meeting was probably too far away to attract biologists from many countries. He also summarized the biological/physical items outlined in paragraph 2 of his statement, adding that these could no doubt be improved on. Finally, Deacon believed that Sverdrup knew the views of ICES better than he did and would be more able to help.

Sverdrup thought that the best approach would be, in cooperation with IUBS and IUGG, to arrange symposia at which problems could be clarified, and from which plans for international and national cooperation could be developed. He also promised to contact ICES; unfortunately I have not been able to trace Sverdrup's presumed correspondence with ICES, neither in the committee members' files, nor in the ICES files.

However, Monod's letter to CIESM is available. He addressed the Secretary General, Professor Georges Petit, to seek the commission's view on the different possibilities as outlined by Monod regarding the ICSU memorandum. In his reply, Petit welcomed the likely creation by UNESCO of the proposed consultative committee. He believed that the moment was ripe for a regrouping, being apprehensive of the growing apparatus of organizations working in a scattered fashion in the same environment. CIESM regarded its committee on the coordination of Mediterranean marine laboratories as very important and was therefore interested in the creation of the UNESCO committee. Petit does not comment on the three other items.

Finally, Bruun also sought the advice of Professor Louis Fage of the Paris National Museum regarding the relationship to ICES. Fage believed that with the chosen members of the Special Committee there was a good opportunity for the revival of the Joint Commission. This had in fact nothing to do with ICES, which was oriented towards practical goals and limited to shelf areas. As principal future tasks for the Joint Commission, Fage envisaged the following: to establish an organization for liaison between deep-sea scientists and their collaboration; to set up a central secretariat that should use *Deep-Sea Research* as its vehicle for distribution of information; and to organize international participation in research and expeditions.

It must have been a great relief for Bruun when Ronald Fraser informed him that the Bureau of ICSU, at a meeting in Washington in early March, in consultation with Revelle (who was present), had agreed not to press the committee to report to the Executive Board in August but to postpone it until the next Bureau meeting early in 1956. Revelle preferred to have the committee meeting before or after the meeting of the Special Committee for the International Geophysical Year (CSAGI) in September in Brussels. Fraser recommended a date following that meeting since new viewpoints might arise from the discussions.

Formation of IACOMS by UNESCO

At a meeting at FAO in Rome, 9-10 May 1955, experts invited by UNESCO considered the terms of reference and mode of operation of an International Advisory Committee On Marine Sciences, which is dealt with in some detail in Chapter 11 (p. 75). The meeting recommended the establishment of IACOMS to advise the Director General

⁸ Apart from these comments, the item of a biological counterpart to IAPO (later IAPSO) does not seem to have been further discussed by the committee, and it took almost ten years before an association for biological oceanography (IABO) was born in 1964 (Currie 1971), although Bruun had put forward the idea three years earlier at the First Assembly of the Intergovernmental Oceanographic Commission.

of UNESCO on the preparation and execution of its program, working closely with FAO.

UNESCO had invited all members of the ICSU Special Committee to participate in the Rome meeting; only Bruun and Sverdrup could attend, while Revelle was represented by Dr. Milner Baily Schaefer, Director of the Inter-American Tropical Tuna Commission. Immediately after the meeting Fraser contacted Bruun to ask for an interim report to be presented at the ICSU Executive Board meeting in Oslo in August. Fraser also mentioned that he and A.V. Hill were “somewhat disturbed at the line taken by UNESCO” and requested that a summary of the discussions in Rome be included in Bruun’s report.

Bruun replied that neither he nor Sverdrup felt that the recommendations at the Rome meeting would influence the work of the Special Committee at all. IACOMS would be only advisory, making recommendations to UNESCO, the small number of members (nine) indicated a limited scope of its activity, where the underdeveloped countries and FAO would be in the background all the time.

In Bruun’s Interim Report to ICSU of 20 June 1955 he said that, as anticipated, “the UNESCO committee will not make superfluous a possible special effort of international collaboration in deep-sea research under the auspices of ICSU or its unions.”

In addition Bruun summarized the background of the Special Committee and its previous and future work.

Special Committee meeting in Copenhagen, 16-17 September 1955

In his Circular Letters nos. 3 and 4 (28 June and 13 August) Bruun invited the committee members to meet in Copenhagen immediately after the CSAGI meeting in Brussels and gave details of practical arrangements. He had prepared no special agenda, adding that “the recommendation of the ICSU Joint Commission on Oceanography to ICSU and IUGG in 1954 may be taken as my general attitude towards the problems we are to discuss. Revelle and I were members of the JCO when it adopted the recommendation.”

Monod regretted that he was unable to attend. Fraser informed Bruun that according to Ing. Gén. G. Laclavère,

the Secretary General of IUGG, Sverdrup was unwell and would not be able to go to the meeting (which Fraser at the time thought would take place in Brussels). The ICSU Bureau had therefore nominated Laclavère to replace Sverdrup at the meeting.

However, Bruun had already received confirmation that Sverdrup would come to Copenhagen. This was important since Sverdrup was going to be elected President of ICES and was a leading scientist, equally appreciated by biological and physical oceanographers. Bruun welcomed the attendance of Laclavère, whom he considered to be particularly well informed on ICSU’s views, and Bruun would like Laclavère to get Fage to come instead of Monod (“think of poor me, an only and lonely biologist flooded by four geophysicists!”).

Fraser also informed Bruun that the ICSU Bureau felt it essential to have the committee’s report early enough to forward a copy to the meeting of the UNESCO Interim Advisory Committee in Tokyo in late October 1955. The Special Committee members had been invited to that meeting, but Bruun felt reluctant to present a report at the Tokyo meeting since there again the geophysicists would be in overwhelming majority, and many of the invited people did not have the same broad understanding of the joint interests of biologists and geophysicists as the members of the Special Committee. Fraser replied that he and A.V. Hill felt that Bruun need not worry about being the only biologist. Maurice Hill had been nominated as ICSU observer at the Tokyo meeting and had been briefed on the relations of ICSU to UNESCO. At the CSAGI meeting in Brussels advantage would be taken of a goodly number of oceanographers to discuss the question of a continuing program in the marine sciences, “so you have a good chance of returning to Copenhagen with a sound preliminary draft as a basis for the report of your committee”.

The meeting of the ICSU Special Committee on Deep-Sea Research was held on 16-17 September 1955 at the University of Copenhagen and attended by Bruun, Deacon, Revelle, Sverdrup, Laclavère and Masao Yoshida, representing UNESCO (Figure 2). Unfortunately, there is nothing whatsoever about the discussions in the files of the four committee members.



Figure 2. The meeting of the “ICSU Special Committee on Deep Sea Research”, 16-17 September 1955 in Copenhagen. From left: Mrs. Lisbeth Wolff (ad hoc secretary); Dr. George E.R. Deacon, Wormley, England; Prof. Roger Revelle, Scripps Institution of Oceanography, La Jolla, California; Dr. Anton Bruun, Zoological Museum, University of Copenhagen; Prof. Harald Sverdrup, Norwegian Polar Institute, Oslo; Ing. Gén. G. Laclavère, IUGG, Paris; Masao Yoshida, UNESCO, Paris. (WHOI Archive)

There are four surviving documents from this meeting. The following is about the establishment of a special committee of ICSU:

Report To ICSU From The Special Committee On Deep-Sea Research

We consider that an organization to promote cooperation in the oceanic sciences between IUBS and IUGG would be too limited.

The main problem is to apply recent great developments in all the basic sciences to the study of the oceans to bring about a new level of understanding of the earth and of living organisms. In the field of biology, the genetics and physiology of individual organisms, the dynamics of populations, the problems of reproduction, growth and adaptation, all require greater knowledge of oceanic plants and animals, and of their environments. Such knowledge will throw a new

light on the results of many years of study of terrestrial organisms, and will give a better understanding of the evolution and distribution of plants and animals. In the study of the earth, problems of the origin and history of continents and ocean basins, of forces deep within the interior of the earth which form mountains and bring about earthquakes and volcanism, and of processes and changes in the atmosphere and hydrosphere, cannot be solved without extensive exploration of the oceans.

To attain these goals international collaboration between scientists of many different disciplines has already proved fruitful and will be more necessary in the future. Much of this collaboration has been carried on by the IAPO and the Joint Commission of Oceanography, but remembering especially the needs for collaboration between geophysicists in general, biologists, physicists, chemists and geologists, and the necessarily limited objectives of

the IAPO, we recommend the establishment of a special committee of ICSU to be called the Special Committee for Oceanic Research. This committee would deal with those aspects of oceanic science that cannot be handled effectively by IAPO or by any other existing international body.

The primary function of the committee would be to foster international cooperation in attacking problems of the oceans that require knowledge from many branches of science. To accomplish this, the Special Committee would endeavour:

- 1. to enlist the participation in oceanic research of scientists of many disciplines who have developed techniques which show promise of application to problems of the sea;*
- 2. to initiate meetings and conferences at which topics of interest to different disciplines would be discussed, the meetings to be arranged in cooperation with international unions and with other scientific organizations;*
- 3. to encourage publications in which scientists of different disciplines concerned with problems of the oceans could communicate with one another;*
- 4. to further international collaboration in inter-disciplinary programs of oceanic research.*

The activities of the proposed Special Committee cannot be isolated completely from those of organizations such as UNESCO, ICES and others interested in fundamental research in oceanic science, but we consider that because of its non-governmental character the Special Committee could usefully supplement their work.

We believe that besides ICSU the following unions should be represented at the beginning: IUBS: 3; IUGG: 5 (of which 2 should represent IAPO); IUPAP: 1; IUPAC 1; IGU: 1.

We consider that it is not necessary at the moment to appoint representatives of IAU, IUPS, IUB and IUTAM.⁹

Copenhagen, 17 September 1955.

<i>Fr. Bruun</i>	<i>R. Revelle</i>
<i>G. E. R. Deacon</i>	<i>H.U. Sverdrup</i>
<i>G. Laclavère</i>	

The solid foundation laid by the JCO is clearly demonstrated when comparing this report with the recommendation (p. 9) that was submitted by JCO during the 1954 Rome meeting and which caused so many disturbances in the ICSU Executive Board.

Apart from minor changes, the second paragraph of the report is identical to the first part of the JCO recommendation. The reference to IAPO in the third paragraph is new, and of course the name of the proposed new body is different, Special Committee for Oceanic Research being used for the first time. The four tasks are also the same, apart from minor changes in wording and item 4 being less specific. The three concluding paragraphs are all new.

The three other documents from the Copenhagen meeting are (a) a printed report on the meeting in Rome 9-10 May 1955 on the creation of an advisory committee under UNESCO, which also contained the above mentioned report on the Copenhagen meeting; (b) a report on the same meeting written by Laclavère; and (c) a paper to consider the terms of reference and mode of operation of the said committee. They are all further described in Chapter 11.

⁹ Unions of Astronomy, Physiological Sciences, Biochemistry, and Theoretical and Applied Mechanics.

CHAPTER 3

The Transition from the ICSU Special Committee on Deep-Sea Research to the Establishment of SCOR

After the 1955 Copenhagen meeting, there was apparently no immediate reaction from ICSU. There is an extraordinary and regrettable lack of letters and documents in the Bruun, Deacon and Revelle files to which I have had access.

Roger Revelle informed me that, unfortunately, there was a hiatus in his memory of details of what happened between the Copenhagen meeting and the International Geophysical Year (IGY) meeting at Gothenburg in January 1957. He does recall, however, that while the preparations for the oceanographic part of IGY 1957-1958 were well underway in 1956, the American geophysicist Lloyd Berkner, then President of ICSU and generally regarded as the "inventor" of IGY, approached Revelle on behalf of ICSU. Berkner suggested that, as one of the continuations of IGY, there should be an international cooperative program in oceanography, and ICSU wanted Revelle to organize a special committee for this purpose. Lloyd Berkner's approach to Revelle is also recorded by Behrman (1981: 11) and Charnock (1984: 124).

Oceanography in the first planning phase of IGY

Thus, IGY and the activities connected with preparing it played an important role in the prolonged establishment of SCOR. A short review of these activities up to 1956 may therefore seem appropriate in this place.

During the first two International Polar Years (IPYs), 1882-1883 and 1932-1933, oceanography and hydrography had only been minor programs in addition to the main scientific tasks: studies of meteorology, aurora and geomagnetism. IGY, the successor of the IPY, had a much wider and more coordinated program. Its main idea was to cooperate in studies that demanded worldwide networks of observations.

In 1952, ICSU established a Comité Special de l'Année Géophysique Internationale (CSAGI), but at its first meeting in 1953 proposals for a program of oceanic research¹⁰ were so few that the report indicates: "It does not appear that oceanographic observations are likely to be actively pursued, unless additional countries are prepared to participate" (Baker 1983: 297).

IAPO set up a "Working Group on Oceanography of CSAGI" with Admiral E.H. Smith, Director of Woods Hole Oceanographic Institution, as Chairman, George Deacon as

Secretary and G. Laclavère as oceanography correspondent of CSAGI. In 1954, the Group made the following recommendations for studies during the IGY (Deacon 1954):

1. *Long-period oscillations of sea level, including both seasonal and year-to-year fluctuations*
2. *Deep water circulation in the equatorial region*
3. *Processes involved in the shifting of the boundary region between temperate and arctic waters and in the warming of the Arctic.*

Measurements of electric current fields in the ocean might also be included. Studies of the CO₂ balance between the atmosphere and the sea and the amount and composition of dust reaching the ocean surface were left to be carried out by others due to the pressure of other commitments on the oceanographers.

In September 1955, the Working Group met at the CSAGI meeting in Brussels. Plans were further advanced, and the meeting produced the surprising information that about 50 vessels from at least 15 nations were scheduled to participate.

At the CSAGI meeting in Barcelona in September 1956, it was decided that the water circulation program was to consist of three main objectives:

1. *Changes during the last decades of physical and chemical properties at all depths in the main ocean basins*
2. *Information about the balance between Arctic and temperate currents in the Atlantic and Pacific oceans*
3. *Monitoring of new methods for measuring water velocities and transport in the subsurface and deep layers of the ocean.*

Furthermore, the Working Group stressed the need for an extended program in the Southern Hemisphere, particularly the Indian Ocean, including establishment of tide gauges in these regions (Deacon 1956b, Laclavère 1969).

Formation of the "ICSU Special Committee on Oceanic Research"

The Special Committee that Lloyd Berkner had invited Revelle to set up was recommended in an undated Draft

¹⁰ One proposal was the recommendation of the Joint Commission to collect water samples for the study of radioactive contents.

Resolution from the Bureau of ICSU to the ICSU Executive Board.

The Committee's provisional terms of reference corresponded exactly to those formulated in the report from the Copenhagen meeting of the ICSU Special Committee on Deep Sea Research, with the addition that "The Committee should be authorized to encourage the formation of national committees to further the extent of scientific cooperation, or regional groups of national committees to deal with special local problems".

The membership would be as follows:

BUREAU:

President: Prof. R. Revelle
Vice President: Dr. A.F. Bruun (if willing to serve)
Vice President: Prof. L. Zenkevitch¹¹
(if willing to serve)
Secretary: Dr. M.N. Hill¹²
Member: The President of ICSU or a member of the Bureau of ICSU designated by him.
Ordinary members: 7 ordinary members to be appointed by the Bureau of ICSU from a list of persons nominated by IUBS, IUGG, IUPAP, IUPAC and IGU¹³

Finally, the Draft Resolution stated that UNESCO would be invited to send an observer to all meetings of the Committee and that the Committee would be requested to furnish a more detailed program of oceanic research to the Bureau and to recommend a budget needed for administration over a 5-year period.

The proposed terms of reference were drastically altered at the meeting of the Executive Board of ICSU in June 1956. They now ran as follows:

The task of SCOR would be to frame a five year programme for a cooperative effort in oceanic research, to initiate action on a national basis through the National Members of ICSU, and to organize such meetings and to authorize such publications as may be necessary for the completion of the program.

Furthermore, the first four proposed members of the Committee Bureau were adopted, while the ICSU member was dropped.

The Executive Board decided on the following representation of the Unions:

IUGG 4 (2 nominated by IAPO)	IUPAP 1
IUBS 2	IUPAC 1
IGU 1	

On 27 June 1956 Maurice Hill forwarded a list with proposed names to Revelle and Deacon. In addition to those appearing on the final list (Bruun, Revelle, Zenkevitch, Deacon, Rossby, Böhnecke, Mosby, Steemann Nielsen and Le Grand) it included Mary Sears, a Japanese (but not Hidaka because Hill thought that overlap with membership of the Marine Sciences Committee of UNESCO should be avoided), a Canadian and Wyrski. In his reply, Deacon strongly recommended Hidaka and welcomed the idea of including a member from UNESCO which would facilitate "the inevitable process of amalgamation". Deacon was not in favour of ICSU's suggestion regarding regional groups of National Committees: "UNESCO has to think about such things, but ICSU ought to have the most active and stimulating men from each aspect of the subject wherever they live". In Hill's final letter he noted that with restricted overlap of members there would be a desirable competitive spirit between the two committees. From a list of 18 representatives of the unions, nine were selected and the list forwarded to ICSU by Revelle.

In late October 1956, the first meeting of the Bureau of SCOR was scheduled for 18 January 1957 during the meetings of the CSAGI Working Group on Oceanography at the Oceanographic Institute, Gothenburg, Sweden.

First (and only) meeting of the Bureau of SCOR, Gothenburg, 18 January 1957

In addition to four members of the Bureau, no less than 47 persons had accepted the invitation to be present as observers at the meeting, that is, almost four-fifths of the participants in the CSAGI meeting. Their names appear in the caption of Figure 3. Other photographs from the meeting are shown in Figure 4.

The agenda contained the following items:

1. *Consideration of specific subjects of deep sea research where international cooperation in a five-year programme is desirable. The following are tentatively suggested. This list may not be complete and it is hoped that members of the Bureau and others attending the meeting may have additional subjects which can be added to the list.*
 - a. *The measurement of the magnitude and direction of deep currents.*

¹¹ Institute of Oceanology, Moscow.

¹² Department of Geodesy and Geophysics, University of Cambridge (son of Prof. A.V. Hill, p. 13).

¹³ Unions of Biological Sciences, Geodesy & Geophysics, Pure & Applied Physics and Chemistry, and Geography.

- b. The exchange of carbon dioxide between the sea and air.
- c. The standing crops and the productivity of the sea.
- d. Long period and short period changes in sea level.
- e. The vertical and horizontal distribution of minor chemical elements in the oceans.
- f. The methods of propagation of long period waves.
- g. The period of vertical circulation of oceanic water.
- h. Climatic changes and their effects upon the oceans.
- i. The planning of the areas of oceanic

exploration.

2. Consideration of methods for the accomplishment of the international cooperation through National Committees which will be necessary in the full investigation of items suggested under (1).
3. Consideration of the organization of scientific meetings of wider scope than would be organized by, for example, IAPO or IUBS, to cover those investigations in which international co-operation is desirable or has been carried out.
4. Consideration of international standardization of methods of exploration, for example, of the methods of plankton sampling or of the construction of tide gauges of a uniform type.
5. Other matters.



Figure 3. Participants in the SCOR Bureau meeting in Gothenburg, January 1957. (Used with permission of the Oceanographic Institution, Gothenburg)

- | | | | |
|-----------------------------|----------------------------------|----------------------------------|-----------------------------|
| 1. Vladimir Kort, USSR | 17. Börje Kullenberg, Sweden | 33. Achibald Day, CSAGI | 49. E. Debrazzi, Italy |
| 2. Helge Thomsen, Denmark | 18. I.R. Lumby, UK | 34. ? | 50. J. Adem, Mexico |
| 3. John B. Tait, UK | 19. W. Bascom, USA | 35. Paul Tchernia, France | |
| 4. Ilmo Hela, Finland | 20. Maurice N. Hill, UK | 36. V. Troitskaia, USSR | Attending and probably in |
| 5. Dale F. Leipper, USA | 21. Stanislaw Szymborski, Poland | 37. Bert Bolin, Sweden | the picture: |
| 6. Anton F. Bruun, Denmark | 22. Columbus Iselin, USA | 38. Koji Hidaka, Japan | Cdr. Carlos Chubretovich, |
| 7. Fritz Koczy, Sweden | 23. Yasuo Miyake, Japan | 39. W. Hansen, FRG | Chile; |
| 8. Roger Revelle, USA | 24. M.J. Piccard, Switzerland | 40. Luis R.A. Capurro, Argentina | Capt. Manoel A. Dias, |
| 9. T. Laevastu, FAO | 25. Georg Wüst, FRG | 41. Marc Eyriès, France | Portugal; |
| 10. Lev Zenkevitch, USSR | 26. K. Zagrodski, Poland | 42. V. Lednev, USSR | Dr. C.G. Hide, South Africa |
| 11. J.N. Carruthers, UK | 27. Håkon Mosby, Norway | 43. Günther Böhnecke, FRG | (probably no. 34). |
| 12. Masao Yoshida, UNESCO | 28. Carl-Gustaf Rossby, Sweden | 44. Kanji Suda, Japan | Attending, but not in the |
| 13. Georges Laclavère, IUGG | 29. Nils G. Jerlov, Sweden | 45. Gordon G. Lill, USA | picture: |
| 14. John Lyman, USA | 30. George E.R. Deacon, UK | 46. ? | Prof. Harald U. Sverdrup, |
| 15. Pier Groen, Netherlands | 31. ? | 47. ? | Norway; |
| 16. Maurice Ewing, USA | 32. G. Aliverti, Italy | 48. Robert S. Dietz, USA | Dr. Henry Charnock, UK. |



Figure 4. *From the SCOR Bureau meeting in Gothenburg, January 1957.*

Top picture, from left: Carl-Gustaf Rossby, Gordon G. Lill and Börje Kullenberg.

Bottom picture: Anton F. Bruun, Georges Laclavère, probably George Deacon, E. Debrazzi, Börje Kullenberg, Stanislaw Szymborski and Columbus Iselin. (BILDservice, Gothenburg)



Thus, the agenda included most of the recommendations from the Copenhagen meeting (techniques to be applied, holding of meetings and international collaboration), but left out the encouragement of publications. It also introduced the idea of working through National Committees that was put forward in the Draft

Resolution from the Bureau of ICSU.

The discussion during the meeting was long and revealed a considerable number of interesting viewpoints. Fortunately, the Bruun files contained the following review, which was probably drawn up by Maurice Hill, Secretary of the Bureau¹⁴.

¹⁴ An introduction explaining the background for the meeting has been left out.

Abstract of the Discussion at the First Meeting of the Bureau of The Special Committee on Oceanic Research of the International Council of Scientific Unions Held at Gothenburg on January 18th, 1957

The meeting was opened by Dr. R. Revelle, the President of SCOR, who was in the Chair. He outlined the primary reasons why ICSU had suggested that SCOR should be formed. These were:

a. that ICSU considered that international cooperation in field programmes in oceanography should be continued after the end of the IGY on a broader basis and for a longer period;

b. that ICSU considered that the existing international scientific organizations were not entirely suited to implementing the programme since no one of them covered the breadth of subject material which was needed;

c. the CSAGI Committee of ICSU had had great success in the organization of the IGY, and it was considered that the future programme in oceanography could best be undertaken by a committee operating on a similar basis.

With these considerations in mind ICSU called together an Advisory Committee consisting of A.F. Bruun, G.E.R. Deacon, G. Laclavère, R. Revelle and H.U. Sverdrup. This Committee met in Copenhagen in 1955 and made recommendations from which the proposed constitution of SCOR developed. ICSU did not believe that SCOR should be a permanent organization and for this reason a programme limited in time had been recommended.

It was apparent that SCOR would not be able to reach its objective unless it had the support of existing international organizations and for this reason Revelle welcomed the opportunity presented by the gathering of oceanographers at Gothenburg for the first meeting of the Bureau of SCOR. The present meeting consisted only of the Bureau of SCOR rather than the whole Committee on account of ICSU having failed so far to ratify the proposed list of names.

Deacon criticized the Executive Committee of ICSU for not having more consultation with oceanographers before producing the terms of reference. For example, he drew attention to fact that the Committee which met at Copenhagen did not recommend that a five-year programme should

be undertaken; on this point Sverdrup said that he thought a five-year programme was putting an obligation on SCOR which was impossible to fulfill. Deacon also disapproved of the term "Bureau" and the fact that officers had been appointed by ICSU; he disapproved of this type of bureaucracy and he did not believe that SCOR could function successfully unless it was a strictly democratic committee elected by oceanographers. Hidaka supported some of Deacon's criticisms and urged that SCOR should be a much larger organization. Hidaka nevertheless felt that Japan would like to support SCOR. In spite of these criticisms Deacon was responsible for suggesting the proposal which was approved at the conclusion of the meeting.

