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Editor of Newsletter

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EDITORIAL - Oceanography in a new century

Millenial madness is not a modern phenomenon, even though we have little record of the reaction of the masses to the beginning of the year 1000. For the millenarian catastrophists of our own time, the first few seconds of the year 2000 were a real disappointment: nothing much happened then that hadn't happened on any other New Year's Eve. And yet there are pivotal times, ones when strands of history come together and the world is changed. Such was the year 1900. I am no historical determinist, but without many of the events played out within a year or so of that time we would be writing different histories of oceanography and the marine sciences.

Ferdinand von Richthofen seems to have sensed that the times were changing when he founded the Institut and Museum für Meereskunde in Berlin in 1900.A scion of the preexisting Geographical Institute of the great University of Berlin, it was, nonetheless intended to promote a new kind of approach to the world, one centering on the importance of the ocean in both geographical and political senses. For its first two decades, the new institute was distinguished for work on the physical geography of the sea rather than for new approaches of the kind that were afoot in Scandinavia at the same time. It entered the 20th century firmly only with the cruise of *Meteor* under Alfred Merz beginning in 1925, and with the promotion of quantitative geophysical approaches to the ocean under the impulse of his successor Albert Defant from 1927 onward. Nonetheless, there is no doubt that Richthofen was on to something a quarter of a century earlier. Change takes time, especially in universities.

Fridtjof Nansen, freshly returned from the drift of *Fram* toward the North Pole and his remarkable sled journal across the Arctic icepack with Hjalmar Johansen, late in 1900 asked his friend Vilhelm Bjerknes for help in solving the problem of why the ship had drifted at an angle to the wind. A year later, Bjerknes turned the problem over to his Swedish student Walfrid Ekman. Rapidly, Ekman completed an mathematical analysis of the effect of the wind and the earth's rotation on the surface waters - now known as Ekman drift - that has dominated mixed layer dynamics on physical oceanography throughout the century. V.W. Ekman became one of the century's great oceanographic theoreticians (also a skilled instrument designer) but nothing later matched in significance his few day's work, a direct result of events in 1900, during the second year of the twentieth century.

1900 was the worst year of the decline in the Norwegian cod fishery that had started nearly thirty years before. Johan Hjort, who was directing fisheries investigations in Bergen, had at his command, for the first time, a new research vessel, *Michael Sars*, capable of intensive fisheries research, and, in the hands of Fridtjof Nansen and his young colleague Bjørn Helland-Hansen, of gathering the data for quantitative studies of ocean circulation. The first Nansen bottle originated under the circumstances. So too did Nansen and Helland-Hansen's deep interest in getting better temperature and salinity data so that they could improve on Henrik Mohn's circulation model of the Norwegian Sea, an astonishing but imperfect *tour de force* of calculation, based upon the Norwegian North Atlantic Expeditions of 1876-1878. Their early results were published in a new journal, the *Report on Norwegian Fisheries and Marine Investigations.* The first number in 1900 made it clear, according to Hjort, that the focus of the Norwegian group and the *Report* would be to study the effect of ocean currents on fisheries, and to learn the occurrences and life histories of fish larvae on the Norwegian coast, most of it in the hands of H.H. Gran, Knut Dahl, Désiré Damas and Helland-Hansen. Per Solemdal's engaging account of this time and of some of these researchers, in the form of a play, *The Three Cavaliers*,[1] gives a vivid sense of how a new approach to the investigation of fluctuations in fisheries began to gel in Bergen around 1900.

Not far away, in Gothenburg, in response to the same problems, a new approach to collaborative studies of the sea was beginning to take shape. Little known in comparison to the formative meetings in Stockholm the year before and in Christiania (now Oslo) the year after, the second Swedish meeting was an important link in the events leading to the

[1]Solemdal, P. 1997. *The three cavaliers*. A discussion from the Golden Age of Norwegian marine research. In: *Early life history and recruitment in fish populations*, edited by R.C. Chambers & E.L. Trippel. London: Chapman & Hall, 551-565.

organization of the International Council for the Exploration of the Sea. Formally established in 1902, ICES was given only a tentative stamp of approval - and more importantly, limited funding - by the participating governments. But the fledging organization struggled, survived well beyond its initial five years, and has prospered into our own times. ICES brought a sense of community, the standards of full professionalism, encouragement of research, and the opportunity to present results to international audiences, to scientists who earlier had worked alone. No organization has been more important in the development of the marine sciences during the past ten decades. In August 2000, a historical symposium commemorating the centenary of ICES was held in Helsinki. With admirable restraint, self-congratulation was evident there but not overdone. Perhaps of greater significance, there was a note of apprehension about the future of the world's most long-lived marine science organization. Can an organization devoted to international collaboration in research and its application survive the development of regional groupings like the European Community, with their bureaucracies, regulations, and parallel attempts to solve problems of marine resources? The founders of ICES certainly would not have envisaged such a problem in the early twentieth century. As historians, we should be prepared to see how this situation plays out, for it will stand in fascinating contrast to the events that led to the founding of this influential organization.

Across the North Sea, Walter Garstang's monograph *The Impoverishment of the Sea* was published in 1900. Designed as a rebuttal of W.C. McIntosh's book *The Resources of the Sea*, published the year before, which claimed the inexhaustibility of fish resources, Garstang showed that there was clear evidence that fisheries could exhaust fish stocks. Based on the catches of British fishing vessels between 1889 and 1898, he showed that although total catch had increased by 30% the fishing power of the fleets had increased by 300%. Per unit catching power (now called catch per unit effort) had decreased from over 60 tons in 1889 to about 32 tons in 1898. Catch per unit effort was both subtle and difficult to calculate, so that Garstang's conclusions aroused opposition and began years of debate - but it was not possible again for his opponents to promote blithely the inexhaustibility of fisheries. Scotland had been involved in the early development of ICES, but Garstang's work, along with the lobbying of English biologists for this and other reasons, made it essential that England join in too, bringing the most insular (in all senses of the word) of marine science efforts together with the much more cosmopolitan European marine scientific world.

It would be possible to go on in this vein, adding for example, the effect of Hans Lohmann's research trip from Kiel to Italy in 1900-1901. He was replaced in Kiel by the microbiologist Erwin Baur, who, at Karl Brandt's request, searched for and found nitrifying bacteria in coastal sediments, reinforcing Brandt's attention to the marine nitrogen cycle. Or by adding the arrival of Jules Richard in Monaco as assistant to Albert 1er, and eventually as the director of the great Musée océanographique founded by the Prince. In the world of limnology, which at least in early days overlapped broadly with the marine sciences, Chancey Juday and E.A. Birge began their life-long collaboration in Wisconsin in 1900, arguably helping to bring about the divorce of limnology and oceanography that has lasted to our own times. But I think that my point has been made - the year 1900 is of exceptional interest to historians of marine sciences. What binds together the events of that year and era is the social environment in which European science and its transplants to the New World were developing. We still have lots to learn about how, or even if, the vivid events of 1900 are linked to the larger European culture of that time. Why worry about millenia? Centuries are just fine as cultural units, at least in this case.

Eric Mills

In memoriam
Jean Théodoridès
1926 - 1999

Une fois encore, il nous faut dire adieu à un ami de longue date : Jean Théodoridès nous a quittés, le lendemain de Noël 1999.

Sa personnalité, à tous les points de vue, était exceptionnelle. Par ses origines et sa formation, il représentait une fusion harmonieuse des plus vieilles civilisations méditerranéennes - auxquelles le rattachaient ses ascendances grecques et sa naissance à Alexandrie - et les sociétés contemporaines les plus avancées - il avait fait une partie de ses études à Harvard où professait son père. Mais c'est en France que l'essentiel de sa carrière professionnelle s'est déroulée. Son immense culture, son insatiable curiosité d'esprit, sa puissance de travail lui ont permis un « doublé » peu courant aujourd'hui : deux thèses de doctorat, l'une de sciences, l'autre de lettres.

Dans le domaine scientifique, ses travaux ont porté sur les Invertébrés terrestres et marins et leurs parasites. Homme de terrain et de laboratoire, son activité a eu pour cadre habituel trois laboratoires : le Laboratoire d'évolution des êtres organisés, à Paris, la Station zoologique de Villefranche-sur-Mer et le Laboratoire Arago, à Banyuls-sur-Mer.

L'histoire des sciences s'inscrit de bonne heure au nombre de ses thèmes d'intérêt. Il a joué un rôle décisif pour la création d'une section spécialisée dans ce domaine au sein du Comité des travaux historiques et scientifiques français. Cet organisme publia l'étude qu'il a consacrée au pionnier de la biologie marine, Jean-Victor Audouin, ainsi que l'historique de la Station de Villefranche, ouvrage posthume de G. Trégouboff, dont Jean assura l'édition. Il participa, presque chaque année, au Congrès des sociétés savantes ainsi qu'à la plupart des Congrès internationaux d'histoire des sciences, durant près de quarante ans. Ainsi, bien avant que fonctionne le « *net* », Jean avait su se créer un réseau dense de relations et d'amis à travers le monde entier.

Sa première contribution notable à l'histoire de l'océanographie a été le Colloque international sur l'histoire de la biologie marine qu'il organisa à Banyuls-sur-Mer, en septembre 1963. La communication qu'il y a présentée portait sur Alexander von Humboldt et la biologie marine : Humboldt, un de ses « grands hommes », à l'égal de Stendhal.

La réussite du Colloque de Banyuls-sur-Mer lui valut d'être choisi comme Secrétaire général du premier Congrès international d'histoire de l'océanographie accueilli par la Principauté de Monaco en décembre 1966. Le succès du congrès s'est prolongé dans trois directions. Cinq autres congrès d'histoire de l'océanographie ont eu lieu par la suite et le septième se tiendra en Russie en 2003. Deuxième prolongement : la Principauté s'est efforcée de créer à Monaco un Centre international d'histoire de l'océanographie. Tout semblait justifier l'initiative : la richesse de la bibliothèque et des archives du Musée océanographique, où était fixé le Centre, la vocation de « mémorial » de son œuvre assignée au Musée par son fondateur, le Prince Albert Ier. Mais le projet n'a pas pu atteindre les objectifs escomptés, faute de moyens et d'appuis : « seul le futur m'intéresse ! » proclamait le directeur du Musée, l'illustre commandant Cousteau …

Dernière initiative, cette fois couronnée de succès : la création d'une Commission d'océanographie au sein de l'Union internationale d'histoire et de philosophie des sciences. L'activité et les relations de Jean Théodoridès ont permis de constituer cette Commission dès le Congrès international d'histoire des sciences, tenu à Paris en 1968. Bien que les moyens de la Commission aient toujours été très modestes, elle a joué un rôle pour les réunions d'histoire de l'océanographie. Son utilité s'est affirmée avec la publication d'*History of Oceanography*, le bulletin de liaison mis à l'étude en 1985, défini pendant le Congrès de Hambourg deux ans plus tard, et, enfin, réalisé grâce au dynamisme d'Eric Mills en 1989.

A titre personnel, je conserve à Jean Théodoridès une profonde gratitude pour les encouragements qu'il n'a cessé de me prodiguer afin de repérer les nouvelles publications en matière d'histoire de l'océanographie. Il avait été très sensible à la preuve que j'avais donnée de l'insuffisance des bibliographies scientifiques et d'histoire des sciences ; elles ne recensaient qu'un pourcentage infime des travaux mis en lumière par le dépouillement systématique des ouvrages et périodiques reçus par la bibliothèque du Musée océanographique.

Atteint par l'âge de la retraite en 1992, Jean Théodoridès décida de concentrer ses activités sur un petit nombre de thèmes : histoire de la médecine, de la parasitologie et des sciences vétérinaires. Il transmit alors, sans l'ombre d'une hésitation, la responsabilité et la présidence de la Commission d'océanographie à Eric qui en était déjà un des vice-présidents.

Si l'histoire de l'océanographie a atteint aujourd'hui le statut qui est le sien, avec un nombre sans cesse croissant de spécialistes, de réunions, de publications, elle le doit pour une large part à la personnalité de Jean Théodoridès. Il était de notre devoir de le rappeler et de lui rendre un ultime hommage.

Adieu, Théo …

Jacqueline Carpine-Lancre

THE 50 YEARS' ANNIVERSARY OF THE GALATHEA DEEP-SEA EXPEDITION 1950-1952

The roots of Danish marine research date further back in the past than for most other countries. It all began with Peter Forsskål, who during "the Arabian Journey" 1761-67 investigated the oceanic and shore faunas of the Mediterranean and the Red Sea, a decade later followed by studies of Otto Fabricius in Southwestern Greenland and O.F. Müller along the Norwegian and Danish shores. Scientists joined the circumnavigation of the corvette *Galathea* 1845-47, and in 1895-96 the first Danish deep-sea expedition on the cruiser *Ingolf* worked in the inhospitable seas around Iceland and off S.W. Greenland, supplemented between the 1880s and 1930s by many Greenland expeditions with marine admixture (Wolff 1967, 1968, 1997).

The Dana heritage. Following his Thor Expeditions 1908-10 in the Mediterranean, Professor Johannes Schmidt demonstrated in the early 1920s the breeding places of the European and American eels to be located in the Sargasso Sea. In 1928-30 the *Dana* circumnavigated the globe in search of the breeding places of the Indo-Pacific eel species and provided through methodologically conducted hauls for two years by far the largest existing collections of mesopelagic animals down to about 3000 m (Wolff 1967, in press).

Already in the years after the Dana Expedition, Schmidt, August Krogh and others discussed the possibilities of another expedition, now concentrating on the bottom fauna. However, the untimely death of Schmidt in 1933 brought an end to these plans. Participating in the entire *Dana* cruise was a newly fledged youngster, Anton Bruun, who in the mid 1930s came to the Zoological Museum and wrote his thesis on the flying fishes of the Atlantic. Ever since the *Dana* days he kept in the back of his head wild plans of some day to pursue *Dana's* work on another deep-sea expedition. He and others realized the importance of building on the rich experience gained on board by himself as coming leader and by the navigator, lieutenant commander Svend Greve as captain.

The expedition prelude. Following a newspaper report in 1941 of a popular-scientific talk by Bruun on the existence of the great sea serpent (the *Dana* had collected an apparent eel larva measuring 184 cm), Bruun was contacted by Hakon Mielche, a journalist and author of travel books. This was the tiny first beginning of Mielche's later activities as press officer on board and the tremendous publicity behind the expedition, in Denmark as well as abroad.

Shortly after the war the so-called "Danish Expedition Fund" was established. The much travelling Chief Editor Leif B. Hendil was the driving force, persuading Danes living abroad to donate money or much-coveted goods, e.g., cigarettes, which were sold legally at black market prices! A sort of forerunner was a 10-month expedition (1945-46) to West Africa immediately after the war on board the large yacht *Atlantide*, owned by a Danish millionaire. Four scientists participated: Bruun as leader, F.C. Fraser (U.K.), J. Knudsen (post-graduate) and me, still as a student.

In the spring of 1948 the plans assumed a definite shape. A committee was formed, with the King's uncle Prince Axel as chairman and members including August Krogh, Niels Bohr and R. Spärck, who was professor of zoology and before and during the expedition was the indispensable anchor man on the home front.

Equipment and ship. The Expedition Fund paid for equipment, including, at a much reduced price, the big electrical winch, etc., from the just terminated Swedish Deep-Sea Expedition. Equally in time and politically expedient was the fact that in the winter of 1948-49 the Danish section of the government-supported World Friendship Association had to offer for sale its recently acquired vessel, the *Friendship*. She was a former British sloop (H.M.S. *Leith*) of 1600 tons, length 80 m, width 11 m, draught 3.5 m, and with two turbines of 2000 h.p. combined. She was built at Devonport in 1934 and had during the war served with towage test and minesweeping operations in the wind-swept North Atlantic.

While the expenses of the Dana Expeditions and the later sorting of material and publication of results had solely been defrayed by the Carlsberg Foundation, the total cost of the Galathea Expedition was paid by state appropriations (4.3 million DKK) and by the Expedition Fund (1.3 million DKK); more expensive ship rebuilding than anticipated, devaluation and exploding oil prices due to the Korean war necessitated two extra appropriations.

For technical and financial reasons the departure was delayed three months. This did not mean a less hectic final year - for Bruun and Spärck with all sorts of negotiations and correspondence and for me as chief of equipment - during a post-war era full of scarcity of goods - to provide the various supplies, from tweezers and specimen vials and jars to transport cases in standard size and the world's longest fishing line, the 12.2 km steel wire spun in one piece from a diameter of 9 mm distally to 22 mm proximally.