Mosby was worried by some of the items suggested as suitable subjects for SCOR since he considered these were fundamentally the responsibility of the IAPO. After a considerable discussion it was however apparent that it was generally felt that although some of the items were not perhaps suitable for SCOR, IAPO was not itself in a position to attempt the implementation of a programme of international collaboration and coordination such as that proposed as the task of SCOR. The reasons for this were (a) that inter-Union collaboration was not the task of IAPO and (b) that it was not the main purpose of IAPO to organize and encourage inter-disciplinary international field programmes in oceanography.

Mosby also suggested that if SCOR was to succeed then it must frame a detailed programme of what it intended to do. Without this he believed that SCOR would fail. He believed that part of the reason for ICSU abolishing the Joint Commission on Oceanography lay in the fact that the Joint Commission produced broad suggestions rather than framing concrete problems. Laclavère supported this view.

Rosby and Laclavère believed that an example of two existing organizations which were complementary in their functions in a similar way to that in which IAPO and SCOR might be, were the Meteorological Association of IUGG and the World Meteorological Organization. The former was essentially a discussion group and the latter arranged for the collection of information from all over the world. After discussion it appeared that the meeting did not believe that it should be SCOR's task to collect synoptic information concerning the oceans in a manner similar to that of WMO in meteorology. There was, however, in these two meteorological organizations a good example of

the type of relationship which should exist between IAPO and SCOR. Rossby considered that ICSU was applying pressure to ensure that oceanographers should find the wherewithal to make rapid strides in deep-sea exploration by international collaboration.

Bruun remarked that although the physical oceanographers to some extent disapproved of the formation of SCOR this was not true of the marine biologists and meteorologists. He greatly welcomed the opportunity which SCOR would provide for the interchange of ideas and the cooperation, hitherto inadequate, between biologists and physicists.

Iselin and Sverdrup suggested that an important contribution that SCOR might make would be in arranging for young scientists to meet together for discussion and for undertaking joint practical work. Sverdrup hoped that ICSU might emphasize this aspect of the recommendations made by the Copenhagen Committee.

Lednev and Kort remarked that at present oceanographic investigations were distributed among many uncoordinated organizations and this was inconvenient and inefficient. Oceanographers should be concerned with the "World Ocean"; it should not be sub-divided, nor should the subject matter be compartmented into biology, geology and physics. Zenkevitch and Bruun supported this concept of the "World Ocean" and the collaboration and interchange of ideas between the various disciplines. They considered that therein lay the opportunities for SCOR.

Kort hoped that the meeting would support the formation of SCOR. He considered that the three main and urgent tasks of SCOR were

- a. the working out of basic problems
- b. the coordination and collaboration of contemporary research in oceanography
- c. the development of uniformity in the methods of oceanographic research.

He did not believe that any existing organization could undertake this work. Carruthers, on the other hand, questioned whether there really was a need for a new organization.

Revelle thought that the example of the cooperative effort of oceanographers during the IGY should be a guide to what SCOR could do. Without the stimulation of CSAGI it would not have been possible for the IGY Working Group on Physical Oceanography of IAPO to have been formed.

Zenkevitch considered that the three important inter-related tasks facing the oceanographers were:

- a. the history of the "World Ocean"
- b. the circulation of the water masses
- c. the biological structure and productivity of the oceans.

Revelle suggested that these three problems could be framed in a different way so that they could be clearly seen to be problems of society in general. Thus, he considered that the three problems were:

- a. climatic changes and the role of the ocean therein
- b. the exchange between the surface water and the deep water from the point of view of pollution by radioactive waste
- c. the fertility and productivity of the sea.

He also believed that SCOR would be essentially a liaison committee which was not going to be able to do much actively at sea either directly or by providing financial aid. It could, however, fill an essential role in supplementing and encouraging national activities.

Rossby suggested that the approach to particular problems might be made by a group of individuals working in one of the more broadly based institutions writing a paper for wide distribution on the methods by which world-wide problems could be solved. This suggestion was supported by Zenkevitch and Hidaka. It was suggested, for example, that Stommel at Woods Hole and Ewing at the Lamont Geological Observatory might respectively suggest world-wide programmes for deep current measurements and oceanic seismic investigations. Revelle drew attention to the excellent report produced by the Russian delegation concerning the problems confronting oceanographers and suggestions as to the methods by which they could be solved. He considered it desirable that other nations should produce similar documents.

Eyriès did not believe that the proposed constitution could allow SCOR to operate satisfactorily and he did not believe that a new international organization was necessary. He thought that the successful organization of the IGY lay in part in the fact that it was limited to approximately one year. For a continuing programme he believed that there would be less

national support. He thought it possible that SCOR might seek and obtain money for problems which could be left to the choice of IAPO. This suggestion was not acceptable to the meeting as a whole and the following proposal concerning the general attitude of the meeting to the formation of SCOR was adopted. This proposal was in essence formulated by Deacon and reached its final form after considerable discussion.

“It was agreed that there is need for a new organization to promote and strengthen international research in marine science and to initiate new work in consultation with the scientific unions and other organizations.

It is intended that in planning and activating the research programme a principal role will be played by relevant national bodies.

It is suggested that in the terms of reference formulated by ICSU for SCOR the words “five year” should be eliminated.”

The meeting ended with a request from Deacon that ICSU be informed that the meeting at Gothenburg believed that ICSU appears to be moving extremely slowly. During the course of the discussion this feeling had been expressed by other speakers as well.

Masao Yoshida, who represented UNESCO, afterwards prepared a report to UNESCO on his mission to Gothenburg. In his summary of the discussion at the Bureau meeting he referred to a number of observations which were not fully recorded in the above Abstract:

“Some felt that the recommendations presented to ICSU after the preparatory meeting in Copenhagen ... were not followed by ICSU. A participant [in the Gothenburg meeting] had received the impression that a small group of oceanographers had been “conspiring” to set up an organization without consulting a representative group of scientists in the field. Another expressed apprehension lest SCOR might attempt to dictate to the Unions on questions related to oceanic research. One idea was that SCOR might be utilized for putting pressure on ICSU to have more funds diverted to sea sciences ... It was then remarked that the existing Unions and Associations were all more or less occupied in the publication of work done in the past, while SCOR would be the first of its kind to be primarily devoted to planning ahead for work to be

done in the future ... Others did not see why IAPO could not change its policy and start planning ahead as well as publish results of past work, while inter-disciplinary and inter-union questions could be tackled case-by-case by ad hoc committees.”

When comparing the agenda for the SCOR Bureau meeting with the three final resolutions and the contents of the discussion, a number of facts appear noteworthy:

1. The resolutions neither refer to consideration of methods or their standardization, nor to organization of meetings.
2. They do, however, emphasize the importance of national bodies.
3. In Revelle's formulation during the discussion of specific subjects, regard to the requirements of society in general is emphasized. As a result, he only retains two of the problems outlined in the agenda, climatic changes and productivity of the sea, introducing as a third subject, not mentioned before, research related to pollution by radioactive waste; this problem was the subject of an expert meeting the two following days.

Revelle's suggestion of members of the Committee was considered and the following representatives of the Unions were proposed:

IUGG: C.-G. Rossby (Sweden), G.E.R. Deacon (UK), G. Böhnecke (Germany), B. Kullenberg (Sweden)

IUBS: E. Steemann Nielsen (Denmark), Th. Monod (France)

IGU: C.O'D. Iselin (USA)

IUPAP: Y. Le Grand (France)

IUPAC: N.W. Rakestraw (USA).

IGY discussions at Gothenburg

Prior to the Bureau of SCOR meeting, the IGY Working Group on Oceanography had met for three days. Columbus O'D. Iselin, the new Director of the Woods Hole Oceanographic Institution, was elected Chairman of the working group. The previously adopted programs (sea level, long waves, deep water circulation, Polar Front survey, and multiple ship measurements) were discussed and supplemented by several new proposals: CO₂ measurements at sea, measurements of radioactivity, biological observations and determination of standing crop and composition of plankton, scientific exploitation with bathyscaphes, and wave observations. Opportunities for special investigations in the Indian Ocean were reviewed, publication of results was discussed, and international

exchange of scientists and exchange of data through the IGY World Data Centers were recommended. A full report of the meeting is found in Annals of the IGY, Vol. IIB (1959); Iselin (1956-57) gave a short review, and Baker (1969) recorded the principal objects of the various sections.

In the above-mentioned report by Yoshida to UNESCO, he concluded his summary of the IGY WG meeting with the following personal remarks:

It was my general impression that the meeting was predominated by oceanographers against a small number of persons who were in charge of the actual ship operations, the result being that the Group kept adding new schemes to the already heavily loaded IGY programme. The oceanographers could not resist the unique opportunity of trying out all the new methods and techniques that had recently been developed, in spite of the apprehension held by those in charge of the operations that many of the plans being added at this late date could never be effectively carried out.

After the Bureau of SCOR meeting, about 20 experts participated in a two-day meeting on Information Bearing on Sea and Ocean Disposal of Radioactive Wastes, chaired by Revelle and with Yoshida as Secretary.

ICSU's final move

After returning from the January 1957 Gothenburg meeting, Deacon wrote to D.C. Martin, permanent secretary of the Royal Society (U.K.) where a meeting of the British National Committee on Oceanic Research was scheduled for late February, with the participation of Sir Harold Spencer Jones, Secretary General of ICSU, having succeeded A.V. Hill. Deacon referred to the strong criticism of ICSU in Gothenburg, particularly the terms of reference of the new committee and ICSU's failure to mention the inter-union cooperation that was the chief object of the committee set up by ICSU in 1955. It was felt that "ICSU had allowed room for the suspicion that it was fostering the conspiracy of small groups rather than seeking agreement on broad lines". All disliked the idea of a Bureau and preferred a representative committee on which the ICSU members had the same standing as those of the unions. Deacon also mentioned the arguments raised against establishing a new organization.

On 12 February 1957, Revelle commented to Maurice Hill on this letter, of which he had received a copy. He believed that the difficulties stemmed from a series of

misunderstandings: (1) that the agenda for the Gothenburg meeting represented official action by ICSU rather than simply suggestions for discussion; (2) that the Bureau of SCOR would dominate its activities instead of just serving as a simple administrative device to get things started; and (3) that SCOR would attempt to limit or supersede the work of IAPO. Revelle wrote: "For the good of marine sciences and the welfare of mankind we must use every device available to enlist interest, disseminate understanding, and recruit able investigators, and no international organization can do more than part of the job ... George Deacon is the most dedicated promoter of the marine sciences I know. I hope with all earnestness that he can be persuaded that SCOR will help in winning his own lifelong crusade".

The meeting of the British National Committee was, according to Maurice Hill in a letter to Bruun, "stormy" and there was little enthusiasm for a new committee or for what had happened since the Copenhagen meeting.

Shortly afterwards ICSU, through Spencer Jones, once again changed the terms of reference of the Committee. They appear as paragraph 1 in the document "Suggested Framework for the Constitution of SCOR" which was released by ICSU in early March; they ran as follows:

SCOR is a Special Committee of ICSU charged with furthering the coordination of scientific activity in all branches of oceanic research, with a view to framing a scientific program of world-wide scope and significance of not less than one year's duration. In framing its program, SCOR will take care to acknowledge the autonomy of other existing international bodies.

Paragraph 2 of the "Framework" gives the following representation of ICSU and the Unions on the Committee:

ICSU 4; IUGG 2; IUBS 2; IUPAP 1, IGU 1, IAPO 2.

In the list of the twelve designated members, those appointed by ICSU are Bruun, Revelle, Zenkevitch and M.H. Hill (Secretary pro tem.). Thus, the so-called Bureau now consisted merely of these four members. The first three are no longer President or Vice-President, and Hill was Secretary only until the election of a Secretary at "the first full meeting of SCOR in the United States in mid-September".

Paragraphs 3-12 are recorded below (pp. 36-37). They had been formulated at the meeting of the Bureau of ICSU in New Delhi, India on 7-9 January 1957. The only significant difference is that the introductory paragraph in the

“Framework” deals with the Steering Committee, whereas in the original version it ran as follows: “The SCOR is a **Program Committee**, responsible for planning the scientific activities of the enterprise. Its members sit in a personal capacity” (Minutes of the New Delhi meeting).

Deacon’s attitude after the U.K. National Committee meeting is reflected in two letters. He still believed that ICSU could do a lot of good by arranging symposia of joint interest to biological and physical oceanographers rather than being “fascinated with the idea of a grand international operation, which might be worth while considering in another ten years’ time”. He also questioned an international authority to plan research. No one can organize oceanographic research, and SCOR’s main aim should be to encourage successful workers in all aspects of science to become interested in applying their skill to marine problems, a much more promising line than five-year plans.

At the meeting of the Executive Board of ICSU in Brussels in June 1957 the constitution of SCOR was reconsidered. The above terms of reference were maintained, except that “of not less than a year’s duration” was deleted and the following word “framing” replaced by “establishing”.

The nominations by ICSU were increased from four to six in order to achieve a better balance of the geographical distribution of members. ICSU adopted the following list of members:

Nominated by

ICSU:	<i>Dr. A.F. Bruun</i>	<i>Denmark</i>
	<i>Commander R.A. Capurro</i>	<i>Argentina</i>
	<i>Dr. Y. Miyake</i>	<i>Japan</i>
	<i>Dr. N.K. Pannikar</i>	<i>India</i>
	<i>Dr. R. Revelle</i>	<i>USA</i>
	<i>Prof. L. Zenkevitch</i>	<i>USSR</i>
IUGG:	<i>Dr. M.N. Hill (Sec. pro tem.)</i>	<i>UK</i>
	<i>Dr. G.E.R. Deacon</i>	<i>UK</i>
	<i>Prof. C.-G. Rossby</i>	<i>Sweden</i>
	<i>Dr. G. Böhnecke</i>	<i>FRG</i>
IUBS:	<i>Prof. H. Mosby</i>	<i>Norway</i>
	<i>Prof. E. Steemann Nielsen</i>	<i>Denmark</i>
	<i>Dr. N.B. Marshall</i>	<i>UK</i>
IUPAP:	<i>Prof. Y. Le Grand</i>	<i>France</i>
IUPAC:	<i>Dr. N.W. Rakestraw</i>	<i>USA</i>
IGU:	<i>Dr. C.O'D. Iselin</i>	<i>USA</i>

CHAPTER 4

The Child is Born: The First Meeting of SCOR

On the suggestion of Maurice Hill, the opening meeting of SCOR was held at the Woods Hole Oceanographic Institution (WHOI) on 28-30 August 1957. It was attended by all the above SCOR members listed at the end of the previous chapter, except Prof. Rossby (who had suddenly died on 19 August), Dr. Panikkar and Prof. Le Grand. Also

present were Dr. Ronald Fraser, Administrative Secretary of ICSU, Dr. R.L. Zwemer from the Natural Sciences Department of UNESCO and a number of scientists from WHOI. The meeting was chaired by the Director of WHOI, Dr. C.O'D. Iselin. The SCOR members are shown in Figure 5.



Figure 5. Participants in the First SCOR Meeting at Woods Hole, Mass., 28-30 August 1957.

First row (left to right): Prof. Lev Zenkevitch, USSR; Dr. Norman B. Marshall, UK; Dr. Günther Böhnecke, FRG; Dr. Ronald Fraser, ICSU; Dr. Anton Bruun, Denmark; Dr. Yasuo Miyake, Japan; Dr. Norris W. Rakestraw, USA.

Second row: Dr. Paul S. Galtsoff, USA; Dr. Columbus Iselin, USA; Prof. Roger Revelle, USA; Dr. Maurice N. Hill, UK; Prof. Håkon Mosby, Norway; Commander Luis R.A. Capurro, Argentina; Dr. George E.R. Deacon, UK; Prof. Erik Steemann Nielsen, Denmark. (WHOI Archive)

The agenda was as follows:

1. Election of Chairman.
2. Adoption of the agenda.
3. Consideration of Prof. Zenkevitch's paper.
4. Consideration of projects where international and interdisciplinary collaboration might be desirable in an oceanographic program:

- a. Meteorology and its relationship to the circulation of the oceans.
- b. The deep circulation of the oceans.
- c. CO₂ exchange between the air and the ocean.
- d. The need for international cooperation in the solution of the biological problems of the World ocean.
- e. Light penetration into the ocean: its physical

- and biological effects.
- f. Physico-chemical problems.
 - g. The productivity of the oceans.
 - h. The artificial radioactivity of the oceans.
 - i. Bottom topography.
 - j. Geological and geophysical exploration of the ocean floor.
 - k. Other scientific projects.
5. Detailing of those projects suitable for inclusion in a SCOR program, and the timing of the program.
 6. Consideration of those problems which are inadequately investigated but which are the responsibility of existing organizations.
 7. Discussion of the ICSU proposals for the constitution of SCOR.
 8. Nominations for, and the election of, the Cabinet of SCOR.
 9. The relationship between SCOR and other international organizations such as ICES, IAPO, IACOMS, &c.
 10. The formulation of the recommendations to be forwarded to the 13th meeting of the Bureau of ICSU.
 11. Other matters.

Footnote to agenda:

It is hoped that members of SCOR and others who may be invited to the meeting will be prepared to speak, or table papers, on those subjects outlined in Item 4 of the agenda in which they are interested.

Framing a scientific program of world-wide scope and significance

The projects listed in the agenda were mainly concerned with areas not covered by the IGY. Only about half of the specific subjects on the agenda of the Gothenburg meeting of the Bureau were included.

Although he had presented his ideas orally, Prof. Zenkevitch's paper (item 3) outlined his views of the three most central and urgent problems related to many marine sciences, and presents in tabular form the topics of each, the basic methods, the questions to be solved and additional questions.

1. **History of the World Ocean** (cf. Zenkevitch 1956). Topics: Nature of bottom deposits; Processes of sedimentation; Bottom configuration and tectonics; Composition and distribution of the deep-sea fauna.
2. **Circulation of water masses.** Topics:

Microstructure; Mutual adjustment of fields of mass and currents; Influence of bottom configuration on the direction of currents; Turbulence and mixing processes; Deep water circulation and its relation to circulation of surface layers; Role of non-mechanic factors; Influence of atmospheric circulation and thermal interaction between ocean and atmosphere; Methods.

3. **Biological structure and productivity.** Topics: Rate of productivity; Factors determining primary production; Quantitative and qualitative horizontal and vertical distribution of organisms in time and space.

On the request of Maurice Hill, designated members of SCOR had prepared background papers for the discussion of item 4. The following were present in the files:

- R. Revelle: "Some problems of carbon dioxide in the air and the sea" (23 pp.) (item 4c)
- A.F. Bruun: "International cooperation is needed in the solution of biological problems" (two different papers, 2 pp. each) (item 4d)
- Y. Le Grand: "Optics of the sea" (1/2 p.) (item 4e)
- E. Steemann Nielsen: "Problems concerning oceanic productivity" (5 pp.) (item 4g)
- "Oceanographic knowledge with a bearing on the oceanic disposal of radioactive waste" (summaries of a report to the United Nations Special Committee on the Effects of Atomic Radiation (UNSCEAR) (H. Charnock); Selection of suitable ocean disposal areas (G. Dietrich); Transport and mixing of materials in shelf waters (J. Joseph); Current velocities, volume transport and mixing effects in Atlantic deep-sea physical processes (G. Wüst); Ocean dangers in using atomic energy (M. Fontaine); Fission products in water and organisms (Y. Hiyama); Effects on abyssal and hadal faunas (A.F. Bruun); Contribution from FAO Fisheries Biology Branch; Outline of U.S. report to UNSCEAR) (item 4h)
- M.N. Hill: "Exploration of the ocean floor" (2 pp.) (item 4i)
- E.C. Bullard: "Heat flow through the floor of the sea" (1/2 p.) (item 4j).

The results of one and a half days' discussion of agenda items 4-6 were the main contents of the subsequent report from SCOR to ICSU, prepared by Maurice Hill. It was published in *Deep-Sea Research* (Anon. 1958)¹⁵ so the following summary is considered sufficient:

¹⁵ In addition, the outcome of the meeting and the obligations of SCOR were summarized by Deacon (1957b) and Revelle (1957).

Three long-range problems may be of critical importance to the future welfare of mankind.

1. **The deep sea as a receptacle for the waste products.** Large quantities of poisonous radioactive waste can be anticipated from the atomic power industry. Will water circulation or vertical animal migrations prevent us from using the deep sea for disposal?
2. **The oceans as an important source of protein food.** In order to obtain the maximum harvest in the fertile areas we must understand the processes by which nutrient trace substances are brought up from the deep waters.
3. **The role of the oceans in climatic change.** This is the least well understood problem of the three. On both sides of the North Atlantic increased average temperature has occurred over the last 50 years, and prolonged changes have prevailed elsewhere. A prediction of future climate would be of great value but a prerequisite is to understand the processes that control climate. Probably the ocean plays a major role in changing climate. The ocean can store and release excess of heat, and excess of atmospheric carbon dioxide may be damped or modified by the absorption in sea water¹⁶.

For all three problems greater knowledge is required of **the exchange between the deep and surface waters**. Three lines of approach have recently been developed: (1) theoretical analysis of the thermo- and hydrodynamics, (2) laboratory and field experiments with indirect techniques, and (3) use of new techniques for direct measurements: (a) tracing by means of natural radioactive substances, (b) free-floating buoys and moored current meters, (c) use of salt content as a tracer, (d) heat flow from the earth to the water, (e) introduction of large amounts of artificially radioactive substances, (f) past changes of water conditions revealed through biological, chemical and physical studies of sediments, and (g) high precision determination of CO₂ in water and atmosphere.

International cooperation will have several aspects:

1. For the first 2-3 years exchange and standardization of techniques, collection and study of samples mainly from the Atlantic and Pacific Oceans, and exchange of data can

serve to guide further deep-sea explorations.

2. With such adequate preparation it would be possible for the next one or two years, provided sufficient funds and ship time become available, for as many as 16 vessels from many countries to make '**a combined assault on the largest unknown area on earth, the deep waters and seabed of the Indian Ocean**'. In this area the seasonal reversals in wind direction, unknown elsewhere, will provide opportunities for investigating the general productivity of the oceans and a better understanding of how the wind-driven ocean currents are built up. In addition to scientists from the northern hemisphere, scientists and students from the countries bordering the Indian Ocean should participate, thus encouraging and developing the marine sciences and fisheries in those countries.
3. In the following years, after development of adequate techniques, a tracer experiment should be undertaken in some suitable deep-sea area, using a large quantity of artificially radioactive material.

Enthusiastic support of other national and international organizations is necessary, utilizing their existing facilities and procedures. Besides financial support for individual ship operations, an adequate budget must be available to SCOR itself, (1) to hold meetings of specialists planning new techniques and explorations, (2) to establish a secretariat, and (3) to allow transfer of personnel engaged in training or learning from others the use of specialized techniques and methods.

It was suggested that oceanographic ships for exploration in the Indian Ocean might be provided by Argentina, Australia and/or New Zealand, Denmark, France, Germany, India and/or Pakistan, Japan, Thailand, United Kingdom, USA and USSR.

The idea of a thorough investigation of the deep Indian Ocean was conceived during the meeting.

Earlier in 1957, the opportunity for coordinated investigations in the Indian Ocean had been discussed by a group of nine oceanographers during the CSAGI meeting at Gothenburg. They had recommended a study of the influence of the central ridge on the distribution and

¹⁶ Items 1 and 3 were not explored until much later, whereas item 2 did become part of the aims of the International Indian Ocean Expedition.

circulation of deep water, observations of the South Equatorial Convergence and extension of the network of hydrological stations. None of these proposals were, however, realized during the IGY.

Behrman (1981: 12) relates that according to Revelle it was Iselin who during the Woods Hole meeting urged that SCOR should look to the Indian Ocean for a combined assault, using all the wonderful new tools that had been developed during and after the war. Behrman also conveys an anecdote told by Henry Stommel: “Iselin had this ability to drift into your room like a ghost”; during a coffee break at the SCOR meeting he suddenly turned up in a room where Stommel showed him a world atlas which he kept there in which he had put together details of water properties at great depths. Iselin was very impressed by the almost total lack of data from the Indian Ocean, and he “had a cup of coffee and went back to the SCOR meeting. I have a suspicion that’s how it all started”.

Revelle informed me that Iselin did not mention his conversation with Stommel when he made the proposal at the meeting. All those present enthusiastically endorsed the idea, and from then on, for the next six or seven years, the planning and organization of the International Indian Ocean Expedition became SCOR’s principal activity. Obviously, Iselin should share with Stommel the honour of being the originator of the idea for the expedition.

First SCOR Working Groups

The agenda of the 1957 SCOR meeting says nothing about formation of working groups. It must have been during the meeting that it was agreed to establish working groups from

the very beginning. Operation through working groups probably became the most important of SCOR’s activities.