Crew and scientists. The naval crew numbered altogether 118 persons. Half of these (12 officers, 4 mates and 42 national servicemen) served both years, the others for about one year, incl. 6 of the 8 student "laboratory hands". Otherwise Bruun, the post-graduate Bent Hansen and I participated both years as zoologists, together with a plankton research assistant, an engineer, a fishing master, and a photographer. Moreover, 16 Danish and 7 foreign scientists and 4 journalists took part from about a month to half a year or a full year. Another 14 Danes and 28 foreigners were short-time

guests, like five stowaways, one of whom could make available only his fingerprint! At any given time the ship housed from 85 to nearly 100 persons.

The sequence in brief. After a windswept and useful trial trip to a Norwegian fjord and a visit on board by the maritime enthusiast King Frederik, we departed from Copenhagen on 15 October under great public awareness. Work was begun off N.W. Africa. Passing the equator called for a mass baptism executed by a minority of only 11 able-bodied men according to old traditions.

The first Christmas was celebrated during a red tide algal bloom and fish death in the godforsaken Walvis Bay off the Kalahari Desert. One week was spent off East London, S.E. Africa, in a futile attempt to catch specimen no. 2 of the renowned blue fish, *Latimeria* (two years later it was found that it is normally restricted to the Comoros Islands north of Madagascar). Rich trawl catches were obtained off East Africa, and from Colombo the first of many cases with specimens were sent home. After calling at Calcutta, ethnographical articles were collected during a visit to the Nicobar Islands, the site of former Danish settlements.

In June-July 1951 we conducted the epoch-making investigations at 10,000 m depth in the Philippine Trench - at the time considered the maximum ocean depth. Subsequently, the Java, Banda and Solomon Trenches were explored, before we, via New Guinea and after grand and hospitable receptions in East Australian cities and the seethingly rich Tasmanian deep sea, reached New Zealand. Here we could celebrate our second Christmas and a stormy New Year on the subantarctic Campbell Island, where a sea elephant and sea birds were collected for the Zoological Museum exhibits. After particularly plentiful catches in the Kermadec Trench, we headed across the Pacific via Tonga, American Samoa and Hawaii to San Francisco and homeward by way of Panama and the former Danish Virgin Islands.

Finally, on 29 June 1952, we entered the Øresund, with Hamlet's Kronborg Castle on the starboard side. The final shots from the ship's saluting canons were returned from the bastions, the King and all former participants came on board, followed by thirteen customs officers! Soon after the port of Copenhagen witnessed one of the finest ship receptions in its long history. The *Galathea* was back after a voyage of 63,700 nautical miles or 116,500 km - nearly three times round the Earth at the equator and after visits to 26 countries and 62 ports and calls.

To the ocean floor at 10,000 m. Our principal task, the attempt to demonstrate life at the greatest depths, was solved brilliantly in the above-mentioned five trenches exceeding 6000 m. This was possible because of the recent construction of a technical marvel, the Kelvin-Hughes echo sounder, which registered the bottom topography. But beforehand a number of technical problems should be overcome prior to the trawlings with 3 m sledge trawls, taking place under constant reading of wire tension and echo sounder. Simultaneous control of the depth, the ship's speed and the angle of the trawl wire could, according to complicated curves and formulae, indicate that the trawl moved along the bottom deep, deep under us. There were several misses and loss of gear, and the suspense was sometimes unbearable. So much the greater was the triumph when in July 1951 we could collect living animals from the Philippine Trench at 10,190 m depth and under an inconceivable pressure of over 1000 atm. or 1 ton per square cm. The first object to be recovered from the trawl bag was a 25 cm long stone with two sea anemones which were later shown to belong to a new family, the Galatheanthemidae; later *Galathea* and Russian catches showed it to be restricted to the trenches at depths exceeding 6000 m.

Serious problems were also encountered in the Philippine Trench and elsewhere during hydrographical work at great depths: precision thermometers were crushed and metal messengers, which were sent down the wire to release and close water bottles at various depths, failed because they for several reasons were slowed down on the way. Nevertheless, we succeeded in obtaining many measurements of bottom temperatures at trawling stations.

In the five investigated trenches a total of 115 species were collected deeper than 6000 m. Most were different from one trench to another at the specific but not generic level. A lower limit of 8000 m was found for tunicates, sea stars, brittle stars and fish, which are otherwise very abundant groups in the deep sea; deeper than 6000 m there was a total lack of decapods like shrimps, crabs, lobsters, etc. - apparently due to inability to adapt to the high pressure. The special trench fauna and the corresponding depth zone were by Bruun named hadal - after Hades, the underworld. Dominating in size and numbers were the holothurians, e.g., 3000 in a single haul at 7160 m in the Java Trench and 1800 of another subspecies at 8300 m in the Kermadec Trench.

Epoch-making studies of bacteria under pressure. In the years up to 1950 the American microbiologist Claude ZoBell had developed a technique by which he could expose bacteria to high pressure. His request to join the expedition was met with delight, and in the Philippine Trench his first trial was made. After adding sea water and nutrients to a sediment sample in glass vials, these were exposed to 1000 atm. pressure and afterwards kept at 2°C. As controls, similar

samples were kept at 1 atm. and the ordinary 30-35°C on board. ZoBell could find bacteria propagation only in samples at high pressure and low temperature, this documenting barophilic bacteria as the basis for animal life.

Strong hollow glass balls (diameter 7 cm) were used by ZoBell in connection with bacterial sampling. Some were recovered empty, others about half filled with water and are still in that condition. Several balls inside specially manufactured, thick-walled copper containers exploded to the finest conceivable glass dust during an "implosion" that made the containers look as if they had been squeezed by an iron fist!

The first quantitative deep-sea bottom sampling. The use of a bottom grab to demonstrate the density of the benthic fauna was introduced by C.G. Joh. Petersen half a century earlier and was still a Danish speciality. For deep-sea sampling, very heavy Petersen and van Veen grabs covering 0.2 m^2 had been constructed (instead of ordinary 0.1 m^2 grabs). We encountered several technical problems and much frustration when they came up empty after daylong paying out 10 km of wire and hauling it back. A total of 28 successful samplings from depths exceeding 2000 m were obtained, including seven from the hadal zone. Two were from the Banda Trench at 7280 m (7 species, 12 individuals, weight 0.7 g) and at 6580 m (8 species, 11 individuals plus fragments, 2.1g).

Neopilina - **our most important single find**. The big sensation was half a score of a living fossil, an unimpressive, segmented mollusk with a cap-shaped calcareous shell and 5 pairs of external gills. It closely resembles those primeval forms from which limpets, gastropods, bivalves and cephalopods have evolved. They were considered extinct about 300 million hears ago, but here they appeared full of life in the deep sea! Two monographs in the *Galathea* Report (1959 and 1985) give a detailed account of the anatomy and relationships. Specialists have said that this find alone justified the whole expedition.

The world's richest trawling from the deep sea. The ancient mollusk was collected with a large herring trawl (mouth opening 32 m) at Station 716 in the East Pacific off Nicaragua at 3570 m depth. Other remarkable animals from the famous Stn. 716 were the 47-cm-long angler fish (Ceratioidea) with the light organ hanging like a bifurcate bell clapper inside the huge mouth behind rows of awe-inspiring, sharply pointed teeth, a hermit crab, which due to lack of sufficiently large snail shells was roaming freely like the ancestors of hermit crabs, even though its calcified abdomen is asymmetrical as in ordinary hermit crabs. Also quantitatively Stn. 716 was overwhelmingly rich: 137 species and 2100 individuals. Dominating in numbers were in order of succession: holothurians, brittle stars, polychaetes, sea stars, sea anemones and bivalves, but due to the type of gear, small-sized forms, particularly peracarid crustaceans, were generally missing. Space does not permit a closer description of the many exciting creatures, for instance an extremely primitive shrimp belonging to a new superfamily of Caridea: Galatheacarioidea, or the abundant fauna utilizing land plant remains which had only sporadically been explored by previous deep-sea expeditions.

Six doctoral theses. Six of the many monographic studies were awarded the D.Sc. degree: F. Jensenius Madsen (a sea star family and deep-sea zoogeography), T. Wolff (asellote isopod crustaceans), J. Nielsen (the fish family Aphyonidae), J. Knudsen (bivalves), O. Tendal (xenophyophorean foraminiferans) and B. Hansen (elasipod holothurians).