It was recommended to form five initial Working Groups, “with perhaps 5-7 members”, as the first of what was to become a long series of SCOR Working Groups.

1. *The measurement of artificial radioactivity. Convener: Dr. Y. Miyake, Japan.*
2. *The measurement of the CO₂ in the air and sea and its exchange rate. Convener: Prof. N.W. Rakestraw, USA.*
3. *The measurement of the standing crops and productivity of the sea. Convener: Dr. N.B. Marshall, U.K.*
4. *The measurement of the physical properties of seawater. Convener: Prof. H. Mosby, Norway*
5. *The exploration of the Indian Ocean. Convener: Dr. C.O’D. Iselin, USA.*

SCOR Constitution

Three versions of the original SCOR Constitution exist in the files: (1) ICSU’s “Suggested Framework” from March 1957, (2) the “Proposed Constitution” formulated by the ICSU Executive Board in June, and (3) the version that was found acceptable to SCOR after discussions at the Woods Hole meeting (agenda item 7).

In the comparison below, the two first ICSU versions have been combined; italics indicate corrections or additions from first to second version and parentheses show text that was deleted in the second version.

The ICSU version	The SCOR version
1. SCOR (appoints a Steering Committee) <i>nominates its Cabinet</i> from among (its own members: to consist of a Chairman, <i>a Vice-Chairman</i> , a Secretary and 3) 2 members (of which one is the Secretary General of ICSU ex officio). <i>These nominations are subject to confirmation by the Bureau.</i>	1. SCOR nominates an Executive Committee from amongst its own members: to consist of a Chairman, a Vice-Chairman, and a Secretary. These nominations are subject to confirmation by ICSU.
2. <i>The Cabinet is responsible to ICSU for administration of the scientific program adopted by SCOR.</i>	
3. At the appropriate stage in the elaboration of its program, SCOR will appoint from among its members Reporters for the disciplines included therein.	2. At the appropriate stage in the elaboration of its program, SCOR will appoint from among its members Reporters for the formation of Working Groups of experts in their respective fields. The Working Groups would then elaborate the technical details in their respective disciplines, for the Reporters to carry back to the Central Committee.

4. The Reporters will arrange for the formation of Working Groups within the appropriate Unions and Associations. The Working Groups would then elaborate the program details in their respective disciplines, for the Reporters to carry back to the Central Committee for discussion and final integration in a definitive program.	
5. In organizing the operation of the definitive scientific program, SCOR will invite the formation of a SCOR National Committee in each participating country, <i>the formation of Participating Committees in the program of SCOR, to be set up by qualified Academies or Research Councils in any part of the world</i> , to frame and carry out (a national) <i>an operational</i> program designed to implement the general scientific program formulated by SCOR.	3. In organizing the operation of a definitive scientific program, SCOR will invite the cooperation of qualified Academies or Research Councils in any part of the world.
6. A representative from each (National) <i>Participating</i> Committee will be designated as corresponding member of an Advisory Committee to SCOR. The task of the advisory committee will be to correlate the (national) contributions <i>of the Participating Committee, scientific and financial</i> , towards the implementation of the SCOR program.	4. Each participating Academy or Research Council will be invited to designate a corresponding member to SCOR.
7. <i>SCOR shall scrupulously respect the autonomy of the Participating Committees, in respect of any necessary bilateral or multilateral negotiations for the effective dove-tailing of regional programs, or for the establishment of joint observational stations on the judicial territory of any one participant or of any other practical adjustments rendered necessary by existing natural rights.</i>	5. SCOR shall acknowledge the autonomy of the participating Academies or Research Councils, in respect of any necessary bilateral or multilateral negotiations for the effective dove-tailing of regional programs, or for the establishment of joint observational stations on the judicial territory of any one participant or of any other practical adjustments rendered necessary by existing natural rights.
8. SCOR may appoint Regional Secretaries as the need for them arises.	6. Same text as opposite.
9. SCOR may appoint ad hoc Committees for the examination of special problems.	7. Same text as opposite.
10. The administration of the program is the responsibility of the (Steering Committee) <i>Cabinet</i> of SCOR. The (Steering Committee) <i>Cabinet</i> will submit its budget requests to ICSU, including its (assessment) <i>estimate of the scale</i> of the contributions from the (participating countries) <i>Participating Committees</i> required to maintain the central administration (through) <i>after due consultation with</i> a Finance Committee of four members, of whom one is consisting of the Treasurer of ICSU ex officio, <i>the Secretary of SCOR and 2 members, not members of the Cabinet.</i> The Finance Committee is appointed by SCOR.	8. The Administration of the program is the responsibility of the Executive Committee. The Executive Committee will submit its budget requests to ICSU, including its estimate of the scale of contribution from the participating Academies or Research Councils required to maintain the central administration, after due consultation with a Finance Committee of four members, consisting of the Treasurer of ICSU ex Officio, the Secretary of SCOR and two members, not members of the Executive Committee to be appointed by SCOR.
11. Expenditures (made) <i>incurred</i> by SCOR will be subject to adequate control by the Treasurer of ICSU.	9. Same text as opposite.
12. The SCOR Secretariat will keep the Secretary General of ICSU fully and promptly informed of all its activities.	10. Same text as opposite.

There are several interesting particulars in the development of the wording and contents of the Constitution.

Regarding the differences between the two ICSU versions, some notes attached to the “Proposed Constitution” explain the alterations.

Paragraphs 1-2: The first note states that the persons who “have all been nominated by ICSU or the several interested Unions, should not regard themselves as representing either ICSU or the Unions on the Committee, but rather as individuals dedicated to a task. The link between the Committee and the Unions, which must be most strongly forged if the enterprise is to succeed, is formed by the Reporters under para. 4 of the proposed constitution.”

The reason for leaving out the ICSU Secretary General ex officio from the governing body of SCOR is explained in another note: His “inclusion ... can only lead to a weakening of the sense of responsibility which the Committee must bear towards ICSU, the organization that must face alone either the success or failure of the enterprise on account of which the Special Committee has been set up. However, the Administrative Secretary will be present at all Cabinet meetings, as observer and adviser.”

Paragraph 5: The final note states: “The conception of “National Committees” has led to certain misunderstandings in the conduct of the IGY program. The Executive Board was therefore careful to adopt a more precise nomenclature for SCOR, in the best interests of an enterprise “of world wide scope and significance”.”

There are some additions from ICSU version 1 to 2: introduction of a Vice-Chairman (para. 1), involvement of academies and research councils in setting up Participating Committees (para. 5), strict consideration for the autonomy and national rights of participants (para. 7), and specification of members of the Finance Committee (para. 10).

The SCOR version is commendably brief. There is a general wish to free SCOR as much as possible from a close supervision by ICSU and its Unions (quite understandable in view of ICSU’s pretty reluctant maternity care during the prolonged delivery of SCOR). Thus, no responsibility to ICSU is expressed in para. 2, and Working Groups are not necessarily to be formed within Unions and Associations (para. 2); the obligation of the Reporters to form a close link between SCOR and the Unions (expressed in ICSU’s note cited above) is therefore not evident.

Furthermore, the ideas of Participating Committees and an Advisory Committee to SCOR have been dropped, probably in an attempt to keep bureaucracy at a reasonable level.

Final version of the Constitution

In a letter of 25 September 1957 (mentioned in Chapter 5), ICSU accepted the Constitution “with certain verbal amendments, subject to approval by the Executive Board”. There is no document from ICSU in the files giving the final wording, but this appears from an appendix to Revelle’s letter of April 1959 on the formation of National Committees (p. 44).

The text giving the object of SCOR has been further abbreviated and now reads:

SCOR is a Special Committee of ICSU charged with furthering the coordination of scientific activity in all branches of oceanic research, with a view to framing a scientific program of world wide scope and significance.

The representation from ICSU and the Unions is the same and the only change is found in paragraph 3: “... SCOR is **authorized** to invite ... Research Councils **representing bona fide scientific activity of any geographic area**”.

Financial requirements of SCOR

The meeting agreed upon the following annual and non-recurrent expenditure, recommending that it should continue for a minimum of five years.

Note: Numbers are shown as in the original, although the individual figures do not sum to the total shown.

(1) Annual Budget	
Executive secretary and typists and office rent	\$7,500
Traveling expenses for SCOR and Executive Committee	\$7,500
Traveling expenses for five working groups	\$20,000
Traveling and subsistence expenses for four observers a year visiting to teach or learn new techniques	\$7,500
Annual expenditure	\$45,500
Total for five years	\$227,500
(2) Expenditure on Indian Ocean Exploration	
Cost of say, 16 ships each operating in the Indian Ocean for eight months	\$2,400,000
Training of 25 scientists from Indian Ocean area, each for one year @ \$3,000 per head	\$75,000
Special equipment for each ship @ \$24,000	\$384,000
Salaries of the scientists working in the ships (100 people for one year)	\$550,000
Working up the scientific results (100 people for one year)	\$600,000
Publication of results	\$30,000
Total Cost	\$4,039,000
Less estimated contribution from normal operating costs and salaries	\$2,000,000
Estimated extraordinary cost	\$2,039,000

Election of officers

SCOR recommended that the following nominations be accepted by ICSU:

<i>Chairman of SCOR</i>	<i>Dr. R. Revelle</i>	<i>USA</i>
<i>Vice-Chairman</i>	<i>Dr. G.E.R. Deacon</i>	<i>UK</i>
<i>Secretary</i>	<i>Dr. G. Böhnecke</i>	<i>Germany</i>
<i>Finance Committee</i>	<i>Dr. C.O'D. Iselin</i>	<i>USA</i>
<i>Member</i>	<i>Prof. L. Zenkevitch</i>	<i>USSR</i>

In a letter to Deacon (with the draft of the agenda), Maurice Hill had suggested Böhnecke as Chairman rather than Revelle. It is unknown whether this proposal was brought up at the meeting. It was agreed that the next meeting of SCOR should be held at Hamburg, late July or early August 1958.

Wooster (1990) has pointed out that the International Council for the Exploration of the Sea (ICES), which at the time was the most important international organization engaged in marine research, was not the slightest involved in the establishment of SCOR. ICES was set up in 1902 to

evaluate the dangers of over-fishing, mainly in the North Sea and the Baltic Sea, through cooperative biological and hydrographical research. Its fathers were leading scientists from Scandinavia, Britain, Germany and Russia and they were not specifically fishery biologists.

In view of ICES' age and the central role its members had played in the development of oceanography since ICES' founding, one might think that SCOR grew out of a special perceived need among ICES members. This was, however, not the case: all those who were involved in the work of the Joint Commission on Oceanography and the succeeding Special Committee or who became the first members of SCOR primarily came from academic institutions, although a few were government oceanographers (Deacon and Miyake) or government hydrographers (Böhnecke, Capurro and Panikkar); with the exception of Sverdrup they had nothing or very little to do with the work of ICES. The principal officers of ICES in the late 1950s and early 1960s (Furnestin, Rollefson and Went) were at no time involved in the negotiations leading to the establishment of SCOR.

CHAPTER 5

The First Two Years

ICSU's response to the Woods Hole report is dated 25 September 1957. Referring to the record of the 18th Meeting of the Bureau of ICSU in New York a week earlier, Ronald Fraser informed Günther Böhnecke (SCOR Secretary: Figure 6) that the SCOR report was adopted, the nominations approved, and that Maurice Hill was appointed IUGG representative instead of the late C.-G. Rossby. In a separate letter (15 Sept., not available) Fraser had informed Böhnecke that the ICSU Bureau, in principle, had accepted the SCOR Constitution.

In the matter of budgetary requirements, the Bureau authorized SCOR to approach the Rockefeller Foundation for support over a 5-year period and in due course to approach other foundations for financial aid for the Indian Ocean exploration. It further authorized an advance of \$5,000, over and above the allocation of \$5,000 for 1957-1958 from the

UNESCO subvention to ICSU, to initiate the Central Secretariat of SCOR, "pending the response of the Rockefeller Foundation and participating Academies and Research Councils in respect of the annual expenditure envisaged by the Committee". The first estimate of the cost of the Woods Hole meeting had come out at \$8,000, whereas only \$5,000 had been carried forward from 1955-1956 for this purpose; it was envisaged that the deficit would be covered by savings on other ICSU meetings.

In November, Böhnecke asked for clarification



Figure 6. *Günther Böhnecke, the always conscientious Secretary of SCOR from its start in 1957 until 1963. (Copyright The Federal Maritime and Hydrographic Agency, Hamburg)*

concerning the approach to the Rockefeller Foundation and also whether the allocation of the \$5,000 from UNESCO was dependent on contributions from academies or research councils. If so, he feared that SCOR "should get nothing this year, for the way from the national members ... to academies ... is a very long one". Fraser's answer could not be provided.

Resolutions on SCOR from the CSAGI meeting in Moscow, July-August 1958

Böhnecke also reported on the meetings of the CSAGI Working Group on Oceanography in Moscow, with almost 50 participants, three of whom were SCOR members (Böhnecke, Capurro and Deacon). The reports on IGY activities were only preliminary, since many research ships were still at sea, but it was already evident that this international cooperation, unmatched in the history of

oceanography, had led to a unique success. Some of the first results in deep-sea circulation, deep currents, Polar Front survey and instrumentation were recorded.

The participants unanimously passed the following resolution:

The Working Group on Oceanography at the Fifth General Assembly of CSAGI taking account of the successful development of marine investigations and in the great need for future international investigations of seas and oceans, resolves:

1. *that oceanographic investigations begun during the IGY be continued on as large a scale as possible in 1959 and the following years under the sponsorship of SCOR and the appropriate national organizations;*
2. *that data exchange in 1959 and in the following years should be carried on as during the IGY using the World Data Centers and the Permanent Service for Mean Sea Level;*
3. *that plans of oceanographic investigations of different countries should be made known by the appropriate national committees at the meeting of SCOR in Paris in September 1958.*

Before the end of the assembly the Bureau of CSAGI changed this resolution as follows:

The CSAGI recommends:

1. *that oceanographic investigations begun during the IGY be continued on as large a scale as possible in the future under the sponsorship of SCOR to which committee research plans should be made known at the earliest possible time;*
2. *that data should be sent in the future to the World Data Centres and the Permanent Service for Mean Sea Level (Tidal Institute, Liverpool, England) to which also scientific publications, reports or other useful information should be forwarded;*
3. *that WDCs and Permanent Service prepare a catalogue of oceanographic data, collected during the IGY.*

In a letter (of 9 September 1958) to Sir Harold Spencer Jones, Secretary General of ICSU¹⁷, Böhnecke recorded the alterations and regretted the deletion of “certain facts to which we in the Working Group set great value on”. He further asked whether those responsible for these changes might not at least have informed the participants in the meeting of their intentions. His opinion of the Assembly was that it might be regarded as a success although the discussions were “very onerous and time-taking”. Unfortunately, there is no answer to be found in the Revelle files.

Second SCOR General Meeting in Paris, September 1958

On the whole, there is a remarkable lack of material in the

files from most of the period between the Woods Hole meeting until shortly before the second meeting one year later. Both the contents of the report of the second meeting and the absence of correspondence seem to be evidence of a rather reduced activity of SCOR during its first year. Fortunately, there is good coverage of the second meeting, including the agenda and the extensive report (9 pages). It was drafted by Revelle with the aid of Deacon and signed by them and Böhnecke.

The meeting was held in Paris on 26-27 September 1958 in conjunction with an IACOMS meeting. It was attended by all SCOR members except Le Grand and Panikkar. Representatives of UNESCO, FAO, WMO and IUGG and of national organizations in Finland, France, FRG, Italy and Sweden were also present (a full list of participants is not available).

Main items of the report of the 1958 Meeting

The introduction outlines the objectives of SCOR, which may be summarized as follows:

Pioneering research and new ideas must come from individual scientists, but an international organization may be helpful in emphasizing the economic and social importance of research and thus help scientists to participate in cruises, etc. It can also point out work that needs to be done and facilitate exchange of personnel, samples, data and techniques (including their standardization and intercalibration). Furthermore, it can arrange meetings, thereby enlisting scientists from other fields, and arrange for coordinated work at sea, when a wide network of observations is desirable.

SCOR’s principle objective is to encourage and coordinate investigations of the deep ocean. SCOR recognizes the necessity of geophysical and geological studies of the Earth beneath the sea to elucidate the structure and history of the Earth¹⁸. The rest of the Introduction is a repetition (with slightly different wording) of what was reported from Woods Hole on principle objectives, the three previous long-range problems, and the new techniques recently acquired (p. 35).

The Working Groups

The five recommended working groups had now been formed. Their not-yet-complete membership of active research workers in particular fields, their objectives and future work was as follows:

¹⁷ Copy in the Revelle files.

¹⁸ As appears from subsequent correspondence, this objective was added at the Paris meeting to the three previously accepted long-range problems.

1. Radioactivity in the Ocean: Convener, Miyake. Proposed members: Bolin, Bowen, Charnock, Harley, Kautzky, Martin, Nikolajev, Smales, Sorokin. Primary objectives: standardization, intercalibration and exchange of information on analytical methods; coordination of world-wide oceanic measurements of artificial radioactivity; oceanic tracer experiments. Support for meetings of the working group should be sought from the International Atomic Energy Agency, FAO and UNESCO. Preliminary work has been done by correspondence and the group should meet in 1959.

2. Carbon dioxide in the Ocean and Atmosphere: Convener, Rakestraw. Proposed members: Brujewicz, Erickson, Keeling, Koroleff, Munnich, Sugawara. Primary objectives: assay of present concentrations in ocean and atmosphere and monitoring changes; study of exchanges between ocean, atmosphere and biosphere; use of carbon dioxide content and isotopic relationships to characterize water and air masses. Members of the group have guided the IGY programme in this field and the WG plans to continue it after further development of analytical methods. It should meet in 1959 and plans a symposium at the Helsinki Assembly of the IUGG in 1960.

3. Measurement of the Productivity of the Sea and of the Standing Crops of Phytoplankton and Zooplankton: Convener, Marshall. Proposed members: Currie, Holmes, Krey, Ryther (Productivity); Bary, Bogorov, Brinton, Cushing, Foxton, Motoda, Vinberg (Standing crop of animals). Primary objectives: to appraise and recommend methods for world-wide comparisons of organic productivity and standing crops. An FAO symposium on standing crops will be held at the International Oceanographic Congress in New York in 1959 and an ICES symposium on quantitative zooplankton methods at Moscow in 1960. The working group should attend these symposia and should seek support from FAO. It has already begun a careful survey and appraisal of methods by correspondence and discussion.

4. Physical Properties of Sea Water: Convener, Mosby. Proposed members: Cox, Eckart, Kolesnikov, Schleicher, Worthington, Zubov. Primary objectives: to appraise the accuracy of present values of the physical constants and to encourage research leading to more accurate values. This is a joint working group with IAPO. An International Conference on the subject was recently

held in the U.S.A. Further discussions will be held at the ICES meeting in Copenhagen in 1958 and at the International Oceanographic Congress in New York.

5. International Indian Ocean Expedition: Convener, Iselin. Proposed members: Davies, Deacon, Fisher, Ichiye, Kort, Laevastu, Marshall, Panikkar, Rochford, Tchernia, Thompson, Wüst.

Subgroups on

- facilities for ships
- geology, geophysics and bathymetry
- marine biology
- physical and chemical oceanography.

Primary objective: to plan and organize international co-operative exploration of the Indian Ocean. This is the major project of SCOR. The working group must meet as a whole or in part on several occasions and needs considerable financial support.

This list of scientists proposed for the first five working groups, together with the initial members of SCOR, constituted a roll call of the oceanographic establishment of the time.

International Oceanographic Congress in New York

The committee enthusiastically agreed to sponsor, together with UNESCO and the American Association for the Advancement of Science, the International Oceanographic Congress to be held at the United Nations, 31 August to 11 September 1959. ICSU will be requested to invite its adhering bodies in the different countries to be represented at this congress and especially to send young scientists. In addition, countries will be asked to send their research vessels, if possible.

Future program

1. Cooperation with SCAR in Antarctic research (see pp. 47-49). This was warmly welcomed. Zenkevitch was nominated to represent SCOR at SCAR meetings, and SCAR was invited to send a representative to SCOR meetings. With regard to the SCAR oceanographic program, SCOR recommended several specified activities.
2. International Indian Ocean Expedition. SCOR's proposal had been received with enthusiasm by physicists (relation between changing monsoon winds and density layering and currents) as well as by marine biologists (varying productivity of the Arabian Sea) and geologists and geophysicists (submarine topography, sediments and structure). USSR and USA had already undertaken preliminary

Indian Ocean explorations during the IGY. Further expeditions were planned for 1959-1960, and a multi-ship effort should be executed in 1961-1962.

It was anticipated that UNESCO would play a major role in enabling the participation of scientists and students from countries bordering on the Indian Ocean.

Participation of at least 16 ships from 11 countries was expected, each working for about 8 months at sea. It was believed that a total of about 125 persons would become involved; at least 25 of these might come from local countries, and many of these persons should be given a year's prior training in centres of advanced oceanic research.

The estimated total expenditure for a year-long multi-ship exploration was about 4 million dollars (large ship costs). Half of this amount would come from the normal operating funds of the participating countries, while half would have to be raised separately (see p. 38).

3. Additional projects

- a. Oceanic populations and productivity: assessment of marine populations on different trophic levels, rate of productivity on a world-wide basis, collection of quantitative data, and intercalibration of collecting and assay methods.
- b. Life history and distributions of important oceanic species.
- c. Relations between abundance of organisms and convergences and divergences.
- d. The status of marine sciences in all countries: number of scientists and technical personnel, research vessels, emphasis on different objectives, and financial support.
- e. International exchange of information on ships' schedules and availability to promote the best use of existing facilities.
- f. Systematic surveys of the deep-sea floor and physical properties of the deep water.
- g. Co-operation in tracer experiments.

Editorial

Under "Publications" the Agenda had two items: "(a) Formation of an editorial committee and (b) Should Deep-Sea Research become the official journal for SCOR?"

Böhnecke, the Secretary, was appointed Editor of SCOR

publications. It was agreed that the newly established *ICSU Review* should be used for announcements and summary reports, while scientific papers were to be published in existing scientific journals. *Deep-Sea Research* should not become the official journal for SCOR.

Formation of National Committees

Japan, the United States and USSR had already designated National Committees as correspondents to SCOR. A draft letter had been prepared inviting other national scientific bodies to take similar action and to request financial support of SCOR. Advice would be sought from ICSU.

Budget

Expenditures for 1958 totalled \$4,500—almost entirely on the Paris meeting. Requirements for 1959 were as follows:

SCOR meeting in New York	\$8,000
Administrative assistance and stenographer for SCOR Secretary	\$5,000
Meetings of two working groups	\$10,000

It was further stated that it had not yet been decided from which sources this sum would come, but it was expected that National Committees would contribute a certain amount towards it. The sum allotted to assisting the Secretary indicates a decision at the meeting of having the SCOR secretariat in the Secretary's home town¹⁹. When comparing with the administrative expenditures recommended at the Woods Hole meeting (p. 38) it is obvious that the financial requests had been drastically reduced. Probably mainly due to the unfortunate lack in the files of Ronald Fraser's letters of September and November to Böhnecke (p. 41), it is not only unclear who provided the remaining \$3,000 to cover the total expense for the Woods Hole meeting (about \$8,000), but also whether the expenditure for 1958 (\$4,872) was actually covered by a UNESCO or an ICSU grant of \$5,000.

No resolutions

During the meeting it was intended to put forward resolutions on (1) Mean sea level (Reporter: Eyriès and Mosby), (2) Multiple-ship studies of deep circulation (Reporter: Wüst), (3) Carbon dioxide (Reporter: Rakestraw), (4) Phytoplankton (Reporter: Steemann Nielsen), and (5) Cooperation in the Baltic (Reporter: Hela). Böhnecke, however, found it unnecessary to set them off as specific resolutions since "the facts on which they

¹⁹ It appears from a letter from Bruun to Ronald Fraser (Secretary of ICSU) shortly before the Paris meeting that Bruun, following Fraser's "informal question" about setting up the permanent secretariat of SCOR in Copenhagen, had explored the possibilities which were found very favourable but not pursued. The background for Fraser's (ICSU's?) "informal question" cannot be accounted for.

were based would be included in the Draft Report". But this is true only for the first four, not for the last one.

Rules of Special Committees of ICSU

Included in the agenda but not mentioned in the report were plans for future sessions and information about the Provisional Rules of Special Committees issued by ICSU.

The final text of the latter, adopted by the 10th Meeting of the ICSU Executive Board, contains one longer and 14 short paragraphs. The former deals with the composition and tasks of Finance Committees, rules concerning expenses, and statements to be rendered to ICSU. Contents of the other paragraphs are as follows: Special Committees can be set up to facilitate the planning and coordination of scientific research on an international basis. They act for ICSU within the limits of their approved constitutions. Members are nominated by ICSU (at most one-third) or appointed by the Unions or other international organizations. Officers shall be elected from among the members and serve for a period of not more than three years, except the Secretary, who may serve for one further term. The task of the Committee is to prepare plans for research but not to carry out research projects.

This is the function of the adhering groups such as academies, research councils or national committees, and the Special Committee may not act as arbiter between the adhering groups. An appointed Editor of Publications is responsible for obtaining a permanent record of the projects and their results. Funds for planning and administration may come from ICSU, UNESCO, adherents, foundations or private sources; ICSU will make a charge of 3.5% on all funds received. The budget is subject to approval and adequate control by ICSU.

Continuation of the IGY research in oceanography

The following recommendations about continued research in 1959 were made (summary):

1. *Sea level spectrum. It is recommended to continue the net of stations for sea level recording, with regular observations of temperature and salinity (density). Sea level measurements are key-values to a number of phenomena recorded in the recommendation.*
2. *Long waves. No continuation of long-wave recording appears needed at present. Interested individuals and laboratories should study in particular the problems of methods.*
3. *General circulation of the ocean. SCOR recommends work along the following lines to be continued:*

- a. *Expeditious publication of IGY data.*
- b. *Direct measurements of currents at all depths, particularly the western boundary currents in specific places.*
- c. *C14 samples in high latitudes for studies of the "age" of the deep water.*
- d. *Mixing across the thermocline (artificially radioactive substances and measurements of biological transport).*
- e. *The ICES Polar Front Program.*
- f. *The equatorial current in the West Pacific.*
- g. *Water motion near the deep-sea floor (photographs and bathyscaph observations).*
- h. *Deep-circulation in semi-enclosed seas.*

4. *Carbon dioxide in ocean and atmosphere. Determination (from airplanes and fixed stations) of average CO₂ concentration in the atmosphere is well on the way, but knowledge of the rate and extent of CO₂ exchange between the atmosphere and the ocean is very superficial, and extensive field work at sea is needed. Support seems assured beyond the IGY of the important study of the synoptic pattern of CO₂ in the atmosphere.*
5. *Geophysical exploration under the sea floor. Primarily a wider network of measurements of heat flow and seismic exploration is desirable.*

The invitation to form National Committees

At the time of the Second SCOR Meeting, National Committees as correspondents to SCOR had been designated in Japan (under the Science Council of Japan, 27 members, first meeting on 6 June 1958), USA (National Research Council Committee on Oceanography under the National Academy of Sciences, 10 members) and USSR (under the Academy of Sciences of the USSR). During the autumn a Committee was set up in Great Britain (under the Royal Society, 28 members), and in March 1959 in Denmark (under the Royal Danish Academy of Sciences and Letters, 10 members).

The draft of an invitation to other academies and research councils to form National Committees, prepared by Revelle and discussed at the Paris meeting, was put into its final form in early 1959 after a number of suggestions from Böhnecke.

The SCOR proposal was then forwarded to ICSU for approval and dispatch. The main contents of the final version stated that SCOR had been established by ICSU to continue oceanic exploration initiated during the IGY. As examples of research involving active collaboration of

scientists from different fields, the four accepted long-term problems were mentioned, and the intention to work with and through existing international organizations (e.g. IAPO) was stressed. According to its constitution, SCOR was authorized to invite the cooperation of academies and research councils. While SCOR was to be a planning and coordinating body, the actual carrying out of agreed programs was to be undertaken by scientific bodies of the participating countries through National Committees, which had already been established in the five countries mentioned above. It would be appreciated if the scientific body which is a member of ICSU or one of its Unions will designate such a Committee. The letter was signed by R. Revelle, Chairman of SCOR.

The only major change from the SCOR to the ICSU version is that, in referencing to the individual academy or research council, the phrase “belonging to the maritime countries of the World with a long and outstanding tradition or interest in oceanic research respectively” was left out...

Furthermore, the list of SCOR members was omitted and in addition to enclosing a copy of the Constitution and the Paris meeting report, the ICSU Rules for Special Committees were enclosed, while Revelle’s article in the journal *Science* (which Böhnecke had proposed to enclose) was substituted by an article by Deacon, “The Indian Ocean Expedition” (1960b)²⁰.

The invitation was mailed by SCOR in mid-April 1959 to the 39 countries which were members of ICSU (excluding land-locked states) plus 24 countries that were not in ICSU but represented in one of the relevant Unions, totalling 63. During the International Oceanographic Congress in New York in September 1959, it became clear that only a small number of these invitations had come to the knowledge of national institutions and individuals (Böhnecke’s verbal report to ICSU).

Towards the end of the year five additional countries had established National SCOR Committees: Australia (under the Australian Academy of Science, 6 members), China/Taiwan (under the Academia Sinica, 5 members), Netherlands (under the Royal Dutch Academy of Sciences, 9 members), Israel (under the Research Council of Israel), and the Union of South Africa (under DSIR); in another two countries nomination of members was in progress: France (under the Académie des Sciences) and FRG (under the Deutsches Forschungsgemeinschaft).

The financial situation

Following the request from ICSU (p. 41), Revelle had at some time before April 1958 “applied for a grant of \$45,000 from the Rockefeller Foundation as an initial sum to get SCOR started”. There is no evidence that any such support was received.

A statement of the financial position as of 31 December 1958 shows expenditures for the Paris meeting of \$4,136 plus \$755 covering Böhnecke’s attendance of the Moscow meeting of CSAGI and secretarial expenses, this in all nearly equalling the allocation of \$5,000 from the UNESCO subvention to ICSU.

The allocation for SCOR was postponed by ICSU until Dr. Herlofson, now the Secretary General, had had an opportunity to visit Böhnecke in late February 1959 and discuss the SCOR program. Although the budget was thus still unsettled, the members of SCOR and the Working Group conveners were notified in late January (simultaneously with the mailing of the Paris meeting report) about the date and location of the next SCOR meeting in connection with the First International Oceanography Congress in New York. Other letters indicate Böhnecke’s concern about the financing of this meeting. Finally, in mid-April ICSU, realizing “that the lack of adequate funds had seriously hampered the work of the Committee to date”, granted for 1959 the sum of \$20,000 “for the preparatory stages of planning the Indian Ocean Expedition”, half of the sum as a subvention, half as a loan repayable later by SCOR.

In July, it was announced to all members of SCOR and IACOMS that the American Association for the Advancement of Science, the organizer of the oceanographic congress, would provide each with a \$20 per diem.

Another improvement of the SCOR finances was a request from the U.S. National Committee of SCOR that “the United States, through the National Science Foundation, should give its proportionate share, amounting to perhaps \$20,000 per year” in support to SCOR.

Much less encouraging was the letter on a discussion with ICSU officers which Böhnecke mailed to Revelle and Deacon three weeks before the New York meeting:

²⁰ Deacon had volunteered to write this paper, since “FAO is taking an interest in the Indian Ocean investigation and has offered the services of Laevastu to help us prepare a paper” (letter to Böhnecke in January 1959). “The draft ought to be good enough for the working groups, and the need to call the groups together and discuss it should be a good argument to use with ICSU and national and other sources to get some money”.

Yesterday I had a long talk with Dr. Fraser, Col. Herbays and Mr. MacLennan at The Hague (informal meeting) about the financial situation of SCOR. I was somewhat disappointed about the outcome of our talk, as strong discrepancies proved. I was informed very friendly but also quite frankly that the Executive Board of ICSU does not fully approve of the line SCOR has followed so far. I was especially told that the representatives of the Unions belonging to ICSU look upon SCOR as a Discussion Club which has not yet advanced to any positive result or any practical planning. My remark that to the present we have endeavoured to crystallize the great scientific basic problems of oceanic research and that at the forthcoming New York meeting of SCOR we intend to arrive at a practical planning, in the first place for the Indian Ocean, was taken up with some doubts ... My several remarks that before a planning the scientific problems must be thoroughly discussed were likewise not quite appreciated.

In his letter Böhnecke repeated his previous request for a SCOR Executive Board meeting before the SCOR meeting, to which Deacon had already consented. Böhnecke stressed that ICSU regarded such occasional meetings as important and that future financial contributions from ICSU would depend on the success of the New York meeting, particularly submission of plans for practical work. The success of the New York meeting was therefore to be decisive...

Establishment and Constitution of the Special Committee on Antarctic Research (SCAR)

In early 1958, another Special Committee of ICSU was launched, but in comparison with the long drawn-out creation of SCOR, its sister organization SCAR was born remarkably quickly (in less than 8 months). There are also some noteworthy differences in the constitution so that a short account of SCAR may be relevant in this place.

While the IGY only gave the final push to the creation of SCOR, this large international manifestation was the direct reason for establishing SCAR. The 4th CSAGI Antarctic Conference in Paris in June 1957 passed a resolution recommending ICSU to appoint a committee to examine the merits of further investigation in the Antarctic after the

end of the IGY, covering the entire field of science. In order to avoid an interruption of the current IGY investigations, ICSU was asked to take immediate action. Later in June the Executive Board of ICSU decided immediately to set up a committee to consider this issue, with Professor C.-G. Rossby as convener and with one member from each of the countries carrying out or contemplating scientific operations in Antarctica. After the death of Prof. Rossby in August, Dr. N. Herlofson, Stockholm, was appointed as convener.

The committee met in Stockholm on 9-11 September 1957, with members from Argentina, Chile, France, Japan, Norway, UK, USA and USSR being present. Some representative branches of Antarctic research were considered in detail: meteorology, aurora and geomagnetism, glaciology, and oceanography. Furthermore, prospects of extended life of a number of stations operating during the IGY were discussed.

The meeting concluded that there was a need for further international organization of scientific activity in Antarctica and recommended that ICSU establish a committee to undertake this task, consisting of delegates from countries actively involved in Antarctic research and interested Unions. Finally, it was stressed that these proposals would not entail an extension of the IGY, although the IGY was followed by a year of "International Geophysical Co-operation".

Later in September the Bureau of ICSU decided to establish a Special Committee on Antarctic Research, and twelve nations and four Unions (IUGG, IGU, IUBS and URSI, the International Union of Scientific Radio) were invited to nominate delegates.

The first SCAR meeting was held in the Administrative Office of ICSU in The Hague on 3-6 February 1958. Those attending are shown in Figure 7. The meeting elected the following officers: Ing. Gen. Georges Laclavère as President, Prof. Keith E. Bullen as Vice-President and Dr. Valter Schytt as Secretary (after a few months succeeded by Dr. Gordon de Q. Robin). Plans for future Antarctic exploration were outlined, a budget was framed and a draft constitution of SCAR was approved for submission to ICSU. This constitution was ratified at the Eighth General Assembly of ICSU in October 1958.



Figure 7. Participants in the first SCAR meeting, The Hague, February 1958.

- | | | |
|-------------------------------|---------------------------------------|---------------------------------------|
| 1. Dr. L.M. Gould, USA | 8. Dr. Anton F. Bruun, IUBS | 15. Ing. Gén. Georges Laclavère, IUGG |
| 2. Dr. Ronald Fraser, ICSU | 9. Mr. J.J. Taljaard, South Africa | 16. Ing. Gén. M.A. Gougenheim, France |
| 3. Dr. N. Herlofson, Convenor | 10. Capt. F. Bastin, Belgium | 17. Mr. Luis Renard, Chile |
| 4. Col. E. Herbays, ICSU | 11. Capt. Luis de la Canal, Argentina | 18. Dr. M.M. Somov, USSR |
| 5. Prof. T. Rikitake, Japan | 12. Sir James Wordie, UK | 19. Prof. J. van Mieghen, Belgium |
| 6. Prof. Leiv Harang, Norway | 13. Prof. K.E. Bullen, Australia | (Bruun's Archive) |
| 7. Dr. Valter Schytt, IGU | 14. Dr. H. Wexler, USA | |

The Constitution of SCAR was framed along similar lines to SCOR's. The object was as follows:

"SCAR is a Special Committee of ICSU charged with furthering the coordination of scientific activity in Antarctica, with a view to framing a scientific program of circumpolar scope and significance. In establishing its program, SCAR will take care to acknowledge the autonomy of other existing bodies."

Membership should consist of one scientific delegate from each country actively engaged in Antarctic research and one representative from each interested Union of ICSU; observers might be invited from interested international organizations and Special Committees of ICSU.

There were eight Rules which mainly differed from those of SCOR in the following respects:

1. The three members of the Executive Committee were

elected for a term of three years each (decided at the meeting), and the Executive Committee was responsible to ICSU for the coordination of the scientific program of SCAR.

2. Instead of inviting Academies and Research Councils to cooperate in the operation of the program and to designate a corresponding member each, SCAR would invite the formation of National Antarctic Committees for this purpose.
3. The proposed constitution of SCAR contained a paragraph which corresponded to para. 7 in the ICSU proposal to SCOR (p. 37) and was retained in the SCOR Rules. This paragraph recommended that ICSU amend its Provisional Rules for Special Committees (item 4) to cover "autonomy of International Scientific Unions".
4. No mention of Regional Secretaries.
5. Financial contributions from Participating Countries instead of Academies and Research Councils.

During the 5th General Assembly of CSAGI in Moscow 30

July to 9 August 1958, the Antarctic Working Group and SCAR held several meetings in which Böhnecke, the Secretary of SCOR, took part as an observer.

According to his report, it was recommended to ICSU that the tasks of the CSAGI Antarctic Working Group be continued under SCAR. A considerable number of oceanographic investigations were outlined, including studies of shelf bottom relief and sediments, tides, coastal and deep currents, ice, the Antarctic Convergence, and systematic, seasonal investigations along at least three

sections, covering a great many quantitative and qualitative biological observations. The subsequent close relations between SCOR and SCAR were expressed for the first time in the following terms:

SCAR notes the interest of SCOR in its work and wishes to express its appreciation at the presence of an observer at its meeting. As both committees are interested in the field of Antarctic Oceanography, it is hoped that cooperation between the two bodies will continue and will be most fruitful.

CHAPTER 6

The Indian Ocean Expedition Takes Shape

The First International Oceanographic Congress

The study of the oceans is one of the most international of intellectual activities and has several profound bearings on human welfare. It was therefore fitting that the first international oceanographic congress took place at the United Nations headquarters in New York, lasting from 31 August to 11 September 1959. It was sponsored by the American Association for the Advancement of Science (AAAS) and UNESCO. Generous financial support was received from twenty-one government and private organizations in the United States²¹.

The Planning Committee consisted of ten leading American oceanographers, chaired by Mary Sears, and with Roger Revelle elected as President of the Congress. According to Wolfle (1980) “he was our roving ambassador, serving not only on the AAAS committee but also on SCOR and UNESCO’s Advisory Committee. In that triple capacity he kept both of the other groups informed of plans and helped enlist their cooperation”. The Planning Committee succeeded in emphasizing the interrelationships among the scientific disciplines underlying oceanography. The main topics were history of oceans, populations of the sea, the deep sea, boundaries of the sea, and cycle of organic and inorganic substances in the sea. Within each topic there were in the morning 5-7 “feature presentations”, or invited formal lectures (published in *Oceanography*, Invited Lectures..., Publication No. 67 of AAAS, Mary Sears Ed., Washington, D.C. 1961, 654 pp). In the *Preprints of Abstracts* volume (Mary Sears Ed., AAAS 1959, 1022 pp.) were listed no less than 470 abstracts of papers presented in the afternoon sessions. Thus, it was quite appropriate when Roger Revelle, the President of the Congress, in his opening address (Revelle 1960) said that this was “really Mary Sears’ Congress”. He also noted that the most striking characteristic of the no less than 1,200 people who attended the Congress was youthfulness, the average age being certainly under forty.

Deacon (1960a) and Wolfle (1980) gave accounts of the Congress and its five main topics. Impressions of some of the participants were published in *Oceanus* (Vol. 6, 1960, pp. 5-6 and 15-20); here the presentation of the American

Miscellaneous Society’s *Albatross Award* to Walter H. Munk is also described. My own impressions were equally positive, with one exception: These were the days when the United States had just successfully entered the space age, but to overcome the technical problems to ensure a smooth functioning of slide projectors lay beyond the capacity of most operators!

The overall success of the Congress was evident. It became the first of a series of large oceanographic meetings which from 1970 were termed Joint Oceanographic Assemblies.

Third SCOR General Meeting in New York 1959

Prior to this meeting, the Executive Committee met in Washington on 27 August to go through the general lines of the agenda. The New York meeting benefited greatly by being held at the time of the International Oceanographic Congress. The General Meeting took place at Lamont Geological Observatory on 29 and 30 August (Figure 8), just prior to the congress, and on 12 September just after the congress. For the first time it was attended by all SCOR members (cf. p. 31), although Zenkevitch was absent the first two days and Bruun was ill on the last day. 31 persons were present the first two days and 27 the last day (19 all three days). The participants included National Committee representatives for Australia (2), Holland (2), Japan (4), Taiwan (3), Union of South Africa (2), United Kingdom (1), USA (7), and USSR (4, last day only); observers from Argentina, Iran, Yugoslavia, and Peru were also present the first days or the last. Furthermore, there were representatives of UNESCO, FAO, WMO, the International Atomic Energy Agency (IAEA), IGY World Data Center A, IAPO, ICES, and IACOMS. The five Working Groups (p. 43) were, in addition to all the chairmen, represented by the following members: K. Sugawara (Carbon dioxide), A. Kolesnikov (Physical Properties), and D.H. Davies, G.E.R. Deacon, R.L. Fisher, V.G. Kort, T. Laevastu, N.B. Marshall, N.K. Panikkar, P. Tchernia, and G. Wüst (Indian Ocean Program). Thus, it is a somewhat sweeping statement when the report of the meeting tells that “the majority of the working group members were present” at Lamont. However, it is true that the working groups were well represented at their meetings during the congress (see above).

²¹ In June 1960 Dale Wolfle, Executive Officer of AAAS, informed SCOR that a surplus of \$14,722 was available from the congress, since the majority of donors had not wanted to have their contribution returned. He suggested that if another oceanographic congress were to be held the money might be reserved for this. The money later helped young scientists to attend the Second Oceanographic Congress in Moscow 1966 (SCOR Proceedings 1(1):7).



Figure 8. The participants in the SCOR Meeting on 30 August during the Congress in New York in 1959. The photo was taken in front of Lamont Hall.

1. Günther Böhnecke
2. Athelstan Spilhaus
3. Arthur W. Johnson
4. Marc Eyriès
5. Tsu-You Chu
6. George E.R. Deacon
7. Chao S. Ang. Wang
8. Håkon Mosby
9. Georg Wüst
10. Columbus Iselin

11. Hendrik Postma
12. Yves Le Grand
13. Paul Tchernia
14. N.K. Panikkar
15. Maurice Ewing
16. Noriyuki Nasu
17. Roger Revelle
18. J.R. Luby
19. Robert L. Fisher
20. Koji Hidaka

21. Robert G. Snider
22. Richard Vetter
23. Luis R.A. Capurro
24. Maurice N. Hill
25. Fritz F. Koczy
26. David H. Davies
27. George F. Humphrey
28. Yasuo Miyake
29. Norris W. Rakestraw
30. Masito Nakano

31. Anton F. Bruun
32. Laivo Laevastu
33. Shiotiro Hayami
34. Christo Stavropoulos
35. M.B. Schaefer
36. Norman B. Marshall
37. Liu Fah-hsuen
38. Erik Steemann Nielsen
39. John H. Day
40. A. Perez-Vitoria
(Bruun's Archive)

Agenda

1. Program of international scientific collaboration in oceanic research
 - 1.1 International Indian Ocean Expedition
 - 1.2 Deep-sea tidal measurements
 - 1.3 Spectrum of sea level
 - 1.4 Distribution of carbon-14 in ocean waters
 - 1.5 Carbon dioxide in ocean and atmosphere
 - 1.6 Coordinated Polar Front observations
 - 1.7 Subsurface current measurements

- 1.8 Oceanic population and productivity
- 1.9 Life-history and distribution of species
- 1.10 Other programs
2. Programs involving other organizations
 - 2.1 Ocean-wide surveys of bathymetry, magnetism gravimetry, water properties and organisms
 - 2.2 General Bathymetric Chart of the Oceans (GEBCO)
 - 2.3 World Data Centres
 - 2.4 Coordination with IACOMS of UNESCO
 - 2.5 Cooperation with SCAR

- 2.6 *Other programmes*
- 3. *Finances and administration*
 - 3.1 *Report of the Secretary*
 - 3.2 *Budget*
 - 3.3 *National contributions*
 - 3.4 *Other sources of funds*
- 4. *General aspects of marine sciences*
 - 4.1 *Appraisal and recommendation concerning status of marine sciences in different countries*
 - 4.2 *Exchange of information concerning expeditions, ships-schedules, methods and problems*
 - 4.3 *Publication*
 - 4.4 *Other business*
- 5. *SCOR Working Groups.*

The following is based on the report of the meeting (which contains 17 pages and 8 annexes) and on Böhnecke's "Notes for the verbal report" he presented to ICSU in October 1959.

1. *Programs of international collaboration*
 - 1.1 International Indian Ocean Expedition. See separate section at p. 55 and following.
 - 1.2 Deep-sea tidal measurements. The need for a better understanding of oceanic tides and internal waves was stressed, and a resolution urged National Committees to make plans for off-shore measurements and maintenance of oceanic island tide gauges from IGY.
 - 1.3 Spectrum of sea level changes. Another resolution emphasized the importance of the study of seasonal and secular changes of mean sea level and long waves.
 - 1.4 Carbon-14 in ocean waters. Distribution of naturally occurring radioactive tracers can provide useful data for the study of mixing processes. A resolution urged collection and treatment of large water samples for this purpose.
 - 1.5 Carbon dioxide in ocean and atmosphere. N.W. Rakestraw gave a survey of the present state of this interesting and economically important subject. A resolution requested more extensive use of the new infrared techniques to study the principal physical and biological processes involved, both on land, in the sea, and in the air.
 - 1.6 Coordinated Polar Front observations. This survey was conducted by ICES during the IGY and would be intensified in 1960. The meeting welcomed this operation which would attempt to use continuous recording instruments for temperature and salinity.
 - 1.7 Subsurface current measurements. The difficulties

caused by lack of navigational accuracy were identified, and areas needing special attention regarding direct physical measurements of subsurface and deep currents were defined. A resolution urged National Committees to consider the subject.

- 1.8/1.9 Oceanic populations and productivity – Life histories and distribution of species. The biology of the deep ocean gave rise to a long discussion. Participants agreed that more effort should be devoted to the study of life histories, movements and distributions of single species as well as their behaviour and the factors influencing this behaviour. Such investigations had been rather neglected recently when physiological and biochemical studies had been found more immediately rewarding. Conditions for selecting indicator species were outlined, and the need for an increase of skillful taxonomists was stressed.
- 1.10 Activity of IAPO. A report was available (Annex H) that listed publications and mentioned accomplished and forthcoming symposia, the Standard Sea Water service, and the General Bathymetric Chart of the Ocean (GEBCO). Reference to the report was given under many of the above items.

2. *Programs involving other organisations*

- 2.1 Ocean Survey. Detailed maps of the physical properties of ocean waters and of the topography and nature of the seafloor were needed for a better understanding and use of the ocean and its resources. A resolution carried, urging National Committees to extend coastal surveys into deep water. A SCOR Working Group would be appointed to inform oceanographers about progress in radio-navigation and other facilities for marine research.
- 2.2 General Bathymetric Chart of the Oceans (GEBCO). Böhnecke had prepared a report on the work of the IAPO Committee on GEBCO. SCOR followed the report's proposal to pass a resolution urging all relevant bodies to make their soundings available to the World Data Centres or the International Hydrographic Bureau.
- 2.3 World Data Centres²². It took a long discussion to agree on the need for a continuation and broadening of duties of the WDCs of IGY. The special demand for a data centre to look after data from the IIOE was emphasized. A new working group would soon be appointed and names of members was suggested (J.H. Day, G.E.R. Deacon,

²² Letters from Fraser and Laevastu on this item are not available.

I. Hela, V.G. Kort, J.R. Lumby, J. Smed, and the Geodetic Survey of India).

- 2.4 Coordination of IACOMS and SCOR²³. The UNESCO International Advisory Committee On Marine Sciences had recommended that UNESCO and ICSU explore the possibility of combining SCOR and IACOMS into a single joint committee. Several spoke in favour of this action in order to save time and money, one against it because of difference of aims. Although UNESCO's promotion of marine science was especially concerned with less-developed countries and ICSU's with the highest academic circles, it should be possible to find a solution for combining both. Revelle and Deacon, who represented ICSU and SCOR at IACOMS meetings, would present a final proposal.
- 2.5 Cooperation with SCAR. Marshall reviewed matters of joint interest.