Measurements of the production of oceanic micro-algae. Another pioneer object was to obtain the very first indication of the size of phytoplankton production in the world oceans. As a heaven-sent opportunity, E. Steemann Nielsen had in the spring of 1950 devised a new method of measurement, following the repeal in USA of the ban on purchase of radioactive carbon (^{14}C). In brief, the procedure was the following: After measuring light intensity and taking water samples from the surface and depths of 50 and 100 m, ^{14}C was added to each sample from an ampoule. Next the samples were placed on a rotating disk in a tank under artificial light, and the algae absorbed carbon during photosynthesis. After three hours the water was, under low pressure, sucked through a very dense filter that retained the algae, A geiger counter measured the radioactivity, and the production of organic material could be calculated. The method has since become standard throughout the world. The nearly 800 measurements round the Earth indicated that the total algal production is c. 40,000 tons per year or approx. corresponding to what is produced on land. The maximal figure was 3.80 g per m^2 per day off S.W. Africa - or 14,000 times the production measured in the Sargasso Sea!

Geomagnetic investigations. Measurements of the terrestrial magnetism below the surface of the ground have been conducted in mine shafts, but surrounding magnetic rocks made them unreliable. Instead, Danish geophysicists wished to perform such measurements in the deep sea. Supported by the Carlsberg Foundations, complicated measuring instruments were constructed to be lowered in pressure-secured spheres which had been made from a new and specially prepared bronze alloy, totally nonmagnetic and as strong as steel. However, time-consuming tests on board involved enormous difficulties: at first grinding the closing surfaces to make the spheres absolutely watertight, later avoiding

having the tons-heavy spheres beating against the ship's side during launching, which would put the vulnerable instruments out of function. Rather late during the expedition promising results were obtained, but unfortunately they have never been followed up.

People and animals on a remote South Sea island. The fact that the route touched the Solomon Islands, N.E. of Australia, inspired the ethnologist Kaj Birket-Smith, a member of the Galathea Committee, to visit Rennell Island, an elevated atoll and remote outlier in the Solomons. His purpose was to undertake the first thorough study of the Polynesian population. Besides a film photographer, one of the "laboratory hands" and I took part to study and collect all sorts of animals. It all resulted in Birket-Smith's book on the ethnology and the work *The Natural History of Rennell Island, British Solomon Islands*, the 8 volumes of which were published 1958-91, edited by me and with a total of 97 papers, based partly on our activity in 1951 and my two later visits, partly on a small British expedition in 1953 and minor later visits by others.

Popularization at home and abroad. The early interest in the expedition remained unabated during the voyage and in the succeeding years, partly due to the adventurous touch of the whole enterprise, partly because of the efforts of the journalists and film photographers of the press service and many other participants. Such contributions included novelties and feature articles in newspapers, Mielche's weekly articles in a widespread magazine, later to be published as three books (condensed and translated in Mielche 1953 and 1954), long travel articles in Scout magazines, etc. After our return another four books were published together with scores of articles in periodicals, numerous lectures and film shows and about twenty short films for schools on animal and geographical subjects. En route we arranged press conferences and radio features, invited Danes abroad and many other to receptions on the boat deck and mini-exhibits in the laboratory, gave lectures at universities, etc. The result was a unique press coverage and PR for Denmark.

The scientific results. Along with the bacteria and plankton investigations, the working up of animals from altogether 84 successful trawlings and 74 bottom samplings deeper than 400 m has been published in the expedition series, the imposing *Galathea Report*. So far 18 volumes have been issued with nearly 100 papers (many as monographs) written by 23 Danish and 42 foreign specialists; they cover 3700 pages in quarto, with 180 plates. In addition, more than 300 papers, based entirely or in part on *Galathea* material, have been published elsewhere.

Not only in the many ports visited en route but also amongst marine scientists throughout the world the Galathea Expedition attracted attention as a successful effort by a small country so soon after World War II.

Anton Bruun became a central figure in the co-ordination of international marine research during the following decade. He was one of the founders of SCOR, the Scientific Committee on Oceanic Research (Wolff 1990) and was elected the first president of the Intergovernmental Oceanographic Commission under UNESCO. After his premature death in 1961, an American research vessel bore his name during the International Indian Ocean Expedition in the 1960's. And although Denmark no longer has a vessel for oceanic basic research at her disposal, the group of deep-sea biologists, mainly at the Zoological Museum in Copenhagen, has managed to carry on the traditions.

The Galathea Expedition was the last of 75 years of great circumnavigations dedicated to deep-sea research. It drew profound trails and is still the object of interest and veneration. Its name will no doubt be retained for a long time in the annals of ocean research.

Literature

Bruun, A.F., S. Greve, H. Mielche & R. Spärck, 1956. *The Galathea Deep Sea Expedition 1950-1952*. George Allen and Unwin Ltd., London, 296 pp. (Edition in Danish 1953).

Mielche, H., 1953. *Round the World with* Galathea. William Hodge & Co., Glasgow, 241 pp.

Mielche, H., 1954: *Rund um den Globus. Mit dem Forschungsschiff "Galathea" um die Welt*. Hans Dulk, Hamburg, 225 pp.

Wolff, T., 1967: To the Ocean Floor at 35,000 Feet - the Second Galathea Expedition. Pp. 251-308 *in*: *Danske Expeditioner på Verdenshavene/Danish Expeditions on the Seven Seas*. Rhodos Publ., Copenhagen, 336 pp.

Wolff, T., 1968: The Danish Expedition to "Arabia Felix" (1761-1767). *Bull. Inst. océanogr. Monaco, No. spéc.* 2: 581-601.

Wolff, T. 1990: The creation and first years of SCOR (Scientific Committee on Oceanic Research). Pp. 337-343 in: *Ocean Sciences: Their History and Relation to Man*. Proc. 4th Int. Congr. Oceanogr. Hamburg 1987. Dtsch. hydr. Zeitschr., Erg., Heft B, No. 22.

Wolff, T. 1997: A hundred years' anniversary: The Danish Ingolf Deep-Sea Expedition 1895 and 1896. *Hist. Oceanogr.* No. 9: 2-4.

Wolff, T. (In press) The Danish *Dana* Expedition 1928-30: Purpose and accomplishments, mainly in the Indo-Pacific. Proc. 5th Int. Congr. Oceanogr. 1993. *The Pacific and beyond*, edited by Philip F. Rehbock & K.R. Benson.

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(My apologies to Dr Wolff, and to our readers, for not having the space to include the several fine illustrations that accompanied the original manuscript - *Editor*)

ABORTIVE PLANS FOR A WORLD-WIDE OCEANOGRAPHIC EXPEDITION

Abstract. After several years of campaigning for a synoptic investigation of the North Atlantic deep-water, the Swedish oceanographer Otto Pettersson succeeded in arranging that the first reconnaissance cruises should be made with the naval vessels that would cross the Atlantic on their way to the ceremonial openings of the Panama Canal, scheduled for March 1915. These plans were defeated by the outbreak of World War I. After the war Otto Pettersson and Christian Frederik Drechsel, Vice-President and General Secretary of ICES, respectively, launched a plan for a world-wide oceanographic expedition. They proposed that the research vessel *Hirondelle II*, which was offered for sale after the death in 1922 of Prince Albert I of Monaco, should be acquired for four years of oceanographic investigation of the world oceans. They explored various possibilities of financing the project, which all failed. The idea of buying a smaller vessel, which would be cheaper to run, also had to be relinquished. As some of the Unions of the International Research Council had expressed a wish that an exploration as complete as possible of all oceans be organized by international co-operation, ICES passed the ball to the Section for Oceanography of the International Union for Geodesy and Geophysics. Here too the practical obstacles to such an expedition by an international ship were considered insurmountable. Instead there was agreement about the subjects of universal interest to which all national expeditions should pay attention, and standardization of methods and apparatus. There was meagre outcome of the ambitious plans for a world-wide expedition.

The plans for an international synoptic investigation of the North Atlantic deep-water in connection with the opening of the Panama Canal had to be relinquished because of the outbreak of the World War in 1914 (Smed, a). After the war the originators of the plan, Otto Pettersson and C.F. Drechsel, Vice-President and General Secretary of the International Council for the Exploration of the Sea (ICES) respectively, launched a new proposal: a plan for a world-wide oceanographic expedition.

It is interesting that the need for an expedition of this type was felt elsewhere at the same time. In his presidential address to the meeting in 1920 of the British Association for the Advancement of Science, William A. Herdman raised the question if the time had not come for a new *Challenger* Expedition (Herdman 1920, pp. 813-825). The subsequent discussion of the address strongly supported the need for a new world-wide oceanographic expedition. A resolution was unanimously agreed which pointed out

> the importance of urging the initiation of a national expedition for the exploration of the ocean, and requesting that the council of the British Association should take the necessary steps to impress this need upon His Majesty's Government and the nation (Anon. 1920a, pp. 30-32).

This resolution from the Association's section for zoology was vigorously supported by the sections for chemistry, physics, geology, and geography. An editorial in *Nature* took up the matter and strongly recommended the plan (Anon. 1920b, pp. 101-102). In spite of all this backing the plan was never implemented. The British authorities chose to support work in the Antarctic.

According to Pettersson (1924, p. 39) Prince Albert I of Monaco a few months before his death in 1922 in a letter to the President of ICES, Henry Maurice, had expressed the wish that the leadership of the oceanographic exploration of the Atlantic would be taken over by the most vigorous of the existing organizations for that purpose, i.e. ICES. So when the successor to Prince Albert wanted to dispose of *Hirondelle II*, the research vessel of the late Prince, Pettersson saw a chance of getting an expedition started. In a letter of November 1922 to Jules Richard, Director of the Musée Océanographique in Monaco, he commented upon the sale of the ship: if only King Oscar II of Sweden had still been

living Pettersson would have proposed that the King take the initiative in an international exploration of the oceans and buy or hire *Hirondelle* for four years of hydrographical investigations. The first year would be for the exploration of the Gulf Stream, second and third year for work in the Pacific, the fourth year in the Indian Ocean. *Hirondelle*, staffed by the best experts among the European oceanographers, should make the circumnavigation under the ensign of Prince Albert. Alas, however, now the two most enlightened sovereigns of our time have passed away, Pettersson ended his letter (1).

A fortnight later Pettersson informed Professor Louis Joubin (Paris), a close collaborator of the Prince, that he had corresponded with Drechsel about the possibility of organizing a world-wide oceanographic investigation in memory of Prince Albert. *Hirondelle* would make a cruise around the world for a study of ocean currents and their importance for navigation, fisheries, and the climate of the continents. Using modern methods, salinity, temperature, dissolved gases, plankton, and the eggs and fry of the fishes would be studied (2).

According to Rouch (1968, pp. XLI-XLII), it was Richard who, in his capacity as *executor testamenti* of Prince Albert, was charged with the sale of *Hirondelle*. He also wished very much that the ship should be used for research in the future. Richard therefore asked the well-known oceanographer Jean-Baptiste Charcot, for whom the French navy's vessel *Pourquoi-Pas*? was practically reserved, whether the navy might be interested in purchasing *Hirondelle*. Charcot answered that this was an excellent idea and that he would try to get the admiral commanding the Mediterranean squadron to support it. Still, according to Rouch, Charcot did not really do much in this respect because he knew that if the navy acquired *Hirondelle*, which was much better equipped for oceanographic research than *Pourquoi-Pas*?, it would be very difficult for him to get the navy fit out "his" vessel every year.

Some time in 1923 Pettersson learned from Richard that *Hirondelle* had not yet been sold, and that Richard desired to have the matter settled. This brought Pettersson back to his idea of a four years' circumnavigation of the globe to study ocean currents. Such a continuation of the scientific work of Prince Albert would be a proper way to honour his memory. Pettersson was aware, of course, that the purchase and running of *Hirondelle* was not possible for a single country in the then state of Europe, harassed by the economic depression after the War. Drechsel had estimated that the expenses involved in an expedition lasting 4 years would amount to 12 million francs (incl. purchase of *Hirondelle*). For a single country, perhaps also for an organization like ICES, this would seem insurmountable. However, if they succeeded in making many of the large countries throughout the world interested in the plan, the expenses falling upon each country would not be high. Pettersson explained that ICES would meet in Paris in October 1923 where the matter would be discussed on the basis of a proposal to be prepared by Drechsel and himself. It was important for them to know Richard's opinion: would he, as a friend and collaborator of Prince Albert, wish that *Hirondelle* should continue the great exploration of the ocean that the Prince had started (3). Richard's reply is not known. As explained above, however, he was strongly interested in *Hirondelle* being kept as a research vessel.

In any case Pettersson and Drechsel prepared a memorandum for the ICES meeting, pointing out the possibility of starting research on a grand scale that arose if *Hirondelle* became available. It stressed the need for investigations in the three oceans. In the North Atlantic the Gulf Stream and its continuation should be studied; in the South Atlantic the great features of oceanic circulation were to be explored. The Pacific Ocean was an immense and nearly uncultivated field for oceanographers, so even if two years were allotted to the study of this ocean it would mean only a reconnoitering exploration. This, however, might be fundamental for subsequent investigations by the adjacent countries. A survey of the Indian Ocean was likely to be of the greatest importance for the knowledge of the climatic conditions of the adjoining countries, which are so dependent on the monsoon rainfall (Pettersson and Drechsel, 1923, pp. 60-70).

Apparently the memorandum had been circulated at least to some scientists in advance of the ICES meeting. In a letter to Drechsel the Danish oceanographer Martin Knudsen declared that he found the idea of a four years' circumnavigation very fine. He thought, however, that at the time would be so difficult to implement that it was hopeless to make the proposal. He would not be surprised if the Council (i.e. ICES) would be unwilling to recommend to the Danish Foreign Office, the diplomatic channel used by ICES, that it take up the matter (4).

> The ICES meeting, having studied the proposal, expressed the opinion that an increased knowledge of the Ocean systems is not merely of scientific interest but also of practical importance for the explanation and the forecasting of phenomena affecting life both in the sea and on land.

It was considered that an investigation of this type had to be extended over many years and that it could best be initiated by a preliminary reconnaissance by means of a suitable vessel such as *Hirondelle*. The recommendation continued:

> The Council appreciates the fact that the authors of the proposal have not invited the Council to undertake or to contribute to the expenses of the investigation, which go far beyond the limits both of the resources and the mandate of the Council, but merely to give to their proposal the support of its recommendation. The Council gladly recommends the proposal to the favourable consideration of the Governments and the scientific institutions of all countries. The Council makes this recommendation the more readily because it believes that the investigation may produce results of importance to fishery investigations.

Finally it was stated that should the proposal get adequate support the Council would be prepared to undertake the general direction of the work (Anon. 1923, pp. 18-19).

Immediately after the ICES meeting in Paris, negotiations were started with leading authorities on the study of the sea in Europe and America. In England the matter was presented to the Challenger Society by William Herdman (University of Liverpool), Stanley Gardiner (Cambridge University), and Henry Maurice (Secretary, the Fishery Department). Especially in the Latin countries there was sympathy with the idea of acquiring *Hirondelle*, because of Prince Albert's connection with those countries (Pettersson, 1924, pp. 36-44). Problems arose, however. When the proposal had become known an American company became interested in *Hirondelle* because of the very low price at which it was offered. So in early December 1923 Richard asked Pettersson whether those behind the proposal were prepared to pay 1,600,000 francs immediately for the vessel. If not, negotiations with the Americans would continue (5).

Pettersson's idea was that the ten member countries of ICES should buy the ship, whereas the running costs would be paid by the other states bordering the oceans to be investigated. For the first year he had in mind Canada, USA, Argentina, Brazil, and the Cape Colony. The difficulty was to provide the money for the purchase at short notice. Pettersson realized that the diplomatic channels would be too slow. So he got the idea that the leading newspapers in the ICES countries might be induced to guarantee that the purchase price would be available, and he suggested that the Swedish newspapers should take the lead (6,7). It was necessary with short delay to show the persons in Monaco that there was a serious interest in buying *Hirondelle* for oceanographic purposes (8).

Pettersson, who with his family was on holiday in Meran (Tyrol), was busy writing letters to all quarters to create interest in the matter. Drechsel also was active. He had put his trust in the Rockefeller-financed International Education Board, which had just been established in 1923 (Kohler, 1985, pp. 94-95). Its purpose was to promote science on an international scale, mainly in Europe. So when a representative of the Board visited Copenhagen, Drechsel contacted him, hoping that the Board would be willing to support the purchase of *Hirondelle*. The representative took up the matter with the leader of the Board, Wickliffe Rose, who spent the period December 1923 to April 1924 in Europe visiting institutions potentially worth supporting (Aaserud, 1998, p. 204). The reply gave Drechsel the impression that his proposal had been favourably received. The Board was understood to have a section for biological science, and the *Hirondelle* plan might fall within the province of this section. Drechsel was invited to send an official account of the plan to the Board in New York. He did so (9). But at that time it was all too late. In view of the policy subsequently followed by the Board, viz. to concentrate upon supporting a few of the most excellent national research institutions "to make the peaks higher" (Aaserud, 1998, p. 203), it appears unlikely that it would have supported the project to buy *Hirondelle*.