3. Finances and administration

Due to lack of time, this item was deferred to the concluding meeting of the Executive Committee on 12 September, at which the report of the Secretary was approved and a budget for 1960 of \$25,500 agreed upon for basic SCOR activities—\$8,000 for SCOR meetings, \$2,000 for each of the 6 working groups and \$5,500 for secretariat and publications, plus an additional \$26,000 for expenses for coordination of the IIOE.

A more detailed account and budget was presented by Böhnecke to the Executive Board of ICSU at its meeting on 2 October.

Budget 1959	
Income:	
Allocation from UNESCO subvention to ICSU	\$10,000
On loan from ICSU	\$10,000
Radioactivity W.G.: IAEA grant	\$2,740
UNESCO grant	\$1,000
Expenditures:	
Per diems	\$1,242
Travelling expenses (Total sum of reimbursement are not yet available)	\$
Secretary's local budget in Deutschmarks	
Income: Advances towards secretarial expenses	DM 1,755.23
Balance carried forward from 1958	DM 192.78
	DM 1,948.01
Expended already	DM 1,000.00
Balance	DM 948.01

Budget 1960	
SCOR meetings	\$8,000
Working Groups	\$12,000
Secretarial assistance	\$3,000
Printing, postage, etc.	\$1,500
Estimate for publications in <i>ICSU Review</i> or other medium	\$1,000
	\$25,500
Estimate for coordinator Indian Ocean Dr. Robert Snider:	
Salary and pension contribution	\$17,000
Travel	\$3,000
Secretarial assistance	\$4,500
Copying and mailing	\$1,500
	\$26,000
Grand total for 1960	\$51,500

Estimated income: \$5,000-6,000 as contributions from National SCOR Committees.

According to a subsequent letter from Böhnecke to Revelle, the majority of the Board of ICSU had welcomed his report and were satisfied with the success of the New York meeting. He had laid particular stress on an early discussion of the SCOR finances, but there was not yet any response from the Finance Committee of ICSU. According to personal information from Fraser, the situation seemed, however, to be far better than before the New York meeting. ICSU's reaction is mentioned below (p. 61).

4. General aspects of marine sciences

- 4.1 Status in different countries. National Committees should be asked to consider the preparation of reports on the status of marine science in their countries similar to that published by the U.S. National Academy of Science (not available). A resolution expressed this desire.
- 4.2 Exchange of information concerning expeditions, etc. SCOR should seek and circulate information about research cruises and availability of space and facilities, especially in ships.
- 4.3 Publication. The *ICSU Review* should be used as much as possible to keep the work in frame of aspects in other fields. A special Bulletin like that of SCAR should be created when necessary.
- 4.4 Other business. The next SCOR meetings would be held in July 1960 in connection with the UNESCO Intergovernmental Conference in Copenhagen and the IUGG General Assembly in Helsinki. An invitation from the Tenth Pacific Science Congress to hold the SCOR meeting in 1961 at Honolulu was

²³ Letters from Deacon and Mussard on this item are not available.

greatly appreciated, but a final decision had to be postponed pending consultation with IACOMS.

5. Working Groups

The original Working Group 3 (productivity and standing crops of plankton, p. 43) had now been closely linked with the Indian Ocean Expedition; this and the IIOE Working Group will be dealt with in the section Agendum 1.1 at the bottom of this page.

Radioactivity in the Ocean (SCOR WG 1)

All the proposed members of this Working Group (p. 40) had been elected, with the exception of Nikolajev. The group met in the United Nations Building on 2-3 September 1959. Four members (Harley, Kautzky, Smales and Sorokin) were absent. There were representatives from IAEA, FAO and IACOMS, consultants from four U.S. institutions and 7 other participants.

Twelve papers on various radioactive substances, tracer studies, waste disposal, etc. had been prepared (by Miyake (2, with co-authors), Bolin, Bowen, Martin, El Wardani (3), Folsom, Koczy, Østlund, and Yamagata. The texts were later distributed as an addendum to the report of the Working Group meeting (Annex E).

The papers were presented and discussed on 2 September. There was obviously a need for more international cooperation both among the scientists involved and with international authorities like IAEA, FAO, UNESCO, WHO and WMO.

Thus, the discussion on 3 September focused on the help that could be given by oceanographers to the various national and international atomic energy authorities—and vice versa. In order to extend the interest of problems involving oceanic radioactivity, the following recommendations were made by the working group to SCOR:

- 1. A general account of present-day radiochemical techniques should be prepared, dealing both with the analysis of seawater and biological and geophysical applications; a bibliography should also be worked out.*
- 2. Increased support to existing centres for radiochemical analyses and establishment of new centres.*
- 3. Extension of sampling networks, particularly by means of ocean weather ships and whaling ships. Monitoring of radioactivity in coastal waters and harbours in connection with the increased use of atomic power stations was, however, considered the responsibility of government agencies.*

- 4. The treatment of maximum permissible concentrations of radioisotopes, outlined by D.C. Martin (UK), should be recommended to IAEA.*
- 5. Further development of radioactive tracer experiments to increase the knowledge of oceanic diffusion. Several precautions should be taken, and SCOR should assess proposals to tracer experiments.*
- 6. A. El Wardani, F. Koczy and D. Lal were suggested as new members of the Working Group.*

Carbon dioxide in the Ocean and Atmosphere (SCOR WG 2)

This working group did not meet in New York but would attend the IAPO Symposium on Circulation of Carbon Dioxide at Helsinki in 1960.

Physical Properties of Sea Water (with IAPO) (SCOR WG 4)

This working group did not meet because it wanted to await the outcome of a conference on “Physical and Chemical Properties of Sea Water”, recently held by the U.S. National Academy of Sciences. A report of the Working Group would be presented in 3-4 months.

Chemical Oceanography (SCOR WG 6)

This new working group should (1) advise on and coordinate chemical oceanography during the IIOE, (2) advise on methods and equipment to be used, and (3) advise on the training of experienced chemical oceanographers, also including sea-going training. Members appointed by SCOR were B.H. Ketchum (Chairman), F.A. Richards (Secretary), H. Postma, F. Strickland, and K. Sugawara; members appointed by IAPO: L.H.N. Cooper, S.W. Brujewicz, D.E. Carritt, and Y. Miyake.

Two Working Groups were to be established by the SCOR Executive Committee: Radio Aids to Navigation and Data Centre for the IIOE.

SCOR General Meeting Discussion of IIOE (Agendum 1.1)

Background papers for the SCOR meeting
To my knowledge the following documents were available for the discussion:

- 1. International Indian Ocean Expedition, by G.E.R. Deacon, March 1959, 6 pp.*
This extremely well-written paper first gives the reasons for choosing the Indian Ocean for a concerted effort. A number of important physical issues are mentioned: energy

exchange between sea and atmosphere, response of the sea surface to winds and pressure changes, water circulation, and tides and gauges. Organic production and its occasional inimical effects on animal life is discussed in detail; another main biological issue is the three-dimensional distribution of marine organisms. Chemistry and submarine geology (continental movement, distribution of sediments, etc.) are other rewarding subjects. Finally, the effort needed was briefly outlined. An abbreviated version was published by Deacon (1960b). Another account with 12 illustrations came out the following year (Deacon 1961).

2. *Some Suggestions concerning the Indian Ocean Surveys*, by C.O'D. Iselin, August 1959, 20 pp., 9 charts.

The paper contains a list of references concerning physical oceanography of the area, four charts of longer cruises prior to IGY and lists of the reports and station data of relevant expeditions, location of published profiles (with two charts), surface observations and the distribution of the accumulated bathythermograms (with one chart). It was found that there were almost no data available to plot subsurface temperature distributions on a seasonal basis or to determine the depth of the 10°C isothermal surface.

In order to investigate what Iselin considered a central problem (the rate at which the new surface current pattern becomes established after the onset of the monsoons and the rate at which it deepens), direct current measurements and observation of the three-dimensional distribution of temperature and salinity would be essential. After reviewing the availability of ships north and south of Lat. 20°S, Iselin presented a chart that could be thought of as a minimum plan as far as the current system was concerned. If 11 ships were going to be available, it would occupy only half of their time, thus allowing for frequent diversions from the basic grid in order to examine other interesting features.

3. *Indian Ocean vertical temperature sections*, by M.K. Robinson (not available as a document).

This contribution was later printed (Robinson 1960). The data presented were provided by U.S. and British navy and research vessels. Five latitudinal and six longitudinal sections are given.

4. *Proposed International Indian Ocean Oceanographic Expedition, 1961-1963*, by Georg Wüst (not available as a document).

This paper was also published subsequently (Wüst 1960). After the Era of Exploration, the German *Meteor* Expedition 1925-1927 introduced the Era of Systematic

and Dynamic Ocean Surveys with its 14 cross-sections of the Atlantic Ocean from 20°N to the Antarctic ice edge, bringing the whole concept of the circulation of the Atlantic into focus (Wüst 1957). This work was later supplemented with other investigations (by *Discovery II* and *Atlantis* and particularly during the IGY), resulting in the coverage of the entire Atlantic Ocean. Based on the experience gained in the Atlantic Ocean, Wüst “sketched” an idealized schematic network for a survey of the entire Indian Ocean (Figure 9). Measurements should be made at the same depths as during the IGY and with reduced intervals within stronger current systems; in the monsoon areas they should be repeated.

5. *International Indian Ocean Programme - Biological Aspects*, by N.B. Marshall, 8 pp., 1 chart.

This outline was based on discussions among the Working Group members Currie, Foxton, Laevastu and Marshall, and with G.L. Kesteven, Chief of the FAO Fisheries Biology Branch.

The chief aims were recommended to be (1) to investigate the biological structure of the Indian Ocean and (2) to assess the magnitude of its living resources and their variation in space and time. The outcome would depend on the available facilities and their coordination, a preceding standardization of methods, and a close cooperation with marine physicists and chemists. Much of the information collected could be of immediate practical value for those tackling fishery problems in the region, provided that the collection of material and the subsequent sorting and working up could be carried out within a reasonable time.

As a basis for discussion, requirements and methods to be used were outlined for the following disciplines: solar radiation, phytoplankton (primary production and standing crop), chemical constituents, zooplankton (standing crop and distribution), nekton and benthos. As problems of particular interest in specified areas the following were identified:

1. Seasonal changes in plankton production in the Arabian Sea.
2. The apparently spasmodic upwelling in the NW Australian region.
3. Plankton production and hydrographical features, particularly at divergences in the equatorial region.
4. Fish mortality.
5. Distribution and seasonal abundance of fish eggs and larvae.
6. Trophic studies.

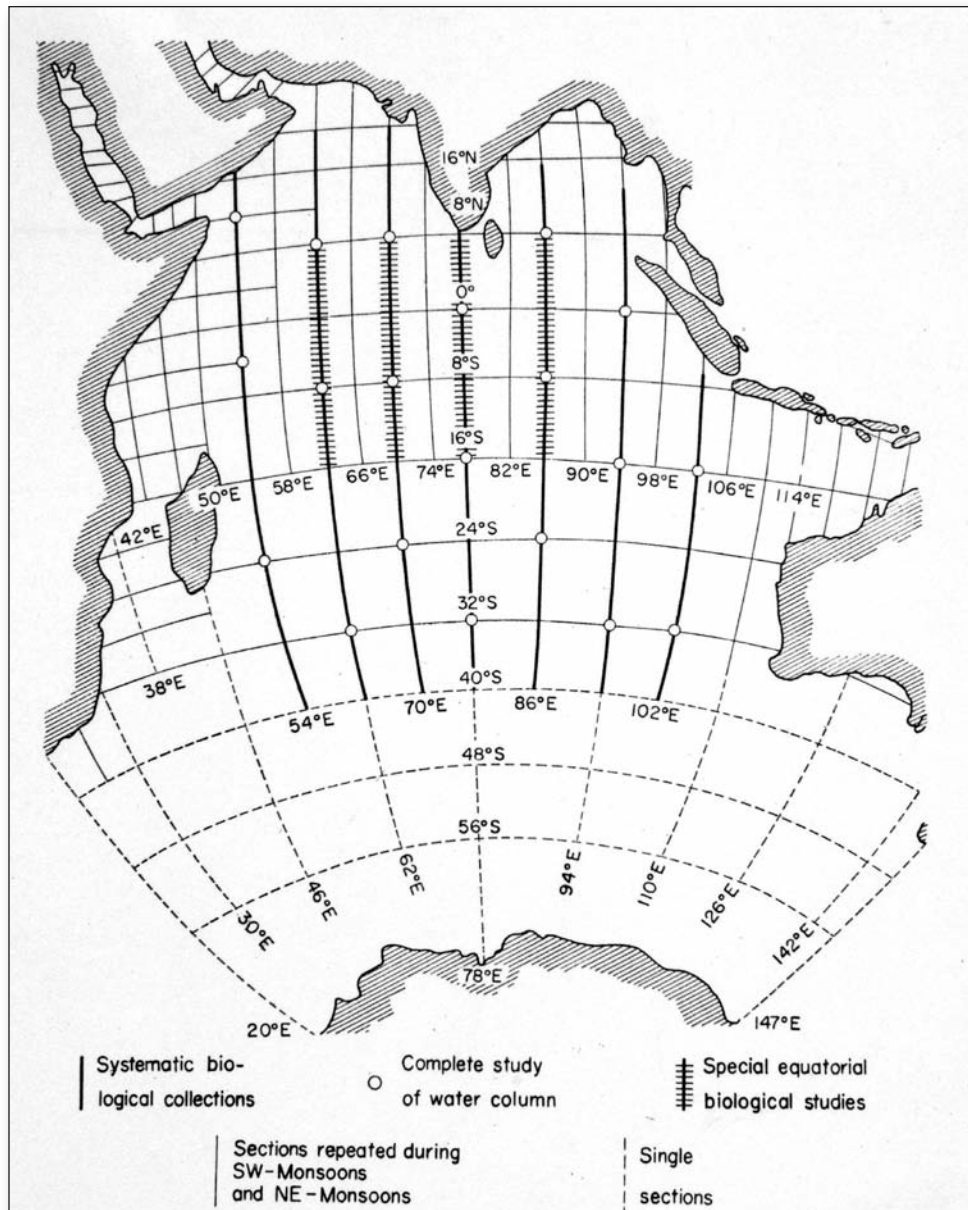


Figure 9. *Proposal of schematic sections for the first systematic oceanographic survey of the Indian Ocean. Georg Wüst's original chart, supplemented with plans for biological investigations, prepared by N.B. Marshall. (After Wüst 1960) Reprinted with permission from Elsevier.*

The management of data might be undertaken in conveniently situated shore laboratories where both much of the analytical work and the rough sorting and distribution of material could be performed.

As immediate preliminary work the following was suggested: preparation of a bibliography of past work and of existing taxonomical and biological knowledge, construction of a tentative production model, experimental work on and standardization of techniques, and manufacture and

distribution of equipment. A time schedule for the preparatory work was suggested, urging action as soon as possible.

6. *The Indian Ocean Bubble*²⁴, five issues, 10 pp. in all This journal (Figure 10) was published anonymously 1959-60 (No. 1 undated, Nos. 2-4 between February and July 1959, and No. 5 on 1 March 1960). Its purpose was exchange of views and ideas between "oceanographers on a working level". The preliminary distribution list contains names of 14, primarily American, physical oceanographers.

²⁴ The Indian Ocean Bubble was originated by Henry Stommel, the first issue appearing in 1958. It was republished in Hogg, N.G. and R.X. Huang (eds.), 1995: *Collected works Henry Stommel*, American Meteorological Society 1:303-311

THE INDIAN OCEAN BUBBLE

ISSUE NO. 5 MARCH 1 1960 I.O.Y. 3

WITH this last issue of THE INDIAN OCEAN BUBBLE, the editorial offices close. The editor has maintained a gently pejorative tone throughout the brief lifetime of this journal - it would have become a clergyman. But when one criticizes too often it tends to take on a petulant ring. Since your editor has essentially a sunny disposition, he has elected to retire from the field - secure in his cloak of anonymity - some day, perhaps, to appear again in a dramatic way (as a Black Knight?) to do battle with Sin.

Figure 10. Extract from the final issue of *The Indian Ocean Bubble* (1959-1960).

Behrman (1981, pp. 13-15 and 17) quotes lengthy citations from articles in the *Bubble*. In the first issue Henry Stommel recommends the Arabian Sea for a study of how much the internal density structure of such a semi-enclosed basin responds to the variations in wind stress; he also suggests season-by-season hydrographical sections of the strong and narrow, reversing Somali Current. R.B. Montgomery would prefer a very small number of carefully chosen sections rather than a fine network and hoped that the program will aid directly the development of one or more oceanographic centres in countries bordering the Indian Ocean. In No. 3 (dated "10 May 1959 A.D.") Martin J. Pollak particularly advocated a "quasy-synoptic" study of the zone between 10°N and 20°S to find out whether seasonal shifts of the equatorial current system occur and suggested that "the overall program will be planned by the people who will take the ships to sea and then use the data". Gene La Fond felt immediate contact with high-level people in the Indian Ocean region essential ("... this is the Indian Ocean, not the Woods Hole or Scripps ocean"). Finally, in No. 5 there is from the editor a statement: "secure in his cloak of anonymity - some day, perhaps, to appear again in a dramatic way (as a Black Knight?) to do battle with Sin", and a letter from Stommel with rancid comments on the individual scientist's "academic" freedom being bound to conflict with his being responsible for a great deal of routine work and Stommel's objections to the idea that the Expedition will help to improve the fisheries of the Indian Ocean.

SCOR General Meeting Discussions on 29/30 August

The presence of SCOR members and of other delegates to these meetings were pointed out on p. 51.

After long discussions it was agreed that approximately half the ship time should be devoted to physical and biological investigations along a network of lines to 40°S. The rest of

take place in 1962-1963, but in order to obtain support nationally and through UNESCO, etc. a well-coordinated plan with estimates of cost must be prepared for circulation before the next SCOR meeting.

Working Group meetings

There is no evidence that the Working Groups on the IIOE and on Productivity of the Sea and of the Standing Crops of Phytoplankton, which were formed around mid-summer 1958 (see p. 43), met before New York. Since its formation, the latter had changed objectives from "World-wide comparisons of organic productivity and standing crops" to become simply the biological program of the IIOE. Both groups met in New York; there are no lists of participants.

Indian Ocean Working Group

The Convener, C.O'D. Iselin, submitted to the final SCOR meeting a report on the meetings of his Working Group (Annex C, 4 pp.).

Three evening meetings were held during the Congress, and smaller groups met to discuss specific problems.

The Indian Ocean, with its seasonally reversing winds, presented unique opportunities for the study of wind currents and biological productivity. The detailed account of the scientific objectives would be widely distributed in the near future.

It was now too late to coordinate the expeditions planned for 1959-1960, but during this first stage a sufficient knowledge should have been obtained to allow for a more detailed, coordinated, international plan for the years 1962 and 1963. Three charts showed the cruises planned before 1 January 1961 (USA, Australia and France), those planned for 1961-1963 (Britain, USA and Australia), and the ideal

the time was needed for investigations of basic physical and biological problems in relevant areas. All ships should work on a few representative problems and in groups, and sorting of biological collections should be provided for. The first stage of the expedition would be the cruises planned for 1959-1960 by various countries. A joint operation should

basic grid proposed by Wüst (see Figure 9). Contributions to this grid of observations were still missing from some countries, but could be expected before the IAPO meetings at Helsinki in July 1960.

The report ends with no less than 17 recommendations to SCOR! They may be summarized as follows:

1. To consider the planned cruises up to 1962 as the first stage of the IIOE and to distribute a general plan for the major cooperative effort 1962-1963 to be agreed to at the SCOR meetings in July 1960.
2. To strengthen the IGY data centres and establish one or more centres for the sorting and study of biological collections, primarily plankton.
3. To adopt a grid of observations at least as detailed as the one suggested by Dr. Wüst (see Figure 9) and devote at least half of the ship time to this coordinated effort.
4. To encourage the establishment of radio aids to navigation; to supplement temperature and salinity measurements by direct current measurements; to develop a tide gauge program and to conduct meteorological observations at sea and on shore of phenomena affecting conditions of the ocean, in close cooperation with WMO.
5. To seek support from UNESCO and other organisations and funds for training and to acquire modern equipment.
6. To request Dr. Laevastu of FAO to prepare a biological bibliography.
7. To reconstitute the Working Groups and appoint Dr. Robert G. Snider²⁵ to serve as its Secretary and as Coordinator of the final plans; in addition he should try to persuade scientists and National Committees to participate fully in IIOE and assist in obtaining funds.

IIOE Biology Working Group

The Convener, N.B. Marshall, submitted to the final SCOR meeting a report on the meetings of his Working Group (Annex D, 5 pp.)

The group held two general meetings and then divided into two subgroups to consider (1) techniques for phytoplankton measurements and (2) methods and gear for sampling zooplankton, nekton and benthos. The aims of the program were extended from those presented in the first outline (p. 56):

1. *To assess the magnitude of living resources (primary productivity and standing crops of plants and animals), including study of seasonal changes.*
2. *To explore the biological structure of the Indian Ocean (i.e., the three-dimensional distributions of plants and animals) and relate it to the physical structure.*
3. *To help assess the magnitude of pelagic fish populations that might support commercial fisheries.*

Before the completion of the coordinated plan for the second phase (1962-1963), there should be an interchange of descriptions of gear and sampling methods employed.

At the meeting no definite agreement could be reached of what should be observed and which methods and procedures should be applied. It was agreed that the Working Group should try to standardize the methods.

The result of this effort is found in the report's detailed recommendations, particularly regarding primary production of phytoplankton: This should be measured daily and the carbon-14 method developed by E. Steemann Nielsen should be employed and supplemented by the oxygen technique in rich, upwelling water. Simultaneous measurements of hydrography, incident and radiant energy, and turbidity down to the thermocline region were also recommended.

For zooplankton, nekton and benthos, collections were suggested along Longitudes 54°E to 102°E (see Figure 9). Details of zooplankton net sampling and estimation of biomass at each station and at selected stations were given. Nekton (fishes, cephalopods, etc.) should be collected with mid-water trawls and counted. Life on the deep seafloor (benthos) should be investigated using Russian gear and procedures for ready comparison with Russian findings elsewhere.

The following special problems were outlined:

1. *A survey with high-speed samplers of the distribution of fish eggs and larvae to identify the spawning grounds of important commercial fishes.*
2. *In the equatorial region current divergences had recently been discovered. A more complete study along longitude 66°E to 82°E and between 8°N and*

²⁵ Mr. Snider had served as an officer in the U.S. Navy during the war, coordinating tests of equipment used in anti-submarine warfare. Several of those with whom he had worked during the war had later become leading oceanographers in the United States. He had later served as a chairman of a panel of ocean resources, and in August 1959 he became coordinator of the U.S. effort in the Indian Ocean. He worked as the international coordinator for SCOR from the end of 1959 to the end of 1962. Revelle described him as "a born expeditor" (Behrman 1981:16).

16°S might indicate whether divergences were present in both monsoon periods and thus might cause increased productivity.

3. Productivity of coral reefs and of upwelling in specific areas.

4. Observations regarding discoloured water, fish schools, fish mortality, and sea birds and sea mammals.

In conclusion, the report emphasized that lines of stations in the chart (see Figure 9) were simply the basis for a more complete survey during the second phase. This was particularly true in the South African and Australian regions, and advice from SCOR representatives from these countries would be welcomed.

SCOR General Meeting Discussions on 12 September

The Working Group reports were discussed in detail and approved with amendments. R.L. Fisher presented the plans for the Scripps Monsoon Expedition to the Indian Ocean in 1960 (Annex F, 3 pp.) and remarked on marine geological-geophysical aspects (Annex G, 4 pp.). The latter paper reviews the known topography and suggests special attention to be paid to the mid-ocean ridge, trenches and seamounts; gravity cores should be taken both on a routine basis and in areas found to be critical. If copies of corrected sounding tracks from forthcoming expeditions were submitted immediately, a basic map might be available for the planning of the second phase in 1962-1963.

CHAPTER 7

Developments Between October 1959 and July 1960

General Assembly of ICSU in The Hague in October 1959

At this meeting ICSU remedied one of the differences in the constitutions of SCOR and SCAR (p. 48) by deciding that for SCOR “Officers of a Special Committee shall be appointed for a period of not more than three years” and that only the Secretary may be reappointed for one further term of three years. Revelle and Deacon would have to be substituted by a new Chairman and Vice-Chairman at the forthcoming SCOR meeting in 1960. There should also be elected two Vice-Chairmen instead of one and the membership should increase from fifteen to eighteen (one extra representative of IUGG, IUBS and IUPAC) “to increase the strength of the Executive Committee of SCOR”.

Activities of the SCOR Secretary

The final report of the meeting of SCOR in New York on 29-30 August and 12 September which was considered in Chapter 6 was sent out by the SCOR Secretary, Günther Böhnecke, on 22 December 1959.

In view of the elections to be held at the 1960 SCOR meeting, Böhnecke addressed the relevant unions about possible changes in their nomination of members of SCOR. SCOR was entitled to elect its Executive Committee from amongst its own members and was looking forward to receiving from ICSU and the five member unions confirmation of the listed members of SCOR, or of such changes as seemed desirable, before 1 May 1960.

Ronald Fraser, Böhnecke and Snider met on 16 March 1960 in The Hague in advance of the planned meeting of the SCOR Executive Committee to be held in Paris. One of the agenda items was the election of a new president and two new vice-presidents. The three other items were concerned with the International Indian Ocean Expedition. The first was a verbal report of Snider’s world-wide travel. The second was a reconstruction of the “Indian Ocean” working group on the lines of the special sub-committees in the fields of (a) Oceanography—physical and chemical; (b) marine biology; (c) geology, geophysics and bathymetry; and (d) a special arrangement through WMO for their committee on marine meteorology to formally assist in the development of the Indian Ocean Expedition programme on marine meteorology and climatology. The third item was cooperation with UNESCO in relation to the ships’ tracks, a proposal of sending Snider to Paris as the representative

of SCOR and breakdown of the UNESCO subvention.

SCOR Executive Committee Meeting March 1960

At a meeting in Hamburg between Snider and Böhnecke an agenda was worked out for the SCOR Executive Committee meeting which took place in Paris on 21 and 25 March 1960, with Snider attending. The agenda of this meeting (with its no less than 20 items) is available. Apart from the SCOR budget for 1960, it deals entirely with working groups (reports and forthcoming meetings) and the Indian Ocean Expedition. Amongst the latter agenda items are the following: delay of start of major work, national programs and geographic areas of these, coordination of ship operations, total budget, equipment needs and uniform standards for equipment use and procedures, navigation aids, shore facilities, training of scientists from the Indian Ocean area and examination of their qualifications, and training of technicians.

The files contain no information about decisions, etc. reached, either at the Paris or at the The Hague meetings mentioned above.

At the Executive Committee Meeting, it was decided that, first, the reconstituted Indian Ocean Working Group had the task to plan and coordinate the major effort of SCOR in the Indian Ocean to be discussed at its meeting in Copenhagen; second, a tentative agenda was drawn up for the SCOR General Meeting on 23 and 24 July 1960 at Helsinki; and third, that the 1961 meeting of SCOR might take place at Honolulu from 21 August to 2 September 1961 together with the 10th Pacific Science Congress.

Circular letter No. 2/1960 was sent out by Böhnecke on 25 April to members of SCOR, to the National Committees of SCOR and to international organizations.

Financing of SCOR – still a sore point

In spite of the sympathetic way in which ICSU received Böhnecke’s verbal report (p. 54), a meeting with Ronald Fraser in early November had made it clear to Böhnecke that for 1960 only \$10,000 of the estimated expenses of \$41,500 would be supplied by ICSU from the UNESCO subvention; \$10,000 would be given as a loan. ICSU also expressed strong expectations that Revelle and/or Snider should try to obtain the largest possible amount from one of

the U.S. foundations. Furthermore, ICSU believed contributions from National Committees should be about \$30,000 instead of the estimated \$5,000-6,000. As soon as Böhnecke had received the audited account from ICSU, he distributed in April 1960 the revised statements for 1959 and 1960 (see also pp. 71-72).

Financial Position as at 31 December 1959:	
Income	
Balance at hand on 1 January 1959	\$127.61
UNESCO subvention to ICSU in 1959	\$10,500.00
Total	\$10,627.61
Expenditure	
New York Meeting	\$9,246.45
Secretarial expenses (travels, assistant postage, etc., bank charges)	\$628.17
Balance at hand on 31 December 1959	\$752.99
	\$10,627.61
Estimated Financial Position for 1960:	
Income	
Balance at hand on 1 January 1960	\$752.99
UNESCO subvention to ICSU in 1960	\$10,000.00
On loan from ICSU	\$14,747.01
National contributions	
	\$25,500.00
Expenditure	
Meeting of the reconstituted Indian Ocean Working Group in Copenhagen	\$12,000.00
SCOR Meeting in Helsinki	\$8,000.00
Secretarial expenses	\$3,000.00
Printing, postage, etc.	\$1,500.00
Publications, information about ships' tracks, expeditions, etc.	\$1,000.00
	\$25,500.00

A comparison with the previous budget (p. 54) shows that the expenses of Robert Snider, the IIOE co-ordinator (salary, travels, etc.), amounting to \$26,000, are not included, since the U.S. National Science Foundation had decided to defray this expenditure. Owing to SCOR's shortage of money, the Executive Committee had decided to support in 1960 only the Indian Ocean Working Group, not any of the others as originally planned.

So far there had been no response to Böhnecke's request some months earlier for contributions from National Committees. He therefore stressed that he would be "*most grateful*" to know for the Helsinki meeting the amounts which National Committees were willing to contribute. Their total number was now 18, Canada, Finland, Pakistan, and Thailand having recently joined.

Shortly afterwards the U.S. National Committee forwarded \$6000. Another \$6,000 was available but would not be sent unless some indication was given of the extent of support from others, particularly USSR and UK; to donate the entire amount now might dissuade other nations from putting up adequate amounts themselves.

In response to letters from Revelle to Deacon (UK) and Kort (USSR), in which he informed them about the sum that might be expected from the United States, the Royal Society, London, contributed \$500.

CHAPTER 8

Intergovernmental Conference on Oceanographic Research in Copenhagen 1960

The conference took place in Christiansborg Castle, the palace of the Danish parliament, from 11 to 18 July 1960. Thirty-six member states of UNESCO had responded to an invitation. The total number of delegates amounted to 98 from 35 countries, and another 18 were representatives or observers. Figures 11 and 12 give pictures of attendees from the United States and Denmark. A report of 19 pages on the Intergovernmental Conference is available.

Together with this conference were held:

- Meeting of SCOR members and others, to prepare for the SCOR General Meeting later in the month, p. 65
- Meetings of the SCOR IIOE Working Group members and other SCOR members to discuss IIOE planning, pp. 65-68
- Fifth (and apparently final) session of IACOMS on 8 and 9 July, pp. 82-83

Recommendations for an Intergovernmental Oceanographic Commission

The Intergovernmental Conference, sponsored by UNESCO, recommended the establishment of an Intergovernmental Oceanographic Commission with the purpose

a. to facilitate concerned actions of the nations on behalf of forming a mechanism for exchange of information and data. The data centres existing in USA and USSR, as well as other regional ones (e.g. ICES) and specialized ones (e.g. mean sea

level), should be continued. Biological data and reference centres should be established,
b. to agree upon standardization and intercalibration (e.g. soundings, comparison between titration and conductivity methods),
c. to facilitate the use of oceanographic aids (e.g. navigational aids for position fixing and deep sea tide gauges),
d. to facilitate actual planning for observations of all kinds of oceanography at sea; to facilitate the performance of international programs (e.g. the Indian Ocean Expedition).

The Intergovernmental Commission should be a governmental body under UNESCO with the aim to promote the science of oceanography in all branches (Physics, Chemistry, Biology and Geology). It was proposed that the role of SCOR should be to give scientific advice for IOC on general problems and programs and also for UNESCO's own programs. SCOR should replace IACOMS, which would be disbanded. The proposal of the Conference reads as follows:

“Authorize the Director-General of UNESCO to define in consultation with the International Council of Scientific Unions (ICSU) and the Intergovernmental Oceanographic Commission the working relationship between IOC and SCOR which would be the scientific advisory body for the Office of Oceanography of UNESCO and therefore would receive appropriate financial support from UNESCO”.



Figure 11. *From the IOC preparatory meeting, Copenhagen, July 1960. – Part of the U.S. delegation. Front row, from left: Prof. Roger Revelle, Scripps Institution of Oceanography; Mr. James Simsarian, State Department; Dr. Arthur Maxwell, U.S. Office of Naval Research; Dr. John Lyman, U.S. Hydrographic Office. Second row: Mr. Richard Vetter, Executive Secretary of the National Academy of Sciences' Committee on Oceanography. Other persons: unknown.*



Figure 12. *From the IOC preparatory meeting, Copenhagen, July 1960. Picture of part of the Danish delegation. Front row: Mr. Torben Wolff, Zoological Museum, Copenhagen, Mr. A. Carlsen, Liaison Officer and Dr. Anton Bruun, Zoological Museum, Copenhagen. (Bruun's Archive)*

At the UNESCO General Conference in Copenhagen in July 1960, the recommendation of the Conference was accepted, and it was agreed to establish an Intergovernmental Oceanographic Commission (IOC).

The first meeting of IOC took place in Paris in October 1961. In the following year, IOC undertook the co-ordination of IIOE, thus leading to the end of Snider's role as SCOR's appointed co-ordinator.

CHAPTER 9

Meetings of SCOR Indian Ocean Working Groups, 16-17 July 1960

The following report was compiled by Deacon and Revelle at the ICES headquarters at Charlottenlund Castle, in order to be ready for the SCOR meeting on 23-24 July 1960 in Helsinki. By working very hard the two gentlemen succeeded in getting the report ready in time.

The ad hoc-meeting of SCOR members and others on 16-17 July 1960

The meeting was attended by a fair number of SCOR members: Revelle, Böhnecke, Miyake, Panikkar, Deacon, Bruun, Zenkevitch, Humphrey, Steemann Nielsen, Currie, Iselin and Mosby, in addition to the co-ordinator Snider, Fraser representing ICSU, some members of the Indian Ocean Working group and representatives of various national and international institutions. The group met from 0900 to 1100 on 16 July and from 0900 to 0930 and from 1500 to 1800 on 17 July. The working groups on Physical and Chemical Oceanography and Marine Meteorology, on Biological Oceanography and on Marine Geology and Geophysics met from 1100-1800 of 16 July and from 0930-1500 on 17 July. The following numbers refer to the agenda circulated on 6 May 1960:

1. *The chairmen of the three working groups outlined main conclusions, and common issues were discussed. The chairman and 2-3 members should prepare statements for further discussion in Helsinki.*
2. *National representatives gave brief accounts on their contributions. It was agreed that a new statement should be drawn up for national committees in such a way that it would both appeal and emphasize possibilities for cooperation.*
3. *After a long discussion it was agreed that USA, USSR, Australia and others, before the middle of 1962, should provide a reconnaissance of the main physical, biological, topographical and geological features. From 1962 cooperation between ships should work together to cover some of the important problems, and meetings of the scientists who would lead the efforts of working together should be held and supported by SCOR.*
4. *It was agreed that a laboratory meeting should be arranged amongst all the chemists to make comparative analyses and amongst biologist regarding standardization of methods.*
5. *It was recognized that no ocean-wide navigational aid was likely to be available with the exception of groups of ships doing intensive work in coastal regions.*
6. *Seasonal and shorter period changes in mean sea level and an operation of side gauges would be an advantage, and that ships fitted with wave reading equipment should use this.*
7. *It was agreed that countries sending ships should purchase equipment contributing to the joint programme and that all echo-sounders should have precise control of transmission intervals and record speed.*
8. *The question about a taxonomic centre was referred to the biological group for further consideration. It was recommended that special items were made available for sale, and that each ship should let the Coordinator know its radio call sign and times of radio operation.*
9. *Training of oceanographers and technicians should start as soon as possible in laboratories of the main contributors. UNESCO has expressed its readiness in providing fellowships.*
10. *Aims and objects of the expedition should be given careful publicity in relevant publications.*
11. *It was thought that the only practical way was for all contributors to bear their own costs, but that the sums obtained from international sources might be used to help those who were making determined efforts.*
12. *The main programme should be sufficiently clearly outlined after the Copenhagen and Helsinki meetings to make further general discussion unnecessary. All funds available should be used to settle questions about methods and observations. Much work might be done by correspondence, with the coordinator kept informed, or by laboratory meetings which might be financed by SCOR. Splitting up of meetings would release pressure on countries who have not yet committed themselves.*
13. *It was agreed that scientists on all ships taking part should write frequent cruise reports on what observations had been made to be sent to their parent laboratories for further circulation to all national committees. Eventually there should be a central authority ready to produce an atlas and to issue collected reprints in which scientists would have an opportunity to present conclusions.*

Appendix I: Facilities for ships

The subcommittee met on 18 July at the ICES headquarters and produced the following suggestions:

1. *An emblem, badge or pennant approved by UNESCO for ships and papers would be appropriate.*
2. *The States should give due recognition of the international nature of the work.*
3. *The scientific personal should be regarded as officers, and UNESCO should provide each crew member with a relevant document.*
4. *The States should provide the following facilities and concessions: (a) no canal and harbor dues, (b) tax-exempt fuel for ships, (c) special customs facilities for entry and embarkation of equipment and store and (d) for transshipment, (e) simplification to gain scientific observations and (f) help in storage and handling of explosive charges for seismic studies.*

Appendix II: Physical and Chemical Oceanography and Marine Meteorology

The working group met on 16 and 17 July in the Parliament Building. Those present were Böhnecke, Deacon, Dietrich, Fedorov, Fuglister, Hidaka, Iselin, Ketchum, Knauss, Laevastu, Tchernia and Uda.

It was felt that there were sufficient hydrographical and biological stations to give a good network, but that the detailed study planned for 1962-63 may be used most effectively by concentrating on special problems.

The characteristic of this ocean, making it particularly useful for physical studies, is the marked change of winds with winter and summer monsoons which will be the main issue. The Arabian Sea will provide good maps, useful information about changes in slope of density layers and data for geostrophic calculation. Another area of intensive study lies northwest of Australia. Observations along lines of latitude and longitude will give a synoptic cover with not more than a hundred miles in spacing of bottom-reaching stations and intermediate observations to lesser depth.

In addition to these repeated lines there will be multiple ship studies of special problems, e.g. physical-biological studies of upwelling, of piling up of surface water by the wind or of surface and subsurface currents near the equator.

The need for year-round work in the Red Sea and Persian Gulf were also recognized. Current measurement of at least two weeks in both summer and winter in the straits of Bab el Mandel and Hormuz was also considered essential. Special areas not adequately provided are the Bay of Bengal, the region of the Agulhas current and the area between Madagascar and Mauritius.

Meteorology.

It was considered essential to require good daily weather maps and monthly climatic summaries for as many 5° squares as possible. Standard meteorological observations should be taken and at once be sent to authorities. Energy exchange between atmosphere and ocean, observation of temperature and humidity gradients and wind profiles from floating buoys afford good opportunity for study. Radio probe and radar wind observations are valuable in ships large enough to carry special equipment.

Chemistry.

The chemical sub-group recommended that all ships should carry out at least a minimum programme, and that all the analysts should participate in a working conference conducting the Marion's methods simultaneously and comparing results. SCOR should arrange such a conference and provide funds. The minimum programme recommended:

- I. *At all hydrographic stations at each sampling depth to identify oxygen, inorganic or total phosphorus (or both) and silicate.*
- II. *At biological stations in upper water layers identifying oxygen, inorganic and total phosphorus and nitrate.*
- III. *At occasional stations requests for determinations of trace elements for shore laboratories have been received when cruise plans are known. Agreement on details will be established.*

Each of the shore analyses must be completed soon after collection. If impossible, each sample must be frozen at -10°C and delivered to a shore laboratory. Samples for total phosphorus may be stored in glass bottles for two years. The methods for analyses (including references) are given.

Appendix III: Report of working group on Geology and Geophysics

The working group met on 16-17 July and consisted of Fisher, Heezen, Laughton, Nafe, Nanda and Siebold, with Hales and Hunt as observers. The following items were recommended:

1. *All vessels should record sounding continuously with a precision time-base accurate to 1 part in 5000 (or better) and distributed rapidly. Also routine 900 FT bathythermograph observations at hourly intervals (more frequently at current*

boundaries), meteorological observations and surface temperature should be recorded.

2. Other operations requiring little additional ship time should include sub-bottom reflection measurements, cores, bottom-photographs, dredging, magnetic measurements and gravity observations, although none of these are expected by all ships.
3. Some or all the following observations should be made by geological/geophysical ships:
 - a. Precise bathymetric exploration of seamounts, ridges, trenches and shelf- and slope-topography.
 - b. Continuously recorded magnetic intensity measurements.
 - c. Gravimeter observations by suitable surface ships and gravity pendulum gravity observations by sub-marines.
 - d. Bottom photography to identify abundance and distribution of manganese nodules.
 - e. Frequent rock-dredgings (also preservations of biological specimens).
 - f. Heat flow measurements appropriate to structure investigated.
 - g. Water samples for radio-isotope dating and trace element analysis.
 - h. Piston cores collected in areas of special interest (30 feet or more recommended).
 - i. Seismic refraction measurements, mainly by two ships making continuous profiles. Since rather large vessels are required for long seismic lines needed for measurements to the base of the crust, efforts should be made for co-operative two-ship cruises and addition funds sought.
4. Grants should be sought for travel and training of students and visiting scientists.
5. Rapid exchange of information on proposed cruises is required to avoid duplication of effort and the widest possible coverage in all regions.
6. Comments and suggestions on sounding are appended in Annex 1.

Annex to Report on Geology and Geophysics

Base Map. It is suggested that all soundings should be compiled by one office (e.g., the British Admiralty or Scripps Institution) requiring one plotter for at least one year and reviewed by interested scientists. The base map should be a Mercator projection as the General Bathymetric Chart (1:10 million at equator).

The work should be started soon and be available for planning after the middle of 1962.

Appendix IV: Report of the Biological Working Group
The group met on 16-17 July in the Parliament Building and on 18-19 July in the Fishery Department in Charlottenlund. Those present were Miss Ray and Bary, Bé, Bruun, Currie (Chairman), Davies, Fedorov, Fraser, Hall, Hansen, Humphrey, Ketchum, Krey, Laevastu, Panikkar, Snider, Steele, Steemann Nielsen, Steinitz, Sugawara, Vetter and Zenkevitch.

The primary biological aims should be:

1. *To study the three dimensional distribution of plant and animals.*
2. *To investigate the quantitative ecology of the plankton.*
3. *To collect as much information as possible within the scope of an oceanographic expedition about potential fisheries in the Indian Ocean.*

The expedition will consist of a series of national contributions on problems of more specific interest to themselves, but should also contribute to a general biological survey of the ocean. But since some of the ships will neither be equipped nor staffed specifically for biological work, it is requested that the biological work from all ships should be kept at a minimum and should necessarily be confined to a study of the surface layers and to a limited section. Larger ships with suitable biological staffs may be supplemented by more detailed observations along three meridian sections (repeated in different seasons) to give a basic picture of the biological structure. These two programmes together are considered to be the minimum of work which is essential. The ships will have their own special tasks to perform, and these should supplement the information of the general biological survey. Detailed proposals for these special tasks are not considered necessary.

The basic biological programme by all ships taking part in underway observations

- *Standard meteorological observations and continuous records of surface temperatures.*
- *Records of discoloured water and accumulations of plankton, fish mortality, fish shoals on the surface, occurrence of e.g. flying fish, squids, turtles and snakes as well as pelagic animals like Physalia and Janthina, whales and dolphins, locust swarms, oceanic birds recorded at four hours of intervals and floating material (drift wood, cuttle bones, pumice, etc.)*
- *It is also recommended to have continuous records of incident radiation in co-operation with the meteorologist.*

Station observations to be made at all hydrographical stations at night.

1. One 5 litre sample taken at one metre depth, filtered through a 0.5 filter and preserved for chlorophyll analysis.
2. One vertical net haul from 200-0 m (apparatus for measuring displacement volume to be provided).
3. One horizontal surface haul with 1 m net towed for 30 minutes and an oblique haul with net from 100-0 m (displacement volume as in 2).
4. Estimations of nutriment as recommended by the chemical groups.

Extended biological programme on larger selected ships
 Besides the above basic programme this one will be performed preferably on three meridian sections at 62°, 78° and 95° East from the continent southwards to subtropical convergence if possible.

1. Night stations at 2200 hours: Vertical net hauls at 1000-500 m, 500-200 m and 200-0 m.
2. Day stations at 1200 hours: Depth of sampling will be determined by measuring optical depths with a submarine photometer. Samples from 6-8 optical depths will be measured for chlorophyll content and ¹⁴C method determinations of photosynthesis. Nutrients will be measured, including nitrates. A high speed sampler will afterwards be used for fish eggs and larvae.
3. At 500 mile intervals tows will be made with a mid-water trawl between 1000 m and the surface.

Treatment of plankton catches. All samples preserved in 10% neutral formalin. One half to be sent to a central handling centre which primarily will be a sorting centre and later develop to a taxonomic centre. Method recommended by SCOR Working group III at the New York meeting to be followed.

Chlorophyll. The technique of Richards and Thompson should be followed with a more precise method being submitted.

Zooplankton nets. For vertical nets, with a mouth area of 50 cm and a mesh size of 160-180 µm should be used. For horizontal or oblique nets, a mouth area of 1 m, 30 meshes per inch and towed at 1-2 knots should be used. Higher speed towing sampler should wait decisions by ICES.

Biomass. Standard technique described later for measuring displacement volume.

Supply of equipment. At selected shore laboratories spectrophotometers and centrifuges are available. Plastic 5 liter water samplers and glass plankton storage jars are necessary. Flow meters will be needed by most ships. Filters, filtering apparatus and desiccators are needed for chlorophyll measurements. Adequate supplies

of spares are emphasized.

It is suggested that observations by merchant ships of e.g. reports on discoloured water and whales should be sent in.

Annex: Special problems in the Indian Ocean

It is essential that special investigations be left to the specialist undertaking the work and that facilities should be available both for specialists cooperating and for cooperation with physical and chemical programmes.

Upwelling. Development and succession of phyto- and zooplankton populations and decomposition and regeneration of nutrients.

Equatorial divergence. Should be extended to include the affects on productivity.

Coral reefs. Productivity might be studied in the Red Sea and central Indian Ocean reefs.

Fish mortality. The occurrence, extent and cause of such mortalities should be collected. Causes are sudden changes in water temperature, lack of dissolved oxygen and blooms of micro-plankton organisms.

It is hoped that the study of benthos quantitatively and qualitatively, the biomass of deep sea plankton, particulate carbon/chlorophyll and the protein/chlorophyll ratios may be studied by some ships.

5. Preservation of bathymetric materials and data

All ships are requested to prepare and preserve graphical navigational plots (fixes, times, courses and speed changes). Each plot should be made at about 1:1 million (4 inches to a degree of longitude), and Mercator plotting sheets should be available on board. Echo sounders should be operated continuously on a scale of soundings to be read at 2 m.

A minimum transmission is required with a 2-3 millisecond transmission to permit resolution of sub-bottom echoes and marked with date, local time and depth scale.

Echogrammes should be preserved by the laboratory or by a designated officer.

Navigational plots should be prepared on the 1:1 million scale with intervals not greater than 2 miles. Changes in roughness to be noted. Soundings to be plotted as the nominal depth read, and on each plot the sounding velocity to be specified. Echo-sounders with time bases good to 1 part in 5000 should be employed with listing of suitable firms manufacturing the N.I.O. and Special Precision Echo-sounders and the Precision Depth and Graphic Recorders. If other sounders are used, special effort to regulate, calibrate and monitor the time base is required. All ships operating outside the shelves should be able to sound the greatest depths.

CHAPTER 10

Fourth Meeting of SCOR in Helsinki, 23-24 July 1960

On 14 June, the Secretary sent out Circular Letter No. 5, announcing that the meeting would be held at the University of Helsinki in connection with the XII General Conference of the IUGG. The following agenda was included:

1. *International Indian Ocean Expedition*
 - 1.1 *Report of the Coordinator*
 - 1.2 *Report of the reconstituted Working Group (Copenhagen Meeting)*
 - 1.3 *Reports of the national Committees of SCOR*
 - 1.4 *Reports of the other Working Groups of SCOR, if available*
2. *Programs involving other organizations*
 - 2.1 *Intergovernmental Conference on Oceanographic Research (ICOR) convened by UNESCO*
 - 2.2 *Reports of the ICSU – IAPO – IHB – General Bathymetric Chart Committee; exchange of soundings via WDCs A and B*
 - 2.3 *Cooperation with SCAR and WMO*
 - 2.4 *Cooperation with IAEA*
3. *Finances and administration*
 - 3.1 *Report of the Secretary*
 - 3.2 *Budget*
 - 3.3 *National contributions*
 - 3.4 *Other sources of funds*
 - 3.5.1 *Elections of the officers of SCOR*
 - 3.5.2 *National Committees*
 - 3.5.3 *Working Groups*
4. *Exchange of information*
5. *Publication*
6. *Other business*
 - 6.1 *Nomination of observers for the Meeting of ICES at Moscow, September 19 – 28, 1960*
 - 6.2 *Place and date of SCOR Meeting 1961*
 - 6.3 *IAEA's plan to convene a Panel of experts in international law to deal with the legal implications of radioactive waste disposal at sea*
 - 6.4 *Next SCOR Meeting.*

The following is according to the General Report of 10 November 1960.