By letter of 21 January, 1924 Richard informed Drechsel that the bargain would now be closed shortly, and invited him to be quick if he wanted to purchase the ship. At the same time Richard forwarded the declaration from the Captain of *Hirondelle* that it was an excellent sea-ship (10). Pettersson had not yet given up completely. He ventilated the idea that Sweden might buy the ship for use in the training of naval officers. Their training cruises could then be combined with scientific research. Another idea was to apply to Wallenberg, the Swedish financial matador, who might simply buy *Hirondelle* via a telegramme and thereafter present the State of Sweden with it! The State might then place the ship at the disposal of an international exploration of the Atlantic etc., or use it as a training ship (11).

The opportunity was missed, however. According to Pettersson (1924, p. 44) a definitive offer was made by the director of the Spanish institute for sea research, but in vain. *Hirondelle* had already been sold to America. The buyer was a film company, which made little use of it (H. Pettersson, 1955, p. 3). The proud ship came to a sad end, as a coal depot-ship, at the Panama Canal (Rouch, 1968, p. XLII).

Even though the plan to acquire *Hirondelle* failed, Pettersson did not give up. In January 1924, when he realized that the game was up, he launched a new idea, to buy or to have constructed a new vessel (12). This would probably be considerably more expensive than the purchase of *Hirondelle* would have been. On the other hand a minor motor vessel, which would cover the needs, would be much cheaper to run. Pettersson's and Drechsel´s extensive correspondence with colleagues about the *Hirondelle* project had revealed, however, that there was a great divergence of opinion. Some

thought that instead of a large vessel like *Hirondelle* many small vessels, working simultaneously in different regions according to a common programme, would be preferrable. Others recommended a repetition of the *Challenger* cruise around the world. Others, again, maintained that, at least in the start, work should be limited to the Atlantic Ocean, and that the nations interested should adopt their preferred type of vessel (Anon., 1925, pp. 29-30).

It was now realized that for the time being it was not possible to implement the project of buying or having constructed a vessel for an international expedition. It would be useful, however, to reconsider the various opinions and proposals put forward. The new global organizations established after the war (Smed, b) offered a platform for these discussions, such as the meeting at Madrid in October 1924 of the Section for Oceanography of the International Union for Geodesy and Geophysics (IUGG), one of the Unions under the International Research Council (IRC). Here the representative of the American Geophysical Union initiated a discussion about international co-operation in support of the proposal for an international scientific expedition. The discussion resulted in the wish that a committee be established to consider the possibility of founding an international organization for investigation of the sea. In 1925 another of IRC´s Unions, the International Union of Biological Sciences, expressed a wish to have organized, by international co-operation, an exploration as complete as possible of all oceans. So apparently there was still some interest in such a project (Anon. 1925, pp. 29-31).

ICES now passed the ball to IUGG, and the ICES President, Henry Maurice, on behalf of the Council attended a meeting of IUGG´s Section for Oceanography at Stra (Venice) in July 1926 (13, 14). At the meeting of the Section's Executive Committee the question of an international marine research expedition was discussed. It was unanimously agreed that the practical obstacles to an organized international expedition by means of an international ship were likely to prove insurmountable. Maurice therefore suggested that the purposes which the authors of the proposal had in view would be best advanced by maintaining contact between the various national expeditions (15). The points that should first and foremost be kept in view were (Anon. 1927, pp. 22-23):

1. An agreement as to the subjects of universal interest to which all expeditions should be asked to pay attention.
2. The standardization of methods.
3. The standardization of apparatus.

These items are certainly important. But compared to the original plans for a world-wide expedition the results of Pettersson's and Drechsel´s great efforts were meagre.

Acknowledgements I am greatly indebted to Mr. Rutger Irgens for access to the correspondence of his grandfather, Otto Pettersson; to M^{me} J. Carpine-Lancre for copies of relevant letters; and to Dr. Artur Svansson for assistance in processing the manuscript.

References

Literature

Anon. 1920a. The Scientific Investigation of the Ocean. Need for a New "Challenger" Expedition. *Nature* 106: 2653

Anon. 1920b. The Re-challenge to the Ocean. *Nature* 106: 2656

Anon. 1923. *Cons. perm. int. Explor. Mer, Rapp. P.-v. Réun*., 32

Anon. 1925. *Cons. perm. int. Explor. Mer, Rapp. P.-v. Réun*., 38

Anon. 1927. *Cons. perm. int. Explor. Mer, Rapp. P.-v. Réun*., 41

Aaserud, F. 1998. Videnskabernes København i 1920'erne belyst af amerikansk filantropi. pp. 201-219 in: Thomas Söderqvist et al. (eds.): *Videnskabernes København*. Roskilde Universitets forlag.

Herdman, W. A. 1920. Oceanography and the Sea-Fisheries. *Nature* 105: 2652

Kohler, R.E. 1985. Science and Philanthropy: Wickliffe Rose and the International Education Board. *Minerva*, 23 (1), 75-95

Pettersson, H. 1955. A pioneer of international deep sea research. In *Essays in the natural sciences in honor of Captain Allan Hancock*. Univ. S. Calif. Press, 1-8

Pettersson, O. 1924. Förslag till en världsomfattande internationell havsforskningsexpedition. *Ymer*, 1924, No. 1

Pettersson, O. and C.F. Drechsel. 1923. Memorandum on an International Expedition for Sea Research. *Cons. perm. int. Explor. Mer, Rapp. P.-v. Réun*., 32:

Rouch, J. 1968. Discours de M. le Commandant J. Rouch. *Bull. Inst. Océanographique, No. spécial* 2, 1: xxxvi-xlii.

Smed, J. a. Early Plans for an International Synoptic Investigation of North Atlantic Deep-Water. Unpublished MS

Smed, J. b. ICES and the New Organizations. Competition or Co-operation? Unpublished MS

Archival material Abbreviations used: Dr: C.F. Drechsel; GE: Gustaf Ekman; Mo: Archives of the Musée océanographique, Monaco; OP: Otto Pettersson; OPP: Private collection (R. Irgens) of letters. 1. OP to Jules Richard 23 November 1922. Mo, 2. OP to Louis Joubin 5 December 1922. Mo, 3. OP to Jules Richard 2 september 1923. Mo, 4. Martin Knudsen to Dr 2 September 1923. Draft copy in Rigsarkivet (Copenhagen), No. F.27-210, Box D.14, 5. OP to GE 12 December 1923. OPP, 6. OP to GE 16 December 1923. OPP, 7. OP to GE 26 December 1923. OPP, 8. OP to GE 5 January 1924. OPP, 9. Dr to GE 10 January 1924. OPP, 10. Jules Richard to Dr 21 January 1924. OPP, 11. OP to GE 30 January 1924. OPP, 12. OP to GE 14 January 1924. OPP, 13. Henry Maurice to Dr 23 June 1926. Rigsarkivet (Copenhagen), No. 10.649, Box 1, File 1.A.1, 14. Dr to Henry Maurice 26 June 1926. As 13, 15. Henry Maurice to Dr 6 August 1926. As 13.

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ON THE HISTORY OF THE NETHERLANDS INSTITUTE FOR SEA RESEARCH

The Netherlands Institute for Sea Research (NIOZ) evolved around 1960 from its forerunner, the Zoological Station of the Dutch Zoological Association (NDV, Nederlandse Dierkundige Vereniging). This Association, founded in 1872 by university or museum zoologists and naturalists, aimed from the beginning to establish a marine biological station on the Dutch coast. A movable wooden laboratory was constructed, funded from private sources and some gifts from "learned Societies" and the Government. It was not clear which location would be the best; Den Helder on the Marsdiep tidal inlet was chosen as the first site. On July 8, 1876 the Station was opened officially as a summer station, the start of "institutionalized" marine biological research in Holland. Subsequently the station was put up at other locations, but Den Helder proved to be the most suitable place because of the diversity of its environment (North Sea, former Zuiderzee as well as tidal flats in the Wadden Sea). After some years of successful operation, drawbacks of the movable laboratory became apparent; many repairs were needed. Also, some NDV-members wanted a permanent station with a small staff and support was sought for a permanent building.