1. *International Indian Ocean Expedition*
 - 1.1 Report of the Coordinator R.G. Snider (abbreviated version)

From January to March 1960 the Coordinator visited the following nations to discuss their participation: Japan, Singapore, Indonesia, Ceylon, India, Pakistan, USSR, West Germany, UK, Netherlands, Switzerland, Portugal, France and USA. Discussions were held with almost 200 senior scientists and officials. In order to stimulate national action the following items were suggested:

1. Formation of National Committees where necessary.
2. Detailed statement for participation, including research program, ships, qualified professional staff and technical trainees, cost of national effort, official hospitality, logistic assistance and laboratory facilities (for Indian Ocean nations).

Discussion also dealt with scientists in the Indian Ocean region, working groups, navigational systems available, calibration of ships' instruments, publication plans, special financial methods, etc. In addition the expedition was also discussed with members of ICSU, WMO, UNESCO, FAO, the UN Special Fund and the Colombo Plan Bureau and with administrators of several other international funds. Three countries can offer post-doctoral facilities for six months to one year, primarily on ship board: Japan, Great Britain and the United States.

Program Planning. The reconstituted Indian Ocean Working Group (SCOR WG 5) now consisted of G.E.R. Deacon as Chairman and V.G. Kort as Vice-Chairman, Deacon as Chairman of the Physical and Chemical Oceanography sub-committee, R.L. Fisher and P.L. Bezrukov as co-chairmen of the Geology, Geophysics and Bathymetry sub-committee and R.J. Currie as Chairman of the Marine Biology sub-committee.

Each nation was asked to submit replies to a questionnaire on ships. Full data had been received on 22 vessels. Extended discussions were held with people from the U.S. Government agencies and laboratories to determine the extent, nature and timing of U.S. efforts. The National Science Foundation and the Navy Department agreed to provide financial support. Then followed a survey of ship facilities from 10 nations, plans to put scientific parties on board other nations' vessels, probable but not yet determined extent of efforts for others and capacity for guest scientists varying from 2-16 per ship. In most cases nations had made cruise plans only for 1962, but general

coverage of the Indian Ocean above 32° latitude seemed reasonably complete. A schematic diagram of recent and impending cruises was enclosed as Appendix B (Figure 13). Most nations would finance their own efforts.

1.2 Report of the reconstituted Indian Ocean Working Group based on the report prepared in Copenhagen. It was discussed in detail and finally adopted. It seemed more productive to plan for special problems and selected areas rather than a general survey of the ocean as suggested some years ago.

2. The national Committees should give information about ships' tracks observations and list of institutions.
3. ICSU is asked to use its influence regarding long range navigational systems.
4. A tide gauge network should be operated in the Indian Ocean.
5. ICSU-SCOR and UNESCO recommendations for ships facilities will be made.
6. UNESCO's training programme for scientists is taken into account.
7. The importance of a Biological Data Centre in

India was stressed and ICSU and SCOR should approach the Indian Government.

8. Closer co-operation between SCOR and SCAR to fill the gap existing in the SW Indian Ocean, which was considered at the SCAR meeting at Cambridge where SCOR was represented.
9. The Maritime Commission of WMO at Utrecht, where SCOR was represented, considered a closer contact with meteorologists and carried recommendation No. 30.
10. The development of weather stations will relate to mean sea level and tide gauges studies.

1.3 Reports of the national Committees of SCOR Most reports gave verbal explanations. Those of Britain and

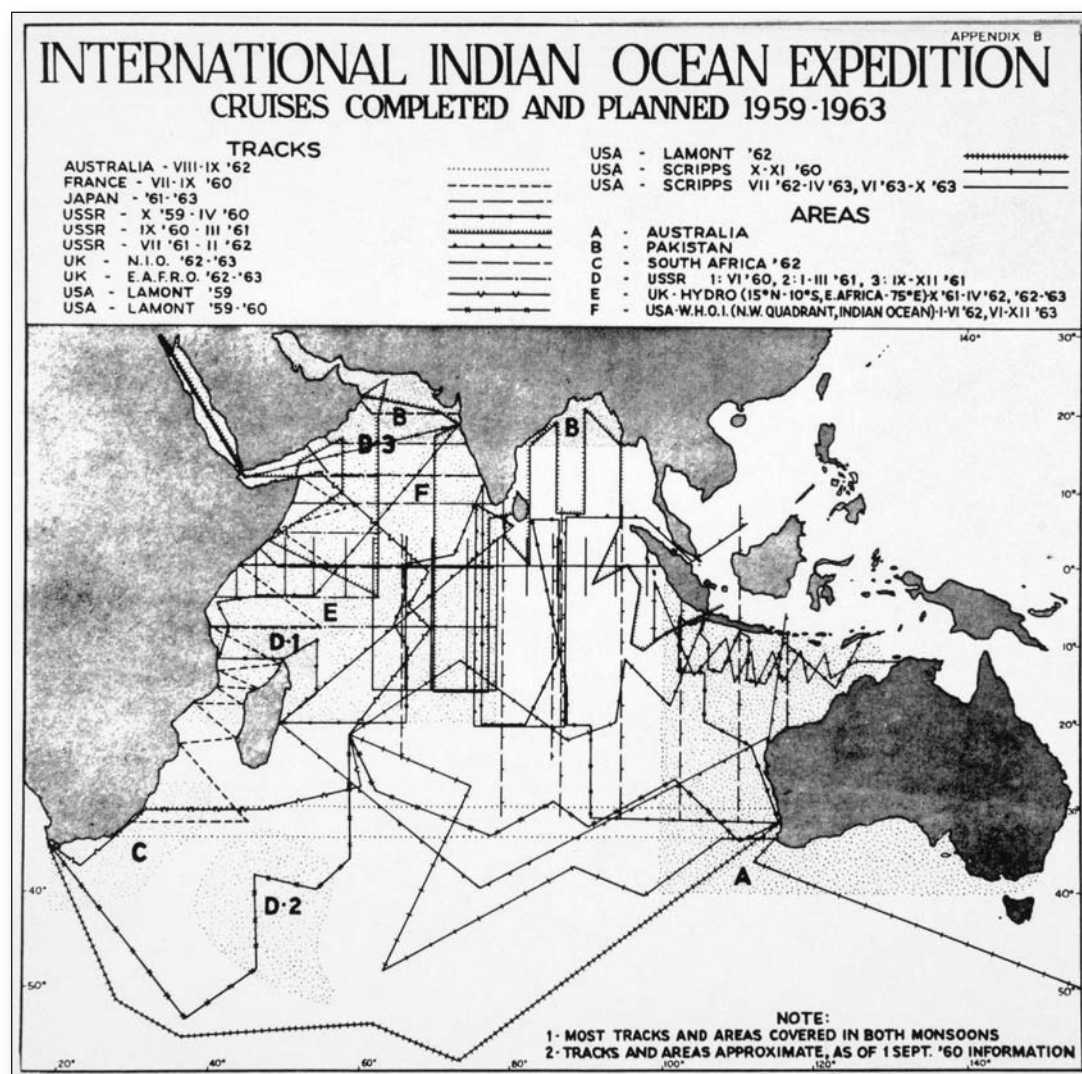


Figure 13. Diagram of cruises completed and planned 1959-1963. Published as Appendix B to the report by the coordinator R.G. Snider and available at the 1960 Copenhagen Meeting.

Further measures for the implementation of the IIOE:

1. For the study of chemical and biological methods intercalibration meetings should be arranged by SCOR.

Germany were given as annexes.

- 1.4 Reports of other Working Groups of SCOR
 - 1.4.1 The report on World Data Centers by

Commander Lumby was distributed before the meeting. In its recommendation SCOR stressed that oceanographers should send their data with additional facts about methods of collection, analysis, calibration and estimate of error. The data centres should serve as a supplement to the traditional exchange of data and should be given adequate support to fulfil their function.

1.4.2 The report on Carbon Dioxide was presented by Dr. N. Rakestraw.

2. Programs involving other organizations

2.1 Intergovernmental Conference on Oceanographic Research – see p. 63.

After a Preparatory Meeting at Paris in April 1960, the ICOR Meeting in Copenhagen in July resulted in resolutions to be submitted to the general Assembly of UNESCO in November/December for final decision.

2.1.1 The Intergovernmental Oceanographic Conference and the Office of Oceanography had recommended the establishment of the Intergovernmental Oceanographic Commission within the framework of UNESCO, with the purpose “to promote the scientific investigation of the oceans with a view to learning more about their nature and their resources through the concerted action of the member states of the Commission”. It will be headed by the Director of the UNESCO Office of Oceanography in close contact with other UN organizations and other organizations. SCOR’s role should be to give scientific advice on general problems and programmes (see p. 63).

2.1.2 Data Centres

The importance of interchange of oceanographic

data via the World Data Centres was recognized.

2.1.3 Standardisation and intercalibration of methods is essential

SCOR, ICES and others should be requested to propose appropriate measures to be presented to the Office of Oceanography.

2.1.4 The training programme of UNESCO in oceanography should be promoted by various means.

2.1.5 Provision of an oceanographic vessel of UNESCO should be studied with the aid of SCOR.

2.1.6 In Helsinki it was felt that the establishment of IOC will be an important event in the history of oceanography, and satisfaction was expressed about the role of SCOR as adviser.

2.2 The ICSU–IAPO–IHB Committee on the General Bathymetric Chart of the Ocean

The report prepared for the meeting of IUGG was adopted by SCOR with satisfaction. In future work ICSU would cooperate with IOC and IHB. It was also suggested that GEBCO would be needed for all kinds of marine research.

2.3 Co-operation with SCAR and WMO: see above 1.2.8 and 1.2.9.

2.4 Cooperation with IAEA is in consultation.

3. Finances and administration

3.1 The report of the Secretary and the addendum of the Executive Committee at Copenhagen (11 July) were distributed, discussed and adopted.

3.2 Budget

3.2.1 Statement 1959

Balance at 1 January 1959			\$127.61
Income			
UNESCO subvention to ICSU		\$10,500.00	
Expenditures		\$9,874.62	
Balance at 31 December 1959			\$752.99

3.2.2 Statement 1960

Balance at 1 January 1960			\$752.99
UNESCO subvention to ICSU		\$10,000.00	
ICSU loan		\$10,000.00	
National Contributions		\$5,000.00	
Total		\$25,000.00	
Expenditures			
Meetings		\$20,000.00	
Secretariat		\$4,500.00	
Publications, printing		\$1,000.00	
Total		\$25,500.00	
Balance at 31 December 1960			\$252.99

3.2.3 Budget for 1961

Balance at 1 January 1961			\$252.99
Income			
National Contributions		\$26,000.00	
ICSU		\$15,000.00	
UNESCO subvention to ICSU		\$25,000.00	
Total		\$66,000.00	
Expenditures			
SCOR Secretariat			
Office rent		\$1,000.00	
Secretary-typist		\$3,000.00	
Running expenses		\$500.00	
Honorarium Secr. SCOR		\$1,500.00	
Meeting of C-14 Working Party, 5 scientists		\$7,500.00	
Meeting of Working Party, Chemistry, 9 scientists		\$11,250.00	
Meeting of Working Party Marine Biology, 9 scientists		\$11,250.00	
Meeting of Working Group, Mar. Meteor		\$5,000.00	
Meeting of SCOR in India in 1961		\$25,000.00	
Total		\$66,000.00	
Balance at 31 December 1961			\$252.99

The above figures were agreed upon in Helsinki and presented at the XII meeting of ICSU in Lisbon.

3.3 National Contributions hoped for in 1960

USA	\$6,000
U.K.	\$500
France	\$500
Netherlands	\$265
Canada	\$500
Australia	\$500
Germany	\$1,000
Total	\$9,265

In addition \$500 for 1960 was expected come from Japan and \$200 for 1961 from Denmark.

3.4 Other Sources of Funds

SCOR was informed that a surplus of \$14,729.32 from the first International Congress was available as help for the second Congress.

3.5.1 Election of the Officers of SCOR for the next three-year period

At an Executive Meeting of SCOR in May 1960 it was suggested to increase the number of SCOR members from 15 to 18 by adding one more representative (each) of IUGG, IUBS and IUPAC. The new Executive Committee was

President	Dr. G.F. Humphrey
Retiring President (ex officio)	Dr. R.R. Revelle
1. Vice-President	Prof. L. Zenkevitch
2. Vice-President	Dr. G.E.R. Deacon
Secretary	Dr. G. Böhnecke

plus three other members.

3.5.1 The election of George Humphrey as president

It was a surprise to many persons related to SCOR that Humphrey was chosen as the new president to follow Revelle (Figure 14). As a new member of SCOR he was not well acquainted with SCOR matters at all. In order to try to illuminate the question I wrote to Humphrey who inter alia answered me (18 October 1988) as follows:

nice to have somebody from the Empire. Kort would have been consulted and was probably in favour since I spoke Russian. I think that I was regarded as the only possibility.

I must have been approved by ICSU because, without reason, the ICSU Secretary gave me an expense account luncheon. We then went to the election meeting where, without a vote, Revelle announced I was the new President. I promised to be unlike him (i.e. I would answer letters), and we all went home to our respective countries. I then wrote to Böhnecke to find out what I was supposed to do."

For Humphrey to pinpoint Revelle and Deacon as the power brokers is no doubt correct. They had a chance to meet Humphrey at the New York meeting in 1959. It is unknown whether the decision was taken in Copenhagen or before.



Figure 14. George Humphrey at the Indian Ocean Symposium in Kiel in April 1971. In those days George was known as the Pope of Oceanography. The secretary was allowed to kiss his ring, but he was not allowed to wash her feet!

"I can't remember any reasons I did learn as to why I was chosen as SCOR President. I think the power brokers would have been Revelle and Deacon. Revelle probably thought I wouldn't do any harm, certainly not interfere with anything he wanted to do. Deacon probably thought it would be

3.5.2 National Committees

The Australian Academy of Sciences wished SCOR to provide for national membership in order to strengthen the influence of National Committees. During the discussion it was stated that SCOR should act as a joining link among the Unions. The main task of the National Committees is to carry on with the scientific work and that their influence should be strengthened because of their role in establishing new working groups. The direct national representation in

SCOR was discussed at the ICSU meeting at Lisbon in October. A small committee was established and came to the conclusion that direct representation should be deferred until the relative activities of the new IOC and UNESCO and SCOR could be more clearly defined.

3.5.3 Working Groups

Radioactivity in the Ocean. The active work would in the future be coordinated with IAEA.

Carbon Dioxide in the Ocean. Recent development was a symposium at Helsinki with report attached hereto.

Measurements of the Productivity of the Sea and of the Standing Crops of Phytoplankton and Zooplankton. The Group drifted into the biological group for the Indian Ocean with Currie as Convener. The group would be renamed Production in the Sea and reconvened.

Physical Properties of Sea Water. This group held no meetings. It was postponed, and the Report on the results of the conference of Physical and Chemical Properties of Sea Water came too late for the Helsinki Meeting.

International Indian Ocean Expedition. This Group had done as much as they could and further work was to be done in small groups of workers.

Chemical Oceanography. This group was re-appointed at the IUGG Assembly at Helsinki and was willing to act for SCOR especially regarding IIOE.

World Data Centres. A report was given at Helsinki. This was an important question and under consideration in many international and national organizations.

Radio Aids to Navigation. Suggested at Copenhagen. The Coordinator of the IIOE would be the convener and propose names.

4/5 Exchange of information and publication

The *ICSU Review* will be used for publication of general topics of SCOR. For local information, Circular Letters will be used.

Concerning planned programmes, the Secretariat will distribute questionnaires. Krishnan (1960) and Deacon (1960b) published short papers on the IIOE.

6 Other business

6.1 The following members of SCOR were nominated as observers:

- a. the meeting of ICES at Moscow, 19-28 Sept. 1960: Prof. L. Zenkevitch
- b. the meeting of WMO at Utrecht, 16-31 August 1960: Dr. K. Wyrski

- c. the meeting of SCAR at Cambridge, 29 August - 3 September 1960: Dr. G.E.R. Deacon.

6.2 Place and date of SCOR Meeting 1961

An invitation had been received to hold the meeting with the 10th Pacific Science Congress at Honolulu 21 August - 2 September 1961. It was found more suitable to have the next SCOR Meeting in the Indian Ocean area (preferably in India) in the fall of 1961.

6.3 Nomination of an expert for the Panel of International Law

If the advice of an oceanographer is wanted, the convener of Working Group on Radioactivity should be approached.

6.4 The Second International Oceanographic Congress

After a long discussion the general opinion was to hold the Congress after the IIOE in 1965 in one of the U.N. World Centres (New York, Rome, Geneva) or to charter a liner to visit various parts in the South Pacific Area.

The participants of the Helsinki meeting expressed unanimously their thanks to the retiring President, Dr. R.R. Revelle. The Finnish Arrangements Committee was thanked for their facilities and the IUGG for the opportunity to attend the XIIth Assembly and contact members of IAPO.

At the ICSU General Assembly at Lisbon the budget for SCOR for 1961 which showed an expenditure of \$66,000 was discussed. On 11 November Böhnecke received a letter from E. Herbays, the Treasurer of ICSU, which was forwarded to the Executive Committee. The letter indicated that all SCOR could expect for 1961 is \$10,000 from UNESCO, \$12,500 as a loan from ICSU and uncertain amounts from national contributions. If the latter amount would not be larger than last year the total sum would be reduced to \$32,500. This meant a reduction of, especially, meetings of the working groups or a substantial application for more money. Böhnecke expected that this would be impossible, although he was willing to invite the nations to raise their contributions, or perhaps better, that the President of SCOR or Dr. Herbays would undertake such a step.

CHAPTER 11

The Life of the International Advisory Committee On Marine Sciences (IACOMS) of UNESCO

The following is an account of the way in which IACOMS was created and lived for 6 years until, apparently, it died in Copenhagen in July 1960. The details are almost entirely based on the files of Anton Bruun.

At the last meeting of the ICSU Joint Commission on Oceanography in Rome in 1954 (see p. 8-10), the creation of a Council of Marine Sciences was recommended to ICSU and IUGG. At the meeting of the ICSU Executive in Naples in October 1954 a decision was taken to create a small Special Committee on Deep-Sea Research (p. 13).

The Committee, to consist of Bruun, Deacon and Sverdrup and two recognized oceanographers (later to become R. Revelle and Th. Monod), was to consider problems in deep sea research of a joint biological and geophysical nature, to make contact with UNESCO and national organizations and to report to ICSU at a meeting in August 1955. In Chapter 2, I have dealt with the history of this ICSU "Special Committee on Deep Sea Research", especially the correspondence of its members and others, which dealt with general problems of oceanography rather than aspects of an advisory committee under UNESCO.

Intergovernmental meeting in Rome, 9-10 May 1955

An intergovernmental meeting of experts to consider the establishment of an advisory committee to UNESCO on Marine Sciences was convened by UNESCO in Rome on 9-10 May 1955. The Bruun files have three papers dealing with IACOMS matters. One is the report in English consisting of 5 pages, the next is a report in French in the *Bulletin d'Information de l'UGGI* for 1955, and the third is also in French (6 pp.) and signed by Ing. Gen. G. Laclavère.

1. Report in English

The following experts attended: A.F. Bruun, A.A. Buzzati-Traverso, P. Groen, K. Hidaka, F. Koczy, G. Laclavère, H. Mosby, D. Rochford, M.B. Schaefer, H.U. Sverdrup, J.B. Tait, P. Tchernia, Å.V. Tåning, J.A. del Villar and L. Zenkevitch. In addition to three observers and four from the FAO secretariat, P. Auger and M. Yoshida participated from the UNESCO Secretariat.

The following resolution was unanimously adopted:

The Meeting of Experts

Considering the great need for intensification of fundamental research in certain branches of the marine sciences and pertinent knowledge in certain areas of the world,

Noting that the programme of UNESCO can include some of the means whereby to assist and to promote such intensification of fundamental research,

Remarking that these means may include the awarding of the fellowships and of travel grants to research workers, the sending of scientists of repute to teach in areas where training of future marine scientists is greatly needed, the support of certain specific studies limited in time and region, the organization of symposia and of study groups, documentation such as publication of specialized bibliographies and dictionaries, etc.,

Recommends the establishment of an Advisory Committee in the Marine Sciences to advise the Director-General of UNESCO on the preparation and execution of its programme and further **recommends** that the committee should work in close co-operation with FAO.

Draft Terms of Reference

Functions

The International Advisory Committee on Marine Sciences shall advise the Director-General of UNESCO on the promotion of international collaboration in the marine sciences and, so far as it is contingent upon them, limnology, and in the preparation and execution of marine science research projects within the programme of UNESCO, taking into account related programmes of the United Nations and other Specialized Agencies, with a view to:

- a. augmenting fundamental scientific knowledge as such,*
- b. gathering and coordinating scientific information intended for application in improving the living conditions of mankind.*

Membership

The Committee shall be composed of 9 members, appointed by the Director-General and chosen amongst experts in physical and chemical oceanography, maritime meteorology, marine biology and submarine geology and topography within Arctic and Antarctic Seas, temperate and tropical seas and adjacent seas (e.g. the Caribbean, the North Sea, etc.). The members shall be appointed for a term of three years. No members must serve for more than two consecutive terms. UNESCO will pay the travel expenses and per diem of the Committee. The Committee shall meet at least once a year.

Relations shall be maintained with:

- 1. the United Nations and their Specialized Agencies which are invited to meetings,*
- 2. international scientific unions which are invited to send an observer to meetings,*
- 3. regional bodies concerned with oceanographic and/or fisheries research which are also invited to send observers,*
- 4. regional scientific organizations which are also invited to send observers. The UNESCO secretariat shall provide the secretariat of the Committee and draft the agenda for the meetings.*

Regional meetings

An invitation was presented by Professor Hidaka for the committee to meet at the time of a regional oceanographic symposium in Tokyo in October 1955.

2. Report in French

Under the headline “L’Évolution des Recherches en Océanographie” it has the title “Creation du Comité Consultatif International des Sciences de la Mer”. It also contains a report of the Special Committee in Copenhagen on 16-17 September 1955.

First comes a long introduction on previous oceanographic undertakings. Then follows (in English) the text of the resolution cited here and reference of the correspondence of G. Laclavère, Secretary-General of UGGI, with persons unable to come to the Rome meeting.

Then comes a report of the Rome meeting 9-10 May 1955, starting with names of participants. Then follows the two resolutions given above, on the recommendation of the establishment of an Advisory Committee to UNESCO and on its Terms of Reference, including the relation to United

Nations and various scientific organizations.

The report concludes by giving the following studies to be included in the symposium in Tokyo in October 1955:

1. Study of the relative problems on the different physical, chemical and geological extents have an influence on the biological resources of the Pacific,
2. Oceanographic material,
3. Exchange of information concerning the available and necessary oceanographic extents.

The last part of the article is the report of four of the five experts of the ICSU Special Committee (Bruun, Deacon, Reville and Sverdrup). It is cited on pp. 26-27 of the article and has bearing on the creation of SCOR, not of IACOMS.

3. Report by G. Laclavère with the title Réunion d’Experts pour la Constitution d’un Comité Consultatif des Sciences de la Mer, Rome 9-10 Mai 1955

A much abbreviated citation follows here.

In the execution of a resolution by the General Conference of UNESCO at its eighth session in Montevideo in 1954, the Director-General intended to set up an International Advisory Committee On Marine Sciences to advise him in stimulating basic research in this field. A preparatory meeting was held in the FAO Headquarters in Rome on 9-10 May 1955.

The meeting regarded the function of the committee as being to advise the Director General on the goal to ensure international collaboration within the marine sciences and where convenient also in limnology. It was also to be recommended that the establishment and carrying out of the research programmes followed the general programmes of UNESCO in such a way that the said programmes always aimed at increasing the fundamental scientific knowledge, such as gathering and coordinating scientific information intended for application in improving the living conditions of humankind.

The committee was to contain 9 members from geographical domains which had been listed.

The members of the committee would be elected for a period of three years. UNESCO would pay travel cost and per diem of the committee at their meetings. The United Nations and Specialized Organisations were invited to meetings. The International Council of Scientific Unions would also be invited to send an observer, and the following

unions may be present: IUGG, IUBS, IASH and IAPO. Also the regional commissions on fisheries, ICES and CIESM, should be invited to send observers if they so wished.

The report ends with two lists with names. One was prepared at the meeting of IUGG which took place simultaneously at the FAO headquarters and contained 44 names from 17 countries. The other list was selected from UNESCO members and those already on the list were not repeated. It contained 31 names from 16 countries.

Bruun afterwards had a number of arguments concerning some of the names. This was pointed out in a letter of 5 July to P.P. Auger, preceding the meeting in Rome. A letter from N. Cacciapouti, the Acting Director of the Department of Sciences of UNESCO, informed Bruun that the interim Advisory Committee would meet in Tokyo, to which meeting Bruun was invited.

Meeting of the interim Advisory Committee in Tokyo, 24-25 October 1955

A report of the secretariat of 6 pages is available. The meeting was opened by N. Cacciapouti, and Bruun was elected chairman.

The list of participants included three of the members of the ICSU Special Committee on Deep-Sea Research, namely Bruun, Deacon, and Revelle and four other well-known persons: Marc Eyriès, Koji Hidaka, David Rochford and Lev Zenkevitch. Maurice N. Hill represented ICSU.

Before formulating the recommendations about the possible role of UNESCO in marine sciences, it was found necessary to consider the character of the sciences and their significance for humankind. After having described the oceans and their characteristics, examples of advances were given:

- In physical oceanography, new techniques of instrumentation and the mathematical methods of theoretical physics are increasing our understanding in ocean currents and waves.
- In biology, new branches of genetics, biochemistry, population dynamics, nutrition and microbiology are going hand in hand with further work on taxonomy, life histories, morphology, zoogeography and ecology.
- In chemistry, mass spectroscopy, radio-chemistry, emission spectroscopy, chromatography and biological assay are now used for very small concentration or in the biogeochemical cycles.

- In submarine geology, geophysical exploration is helpful in determining the sea floor and its sediments and rocks.

Recommendation 1 – Request for assistance in specific projects have been presented, but it was considered that it would be advisable for the Director General to invite all Member States to submit proposals for the Advisory Committee to consider at its next session in 1956. It was further recommended to refer developing countries to the Technical Assistance Aid of UNESCO.

Recommendation 2 – Centres of Oceanic Research. Inter alia the following recommendations were made:

1. New laboratories, established with private funds, would be of great value, for example in the Indian Ocean and around Indonesia and South America.
2. In certain developed countries new national centres, at least partly supported with government funds, would be highly desirable. In addition to listed disciplines, a “critical mass” of at least 10 scientific workers, relationships with universities and fundamental research are essential.
3. The possibility of an international research vessel should be studied and reported at the next meeting.

Recommendation 3 – Fellowships and travel grants. The Committee wished to be consulted in selection of candidates which should also take up active work after return to their home countries.

Recommendation 4 – Existing facilities and directory of institutions should be prepared by UNESCO.

Recommendation 5 – Symposia. The Committee proposed that a symposium on “Productivity of the Sea” be held, preferably in Lima, in 1956. For 1957 the meeting would be held in conjunction with the 9th Pacific Science Congress in Bangkok.

Recommendation 6 – Equapac project. In view of the lack of deep-sea data from the South West Pacific, the committee suggested that Japanese ships in August 1956 might consider the southern extension of their sections and permit Australians and New Zealanders to take part in any operation in their own area.

Three photos from the meeting are shown in Figure 15. An excellent article by Deacon (1956a) on the Tokyo meeting was published in *Nature* in February.



Figure 15. From the LACOMS meeting in Tokyo in October 1955. Top photo from left: Smid, N. Cassiapuoti, Anton Bruun and Masao Yoshida. Middle photo: So Sawada, Kiyoo Wadati, Kanji Suda, N.K. Panikkar and Maurice N. Hill. Bottom photo: Lev Zenkevitch, sitting at window: David Rochford and Koji Hidaka, Marc Eyriès and George Deacon. The two persons at the table in front and the standing person are unknown. (Bruun's Archive)

First session of IACOMS in Peru, 22-24 October 1956

A list of participants is available, giving the members of IACOMS:

Dr. D.V. Bal, Director, Institute of Science, Bombay, India
Dr. Anton F. Bruun, Keeper, Zoological Museum of Copenhagen, Denmark
Dr. George E.R. Deacon, Director, NIO, Wormley, U.K. (Chairman)
Ing. Marc Eyriès, Service hydrographique de la Marine, Paris, France
Dr. Koji Hidaka, Geophysical Institute, Tokyo University, Japan
Dr. Luis Howell Rivero, Museo Poly, University of Havana, Cuba
Dr. Roger Reville, Director, Scripps Institution of Oceanography, La Jolla, U.S.A.
Dr. David Rochford, Division of Fisheries, CSIRO, Cronulla, Australia
Dr. Lev Zenkevitch, Corresponding Member, Academy of Sciences, Moscow, U.S.S.R.
Mr. M. Yoshida who was Secretary of the Committee.

A report of 9 pages of the first session in Peru is available.

1. Report of the Secretariat

The committee felt that its work would be easier if given more definite statement on the funds available. The proposed marine science budget for 1957 was \$29,600 and for 1958 was \$27,500.

2. General policy of the Advisory Committee

2.1 Relation with other organizations. The Committee considered that its chief aim should be to cultivate interest in the ocean especially in countries where little attention was paid to them. A sub-committee was formed to consider co-operation with ICSU and others.

2.2 Organization of Symposia was considered of great importance. UNESCO was recommended to arrange seminars in countries which seemed likely to profit from visits of marine scientists. A sub-committee was formed to consider this (report was appended).

2.3 Fellowships, travel grants and training programmes were regarded as tools to be developed. The work of UNESCO's Field Office was warmly commended but it was felt that still more might be done by a more deliberate approach. In selection of candidates for fellowships it

would be easier to judge their abilities if placed in order of merit.

2.4 Technical assistance and aid to member states. After much discussion, the committee recommended that UNESCO should advise National Commissions to call meetings with their consultants to consider the value of marine science in their own country and agreed to prepare a brief account of recent advances which could be circulated.

2.5 Sharing facilities. To mutual advantage with neighbouring countries UNESCO should publish a regular circular of especially ships to investigate areas and problems.

3. UNESCO assistance to Marine Science Projects
After much discussion, the Committee decided to seek assistance for a small number of projects, especially in regions with little attention until now (nine projects in all). Programmes of particular importance were the following:

3.1 Unification of methods. The Committee would further research aimed at the quantitative assessment of nets and international agreement of methods.

3.2 Biology in the Geophysical Year. When installing long wave and tide recorders it was found that provision of simple collecting apparatus should not present any difficulty, and the SCOR meeting in Gothenburg in January 1957 should co-ordinate demands.

3.3 International research ship. After a long discussion it was agreed that the level of a nation's contribution to the United Nations would determine the level of their say in the ship's programme. A substantial amendment to a draft proposal was considered necessary but should be left unaltered until after the General Conference.

3.4 Other items dealt with a marine station on the Galapagos Islands, standard carbon-14 ampoules, a study of the fertility of the seas around South America, regional plankton keys and freedom of investigation of offshore waters.

4. Conclusion

The Chairman, Dr. Deacon, reminded the Committee that it had tried to deal with a very wide range of subjects and that many of its recommendations had still to be decided. It was not a bad sign that fairly strong feelings had been aroused, and the members were requested to give clear expression to their opinions. An appendix is a Report on the Sub-Committee on Marine Science Symposia (item 3.2 of the Agenda).

Deacon (1957b) gave in *Nature* a description of the marine conditions and of the Advisory Committee meeting in Peru, and Revelle (1957) had a fairly long article on the Peru meeting. In the same year Deacon (1957a) and Bruun (1957) published papers on the need for co-operation in the Far East.

Meeting in Paris on ships' facilities in Southeast Asia, 14-15 February 1957

Present were Bruun, Deacon and Eyriès, with Auger and Yoshida from UNESCO. Bruun started by explaining the lack of facilities and trained staff in Southeast Asia. He had thought of setting up reference collections in important centres. He also considered an idea of pooling resources by utilizing a number of rather well-equipped establishments of the region.

Auger suggested that Bruun might prepare a confidential report and an official report. He further suggested a Japanese ship. Eyriès pointed to Vietnam possessing a good ship. Bruun stressed the importance of training in the region rather than being educated in well-equipped laboratories of advanced countries.

Deacon stressed the importance of Bruun's confidential report. Auger recommended the length of training courses of as much as one year, with lecturers coming from Europe or North America for terms of 3 to 6 months. Bruun mentioned that Nhatrang in Vietnam would be an excellent location for the course. This was supported by Deacon.

The last part dealt with the research ship. The plans for a Scandinavian ship had been dropped. Eyriès stressed that the UNESCO project should not be limited to a European ship since it would mainly work in distant areas as, for example, the Indian Ocean. He believed that the plans for realizing an internationally owned ship were good, and that IACOMS might plan a trial expedition for an existing ship. Deacon said that this ship problem might be considered at the Bangkok meeting.

Meetings concerning the proposed research vessel

A study group, composed of Bruun, Deacon and Eyriès, met first in Deacon's institute in Wormley on 12-13 March 1957 and then in Paris on 7-8 June. From the first meeting there are a preliminary report, with Bruun's corrections, and a final report. From the second meeting there remains nothing at all.

The report contains an introduction about the need for introducing studies of new methods of measurement, and that serious consideration must be given to the establishment

of an International Oceanographic Ship. The existence of such a ship to make observations in distant oceans would increase the efficiency of national laboratories. In this respect it is obvious that scientists and statesmen should be encouraged by the example and prospects in international collaboration of the European Organization for Nuclear Research (CERN) and the International Geophysical Year.

The programme should mainly be devoted to areas that are least likely to be otherwise investigated within biology, physics, chemistry and geophysics. Moreover, emphasis should also be laid on training in oceanographic methods, particularly for newcomers. The ship should have no concern with military requirements.

The organization should follow that which had proved workable in CERN. A scientist and an administrator from each participating country should be in charge. The ship should fly the flag of the United Nations. The officers and crew and long-commissioned scientists should be in international service. The ship would need about six resident scientists serving for 10-12 months and provision for up to 15 visiting scientists and students. An office and storage space on shore would be necessary and might be placed with an existing centre for marine research. The size of the ship should be at least 1,200 to 1,500 tons, and the range not be less than 7,000-8,000 miles at economical speed.

The sub-committee estimated that building and equipping a vessel of this type would cost \$750,000, and an ambitious programme would cost \$100,000 annually.

The launching and success would depend on the cooperation of all existing international organizations to reach a straightforward agreement on the proposal.

Second session in Bangkok, 15-22 November 1957

A report of 10 pages is available. Lev Zenkevitch was unable to attend. Rochford was unanimously elected chairman, and Deacon acted as rapporteur. Some of the total of 16 recommendations are listed in the following.

Relations with SCOR. The Committee took particular note of the plans of the proposed co-operation in deep-sea research in the Indian Ocean, using 16 ships.

Regional Marine Biological Reference Collections and Reference Keys. The establishment of national reference collections of fauna and flora will help developing marine sciences and should be housed in museums of national history.

Proposed International Oceanographic Vessel. The need for such a ship was generally agreed and UNESCO was asked to continue its efforts towards the realization. The ship should be truly international and expenses for

operation borne by UNESCO itself. It should fly the United Nations flag.

Fellowships and Travel Grants. Dossiers of 20 candidates for the 1957-1958 programme were considered. Since some candidates were rather old it was suggested to provide more grants for travel.

Freedom for Scientific Investigation of the Continental Shelf. The views of ICSU to the United Nations to ensure freedom for fundamental research of the shelf should be supported.

Questions raised by FAO. They contained, for example, standardizations of biological equipment, nomenclature of continental shelves, marine sciences directory and documentation for fisheries science.

Questions raised by IAPO. They contained a fairly long list of specific questions ranging from studies of various seas and oceanographic equipment of India to recording stations on the coast of Pakistan and the use of radium distribution as a measure of oceanic circulation.

International Marine Sciences Congress in 1959. Dr. Revelle explained some details of the congress planned by AAAS, which would counteract any tendency for physicists, biologists and geologists to split into separate discussion groups. The Committee felt that such a meeting should take place in a world centre such as New York and recommended that UNESCO should persuade the United Nations to make available their headquarters.

Figure 16 shows a photo from the meeting. Deacon (1958) published a paper on the meeting, giving the contents of the most interesting recommendations.

Third session in Paris, 24-30 September 1958

A report of 13 pages is available. Dr. K. Sugawara, chemist, Nagoya University, Japan was present (replacing K. Hidaka). Dr. P.N. Ganapati, Head, Andhra University, India (replacing Dr. D.V. Bal) and Dr. Z. Popovici, Lima, Peru (replacing Dr. L. Howell Rivero) were absent because of delays in the procedure for their appointment. Mr. Eyriès was unanimously elected Chairman.

Review of activities in the past period. Two recommendations were adopted to let UNESCO help marine laboratories and scientists from neighbouring countries take an active part in the study of the Indian Ocean.

Marine Meteorological records. One recommendation invited the World Meteorological Organization to prepare long series of mean temperatures for selected areas of the ocean with accompanied values of the strength and direction of the winds.

Further studies concerning the international oceanographic vessel. One recommendation considered the need for skilled workers who especially might apply techniques developed in other sciences, the other that the sub-committee should continue its studies, especially in utilizing results obtained by FAO and groups in specified countries.

International Oceanographic Congress. The Committee found that the amount the United Nations demanded for use of their facilities to be extremely high and should be reduced.



Figure 16. From the IACOMS meeting in Bangkok in November 1957. Seen from left: 1, Anton Bruun, 2, Roger Revelle, 3, D.V. Bal, 4, Koji Hidaka and 5, Marc Eyriès. The others are unidentifiable. (Bruun's Archive)

Regional Training project planned for 1959. The Vietnamese Government offered their facilities at Nhatrang for the establishment of training schemes in this region which should be organized in close collaboration with the Scripps vessels working in the South China Sea in 1959-1960.

The fourth session would be held during the Congress in New York in 1959. An invitation from the Danish Government had been received to hold the fifth session in 1960 in connection with an intergovernmental conference on oceanographic research (see Chapter 8).

With the Report came a paper dealing with a meeting of consultants on UNESCO's role in promoting international collaboration for oceanic exploration.

Fourth session in New York, 14-17 September 1959

A report of 9 pages is available. Eight members were present. Apparently, Dr. D. Rochford had left the committee. Dr. Revelle was unanimously elected Chairman. Dr. Sugawara and Dr. Bruun expressed satisfaction with the Nhatrang course. The conference would be held in January 1960. It was found necessary to prepare working papers in advance, and Dr. Deacon, Dr. Kort, Dr. Zenkevitch, and Dr. Revelle promised to have them ready at November 1959. An extra grant of \$2,000-3,000 was recommended. For the International Indian Ocean Expedition it was recommended that the countries involved should make use of the facilities offered by UNESCO and FAO Technical Assistance in obtaining fellowships, equipment and the collaboration of experts.

Under "International Organization" there was a long discussion about combining SCOR and IACOMS to form a single committee. The Committee felt that ICSU and UNESCO should do everything possible to work together. SCOR's function of maintaining co-operation between national committees made it necessary for SCOR to continue under an organization similar to its present one. Committee members were eager to see the reaction of the national committees of SCOR.

New members of IACOMS included

Dr. H. Lacombe, France

Dr. T. Wolff, Denmark

Dr. J.W. Brodie, New Zealand

The retiring members Bruun, Eyriès and Zenkevitch were thanked.

The next meeting would be in Copenhagen with the Intergovernmental Conference on Oceanographic Research. The Committee further recommended to UNESCO to hold the 1961 meeting of IACOMS in Hawaii together with the Pacific Science Congress.

Fifth session in Copenhagen, 8-9 July 1960

A report of 7 pages is available. The members of IACOMS now consisted of:

Dr. J.W. Brodie, Oceanographic Institute,
Wellington, New Zealand

Dr. G.E.R. Deacon

Dr. Vladimir Kort, Institute of Oceanology,
Moscow, U.S.S.R.

Prof. H. Lacombe, Museum of Natural History,
Paris, France

Dr. Zacarias Popovici, Hydrobiological Investigations,
Lima, Peru

Dr. Roger Revelle

Dr. Ken Sugawara, Chemical Institute,
Nagoya University, Japan

Dr. Torben Wolff, Zoological Museum,
Copenhagen, Denmark

Dr. Popovici was unanimously elected Chairman, and Dr. Deacon acted as Rapporteur. The Nhatrang Regional Training Course in Marine Sciences from August to December 1959 was reported on by an instructor in the course, Dr. Jørgen Knudsen, Copenhagen. Several members felt that the facilities in Nhatrang were insufficient, so the following recommendations were adopted: (1) funds be provided for responsible instructors and institutions, (2) the Director should know beforehand of the funds available locally, and (3) selection of candidates should take place six months in advance.

The secretariat presented a budget for 1961-1962 in the field of Marine Science with the main purpose being to assist the International Indian Ocean Expedition organized by SCOR and to help the local people in developing oceanographic activities. It was felt that fellowships should be increased and the number of experts and funds for equipment similarly reduced.

The Budget is given here:

Office of Oceanography		\$114,937
Development of marine sciences:		276,000
1. Equipment (Indian Ocean Research Centre)	\$40,000	
2. Salaries for experts and technicians	95,000	
3. Fellowships	75,000	
4. Publications	10,000	
5. SCOR contract	20,000	
6. Indian Ocean working group meetings	15,500	
7. Meetings (especially on intercalibration methods)	9,000	
8. IACOMS 6th session	9,400	
9. Conference services	2,100	
International research and training vessel		125,000
		\$515,937

It was agreed that for the Intergovernmental Conference on Oceanographic Research Dr. R. Revelle should give an introductory talk, commenting on the report of the preparatory meeting in Paris in March and presenting the recommendations of IACOMS on this matter. The most important of these are given:

IACOMS reaffirms its conviction of the need for a commission sponsored by UNESCO to arrange concerted action to promote oceanography.

The governmental representatives should be scientists with some practical authority in their countries. UNESCO's Office of Oceanography should provide the secretariat for IOC and to carry out such oceanographic work as UNESCO is prepared to support.

IOC should not itself operate ships which will more effectively be operated by single countries or groups of countries.

The Committee emphasized that there would always be need for IOC to co-operate with a purely scientific organization such as SCOR. The IOC would be founded on the need for basic understanding of the sea, but would necessarily be under pressure from economic needs.

Future of IACOMS. At the preparatory meeting for the Conference in Paris it was recommended that UNESCO should be advised by SCOR on marine research. Thus it was agreed that no decision should be taken before the Copenhagen meeting and that a meeting between IACOMS and SCOR should be arranged at a later date, with ICSU invited.

There is in the report from the Copenhagen meeting several indications of IACOMS being kept alive. A list of members is given with three new participants, a budget worked out by the UNESCO secretariat and a number of recommendations of IACOMS in support of the introductory talk by Revelle at the meeting in Copenhagen. On the other hand, there is in the report no information of the next meeting, although this item is mentioned in the meeting agenda and was given as Hawaii at the First International Oceanographic Congress in New York in 1959.

As one of the new members I clearly remember that in Copenhagen it was decided that IACOMS should be disbanded at that meeting, but I have not been able to find any written indication from either the Copenhagen or the Helsinki meetings of the actual death of IACOMS, nor any further reference to an international research training ship.

Tribute to Anton Bruun



At the end of this review of what led to the birth and first years of SCOR, I shall try to give a short report on the untimely death of Anton Bruun.

He had successfully taken part in three expeditions—the *Dana* round the earth, the *Atlantide* to West Africa and the *Galathea* also round the world, and he acted as leader of the two last mentioned. In 1958-1959 he was asked by the Scripps Institution of Oceanography to become the leader of the *Naga* Expedition which had as of its prime purpose to train young scientists primarily from Vietnam and Thailand during basic science investigations in the South China Sea.

When participating in the Congress in New York in August-September 1959 he arrived directly from the *Naga* Expedition and was present at the SCOR meeting on 30 August (see Figure 8, p. 52). A few days later he became seriously ill and was brought to the Midtown Hospital. During the following six weeks he constantly had fever up to 40°C, and the diagnosis included a number of stomach, intestine and liver diseases.

When finally the diagnosis ended at haemorrhage from the stomach which should be treated by an operation, Anton Bruun said that if he was healthy enough to go through an operation, he might as well be taken back home on a plane.

After a careful flight he arrived in a hospital near his home. The patient was in a surprisingly good general condition in spite of having had intermittent fever for about 45 days. His case was described in the weekly medical publication (Halberg and Kristensen 1960). From an idea that the diagnosis might be a hepatic amoeba dysentery, the patient was treated with Emetin, with the remarkable result that in less than 24 hours the temperature was normal. After having been given 400 mg the treatment had to be stopped because of pronounced paresis in both arms and legs and beginning cardiac oedema. Dysentery was treated with Carbazone, and after a stay of three months in the hospital with B-vitamin and physiotherapeutic the patient was discharged without medicine.

After his recovery, Anton often made a show of the fact that his health was now fully restored, having had all his organs carefully checked.

In the summer of 1960, he travelled to the Smithsonian in Washington to open an exhibition, mainly on the *Galathea* Expedition. In October 1961 he was present at the first session of the Intergovernmental Oceanographic Commission in the UNESCO building in Paris and was elected the first chairman of the commission. In November he was invited to the anniversary of the Tokyo University. However, at a scientific meeting on 14 December, the day

before his 60th birthday, he died from heart failure. It was a terrible loss, not only to Danes, but also to oceanographers throughout the world.

In 1962, it was decided to transfer the USS Williamsburg, which had been serving as U.S. Presidential Yacht from 1945 to 1953, to the National Science Foundation and to convert it into an oceanographic vessel. On 29 December I was invited to the renaming ceremony in Philadelphia where the ship received the name *Anton Bruun* (Figure 17).

On the wheel house was placed a bronze plate with the following text:

*TO THE MEMORY OF ANTON BRUUN
1901 – 1961*

*Explorer of the ocean, pioneer of the deeps,
organizer and leader of expeditions and global
programs, scientific statesman, citizen of the world
and friend and inspiration of a generation of
oceanographers - - this ship is dedicated. May she
bear his name proudly and contribute in full
measure to the advancement of man's knowledge of
the wide seas and their inhabitants.*

This plate was later given to the Zoological Museum,
University of Copenhagen.



Figure 17. The former U.S. presidential yacht was converted into an oceanographic vessel and renamed *Anton Bruun*. She served during the Indian Ocean Expedition, but in 1968 was damaged beyond repair. (Bruun's Archive)

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Acronyms

AAAS	American Association for the Advancement of Science	IOC	Intergovernmental Oceanographic Commission
CERN	European Organization for Nuclear Research	IPY	International Polar Year
CIESM	Commission International pour l'Exploration de la Méditerranée	IUB	International Union of Biochemistry
CSAGI	Special Committee for the International Geophysical Year	IUBS	International Union of Biological Sciences
CSIRO	Commonwealth Scientific and Industrial Research Organisation, Australia	IUGG	International Union of Geodesy and Geophysics
FAO	Food and Agriculture Organization	IUPS	International Union of Physiological Sciences
GEBCO	General Bathymetric Chart of the Oceans	IUPAC	International Union of Pure and Applied Chemistry
IABO	International Association for Biological Oceanography (of IUBS)	IUPAP	International Union of Pure and Applied Physics
IACOMS	International Advisory Committee on Marine Sciences (of UNESCO)	IUTAM	International Union of Theoretical and Applied Mechanics
IAEA	International Atomic Energy Agency	JCO	Joint Commission on Oceanography (of ICSU)
IASH	International Association of Scientific Hydrology (of IUGG)	NIO	National Institute of Oceanography (UK)
IAPO	International Association of Physical Oceanography (of IUGG)	SCAR	Special Committee on Antarctic Research (later known as Scientific Committee on Antarctic Research)
IAPSO	International Association for the Physical Sciences of the Ocean (of IUGG)	SCOR	Special Committee on Oceanic Research (later known as Scientific Committee on Oceanic Research)
IAU	International Astronomical Union	UNESCO	United Nations Educational, Scientific and Cultural Organization
ICES	International Council for the Exploration of the Sea	UNSCEAR	United Nations Special Committee on the Effects of Atomic Radiation
ICOR	Intergovernmental Conference on Oceanic Research	UGGI	Union Géodésique et Géophysique Internationale (see IUGG)
ICSU	International Council of Scientific Unions (now International Council for Science)	URSI	Union of Radio Science International
IGU	International Geographical Union	WHO	World Health Organization
IGY	International Geophysical Year	WMO	World Meteorological Organization
IHB	International Hydrographic Bureau		
IIOE	International Indian Ocean Expedition		

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