The central person in these developments was P.P.C. Hoek (1845-1914). He studied zoology at Leiden University and was a well-known specialist on Cirripedia, the subject of his thesis and of monographs on samples from the *Challenger*, *Belgica* and *Siboga* expeditions. He also had a keen interest in fisheries science ("economic biology") and organized a project on oyster culture. He convinced most of the members of the NDV that cooperation with Government in fisheries matters would be the best way to give the Station a more secure financial basis. After he had been appointed scientific adviser to the Dutch Governmental Committee on Fisheries in 1888, a permanent Zoological Station in Den Helder was opened in 1890. The NDV paid for the building from a legacy, gifts and loans, but full use exploitation depended on the Government paying Hoek's salary and hiring rooms in the building. Hoek also became (unpaid) director of the Zoological Station. Due to his involvement in Dutch fisheries policy matters and his continuing involvement in marine biology, Hoek's international contacts with for example, German and Swedish authorities and scientists, increased during the 1890's. In view of this combination and because of his linguistic abilities it was no surprise that in 1902, he was elected as the first General Secretary of ICES. He held this post until 1908; in 1907 he returned from Copenhagen to Holland.

Waxing and waning of the symbiosis with fisheries research. The ICES obligations, agreed upon for five years, greatly stimulated research in the developing "science of the sea", not the least by the multinational program of seasonal cruises. Dutch obligations were carried out by the (new) National Institute for Sea Research, located in the Zoological Station. H.C. Redeke, Hoek's assistant since 1898, became director and the staff was enlarged with biologists for plankton studies (P.J. van Breemen) and chemists (W.E. Ringer and later F. Liebert). The work at sea, involving also the Dutch Meteorological Institute (KNMI in de Bilt), was carried out on a rented paddle steamer, the *Wodan*. The temporary nature of most of the assignments caused many changes in staff. After the first five year period the seasonal cruises became much less frequent, while research at sea came to a virtual standstill during WW I. During the 1920's fisheries research was split in small branches, which one after the other left the Zoological Station in Den Helder, the last in 1928. The

various branches were united again in 1942 into the Netherlands Institute for Fisheries Research (RIVO), since 1955 in IJmuiden.

The Zoological Station as an institute for pure research. Meanwhile, some heads of biological faculties at the Dutch universities successfully asked the government for an increase in subsidy, sufficient for a biological station on the coast, essential for courses by undergraduate students and for thesis work. In 1931 the Zoological Station entered a new life without formal relation with fisheries. The NDV became the formal employer of the personnel: the director J. Verweij (1899-1981), an assistant, a handyman and a skipper/technician. Verweij dutifully and enthusiastically fulfilled his obligations towards the NDV and the universities, but he wanted to broaden research, again into "science of the sea". In the 1930's the economic crisis made the necessary increase of staff impossible. After WW II much repair of war-damage was needed first (Den Helder is also a navy base). In the 1950's, the personnel had increased to about 15, among them H. Postma, who started physical and chemical research on the Wadden Sea. In 1957, with much support from (especially) Prof. G.P Baerends, chairman of the board of the NDV, a plan for gradual growth towards an institute with about 150 personnel, and departments of biology, physics, chemistry and geology was submitted and approved by the government. The Marine Laboratory in Plymouth, UK and the Institut für Meereskunde in Kiel, Germany served as examples. The explosive growth of the "environmental sciences" everywhere contributed to this decision, while the government realized that a coastal nation needed an independent "pool" of marine scientists. It was also decided that the enlarged institute would remain a "field station" for all marine science students from all universities and would remain near the Marsdiep tidal inlet. It proved impossible to find a suitable relatively quiet site with sufficient room for outdoor experiments in the naval port of Den Helder and in 1969 the institute moved to the island of Texel, opposite Den Helder on the other side of the Marsdiep.

Oceanographic expeditions. Scientific expeditions are another root of oceanography and an essential part of the work done by present-day oceanographic institutes. In the 19th century these expeditions gradually evolved from "voyages of discovery", funded by trade, imperialism and its colonial branch. Dutch scientific expeditions went on Navy ships to the Indonesian waters: The *Siboga* Expedition in 1901 (headed by prof. M. Weber) and the first Snellius Expedition in 1929 (headed by P.M. van Riel from the Meteorological Institute). The Netherlands Geographic Society and its counterpart in the Dutch East Indies, with ample support by the Navy, took the lead in their organization, indicating roots in the "Trade-Colonial-Military" complex. The organizing committee sought approval by the Academy of Sciences and raised funds. Afterwards a scientific leader was appointed by the committee, who subsequently recruited his staff. Cross-fertilization with scientists at the Zoological Station and at universities took place on a personal level.

Since the mid-1970's expeditions have been an essential part of science at NIOZ. They are funded by Government via scientific committees, first at the Academy, and later under the umbrella of the (Dutch) National Science Foundation (NWO). Logistic facilities are at NIOZ, but some University departments, the Leiden Natural History Museum and others also receive funding. From 1978 to 1993, many expeditions have been carried out onboard R.V. *Tyro*, a freighter, converted into a research vessel with containerized winches and laboratories. The navy vessel R.V *Tydeman* and the NIOZ vessel R.V. *Pelagia* are the present ocean-going fleet. The 67 m long *Pelagia* recently completed a multi-disciplinary program during a voyage around the African continent.

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PLANS FOR THE SEVENTH INTERNATIONAL CONGRESS OF HISTORY OF OCEANOGRAPHY

In August 2003, the VIIth International Congress of History of Oceanography (ICHO VII) is to be held in Kaliningrad, Russia. The Russian Academy of Sciences, the Ministry of Culture of the Russian Federation, and the Ministry of Industry, Science and Technology are the major Russian organizing institutions. The Commission of Oceanography of the International Union of History and Philosophy of Science has chosen the Museum of the World Ocean to be the host of ICHO VII.

The Organizing Committee is chaired by the Vice-President of the Russian Academy of Sciences Academician N.P. Lavyorov. It is the first time that a global-scale International Forum on the history of oceanography will be held in Russia. More than 300 scholars from all over the world will take part in sessions focused on the main theme of the Congress - "International Aspects of the History of Development of Marine Sciences".

Kaliningrad is a westernmost city of Russia, situated on the South-East Baltic. Its history is interesting and

impressive; its sights attract visitors' attention: a medieval Cathedral with Immanuel Kant's grave, a unique Museum of Amber, architectural and historical monuments of the past epochs.

The Museum of the World Ocean has become one of Kaliningrad's most prominent sights. The museum's main exhibit is the legendary research ship *Vityaz*, famous for the scientific discoveries made from on board the vessel, especially in the deep sea. In the near future a submarine, a scientific ship for space research, and a fishing trawler will be moored at the museum quay. *Vityaz* and the museum grounds house expositions on the history of oceanography and the nature of the ocean. In time for ICHO VII, a new museum building with a well-equipped conference hall will be built in the center of the city.

A meeting of the Organizing Committee is to be held in Moscow in October this year: the list of the Congress committee members and the ICHO VII program will be discussed and confirmed. The first call for papers is planned to be sent to the Congress participants in February/March 2001. People and institutions interested are welcome to forward their applications at the address of the Museum of the World Ocean:

Naberezhnaya Petra Velikogo, 1.
236006 Kaliningrad
RUSSIA
Applications may also be sent by e-mail to <postmaster@vitiaz.koenig.su>

THE PACIFIC AND BEYOND - PUBLICATION OF ICHO-V PAPERS

This long-awaited volume will soon be published by the University of Washington Press in Seattle.

Philip Rehbock and Keith Benson *Introduction*

I. The Scripps Heritage

Deborah Day: *Scripps Benefaction: The Role of the Scripps Family in the Founding of The Scripps Institution of Oceanography*. Fred N. Speiss: *Charles Kofoid's Role in Establishing the Scripps Institution of Oceanography*. Robert Marc Friedman: *Contexts for Constructing an Ocean Science: The Career of Harald Ulrik Sverdrup (1888-1957)*.

II. Pacific Remembrances

Walter H. Munk: *The Sverdrup Years: A Personal Recollection*. William A. Nierenberg: *Deep Sea Drilling-Lessons Learned*. Joseph L. Reid: *The NORPAC Expedition*. George G. Shor, Jr.: *The Development of Research Vessel Design*. Klaus Wyrtki: *Reflections on My Knowledge in the Indo-Pacific.*

III. Myth and Natural Knowledge of the Sea

Sherrie Lyons: *Sea Monsters: Myth or Genuine Relic of the Past*. Alan Eugene Davis: *Suggestions for Study of the Native Knowledge of Marine Animals In the Eastern Caroline Islands.*

IV. Exploration: The Pacific and Beyond

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Deborah Day: *Resources for the Study of Oceanography at the Archives of the Scripps Institution of Oceanography*. Pamela M. Henson: *Sources for the History of Oceanography at the Smithsonian Institution and the National Archives*. Christiane Groeben: *The Stazione Zoologica: A Clearing House for Marine Organisms.*

NEWS AND EVENTS

ICES CENTENARY HISTORY. Celebrations leading to the centenary of the world's oldest intergovernmental marine

science organization provided the occasion for a retrospective synthesis of the major scientific developments to which ICES has contributed. ICES, the International Council for the Exploration of the Sea, began investigating the northern European seas in 1902. One of several major events to mark its Centenary was the ICES History Symposium, held in August 2000. Almost one hundred people from eighteen countries gathered in Helsinki, Finland, for the event.

The Symposium focused on the key role ICES played over the past century in the fields of marine fisheries, hydrography, and environmental quality. Invited keynote speakers introduced twelve areas, including mariculture, fish migrations, the growing understanding of variability and its effect on the ecosystem, the development of the idea that fish form stocks, and quantification of fish population dynamics. Contributed papers and posters in each of these areas focused on particular individuals, controversies, institutional links, multi-disciplinary interactions, and socio-political contexts. As is often the case in history of marine and ocean sciences, many contributors were scientists with an interest in the history of their field. Many were, in fact, participants in the history which they, or others at the symposium, related. A number of professional historians of science also participated in the symposium, providing an opportunity for exchange of ideas and information between the two disciplinary groups. A festive reception at the Finnish House of Estates and the closing Symposium dinner brought old shipmates and colleagues together while also introducing them to representatives of the younger generation.

Papers from the Symposium will appear in a special issue of ICES Journal of Marine Science, slated for 2001.

SCIENCE-HISTORY PARTNERSHIP. In February 2000, marine scientists and historians from ten countries began forging a dynamic partnership to count the creatures in the sea, past and present. About two dozen scholars met in Esbjerg, Denmark, for the Workshop on the History of Marine Animal Populations (H-MAP). This long-term interdisciplinary project aims to increase understanding of marine ecosystem dynamics by investigating historical and environmental archives that reflect marine animal populations over the past 500 to 2000 years.

Workshop participants spent three intensive days discussing methodology for the study and tactics for integrating scientific and historical disciplines. Within small working groups they drafted preliminary proposals for case studies that promise to elucidate the marine animal population history for particular geographic regions or species. One group, for example, identified North Atlantic whale populations amenable to study due to the rich historical records on whaling activities in that ocean. Another group noted that comprehensive White and Barents Seas fisheries records stretch back to the 18th century, providing an opportunity to study these important ecosystems. Other proposed studies include: the beleaguered Newfoundland cod, the southeast Australian shelf and ecosystem, the North Sea ecosystem, and the Benguela boundary upwelling current system.

These and other proposed investigations form the contribution of H-MAP to a larger scientific project, the Census of Marine Life. This massive, global effort is planned as a decade-long program to assess and to explain the diversity, distribution, and abundance of marine life, as described in a recent issue of Oceanography. (Oceanography12:3, 1999).

One challenge to H-MAP, of particular interest to readers of this newsletter, is how best to integrate historians into the project. Most historians who attended the Workshop were maritime and fisheries historians, with a small representation from the history of science. Workshop discussions highlighted the need to incorporate environmental history of the marine environment. Historians of oceanography and marine sciences might well contribute such expertise.

H-MAP workshop discussions are summarized in a report describing the scope and direction of H-MAP, the final result of Phase 1 of the study (http://www.fimus.dk/hmaprepo.htm). Plans for Phase 2 are being developed; it will culminate in a workshop in April 2001 at which an 8 to 10-year implementation plan will be completed. For more information, contact Poul Holm (pho@hist.sdu.dk) or Tim Smith (tim.smith@noaa.gov).

COMMISSION ON METEOROLOGY OF THE DHS/IUHPS. A proposal to form a new historical commission, on the history of meteorology, has been approved by the International Union of History and Philosophy of Science. A formal inauguration ceremony and a symposium, tentatively titled "International Perspectives on the History of Meteorology: Science and Cultural Diversity" is proposed during the XXIst International Congress of the History of Science, which is being held in Mexico City in July 2001. For information on the new commission, contact Dr. James R. Fleming, Science, Technology & Society, Colby College, Waterville, Maine 04901-8858, USA. (jrflemin@colby.edu).

FROM THE PACIFIC TO THE ATLANTIC: OCEANS, PEOPLES, AND THE PURSUIT OF NATURAL KNOWLEDGE is the title of a symposium organized jointly by the Commission of Oceanography and the Pacific Circle, both commissions of the Division of History of Science, IUHPS. It will be held during ICHS-XXI in Mexico City in July 2001 (mentioned above), and includes papers on a variety of topics, including political issues in the marine sciences, instrument use in the Pacific, historical studies of marine scientists and programmes, colonialism and science, and histories of exploration and whale conservation. Information is available on the Congress website, <http://www.smhct.org>.

THE THIRD MATTHEW FONTAINE MAURY WORKSHOP ON HISTORY OF OCEAN SCIENCES will be held from 20 - 24 June 2001 at the Monterey Bay Aquarium Research Institute, Monterey, California, USA. The theme is "The Machine in Neptune's Garden: Historical Perspectives on Technology and the Marine Environment". Maury Workshops emphasize the history of oceanography within an American context but with reference to comparative international developments that shed light on the American experience. Participation is by invitation and is limited to historians whose studies elucidate the origins, development, and current status of marine science. For information contact one of: Dr. David K. van Keuren (Naval Research Laboratory - dvk@ccf.nrl.navy.mil); Dr. Gary E. Weir (Naval Historical Center - weir.gary@nhc.navy.mil); Dr. Keith Benson (University of Washington - krbenson@u.washington.edu).

MARITIME HISTORY JOURNAL SEEKING ARTICLES ON HISTORY OF PACIFIC OCEANOGRAPHY. *Mains'l Haul: A Journal of Pacific Maritime History,* published by the San Diego Maritime Museum, is planning an issue in 2001 on the history of scientific exploration in the Pacific. Articles of up to 3000 words should be submitted by March 1, 2001.The editor is Mark Allen and guidelines for authors as well as text of articles from previous issues is on the journal's website <http://www.sdmaritime.com/journal>.In addition to the request for this special issue, the journal accepts article throughout the year on all topics related to Pacific maritime history.

GENESIS OF SCIENTIFIC DISCIPLINES. The Deutsche Gesellschaft für Geschichte und Theorie der Biologie will hold its next annual meeting June 21-24, 2001 in the Freie Universität and the Museum of Natural History, Humboldt Universität, in Berlin. The main topic will be "Genese wissenschaftlicher Disziplinen," but unrelated contributions are welcome. Contact: Dr Christiane Groeben, Archives, Stazione Zoologica "Anton Dohrn," Villa Communale, I-80121, Napoli, Italy (groeben@alpha.szn.it).

CURRENT BIBLIOGRAPHY OF THE HISTORY OF OCEANOGRAPHY
(1999-2000, with additions from earlier years)

Deborah Day and International Collaborators

Allard, Dean C. 1999. A pioneering oceanic exploration: Spencer Baird in the Northeast Atlantic, 1871-1887. In: *North American Scientific Exploration to 1930*, edited by Edward C. Carter II. Philadelphia: American Philosophical Society, Memoirs of the American Philosophical Society 231: 119-130.

Allen, Garland E. 1999. Edmund Beecher Wilson letters at the Marine Biological Laboratory. *Mendel Newsletter* 8:16-19.

Bellotti, Evelina. 1995. Sul viaggio di Malaspina con la fregata Astrea: Il Ms. 584 del Museu Naval di Madrid. *Malaspina '93: Alessandro Malaspina e la sua spedizione scientifica 1789-1794*. Atti del Congresso internazionale nel bicentenario della massima impresa di Alessandro Malaspina…A cura di Blanca Saiz. Cadiz: Real Academic Hispano Americana; Mulazzo: Centro "Alessandro Malaspina," 1995.

Biblioteca Universitario di Napoli, ed. 2000. *I mari di Napoli. Mostra bibliographica documentaria e iconografica.* Roma: Instituo poligrafico e zecca dello stato, volume 1: 223; volume 2, CD-ROM. [In Italian.]

Bloom, Lisa. 1998. Science and writing: two national narratives of failure. In: *Inscribing Science: Scientific Texts and the Materiality of Communication,* Timothy Lenoir, ed. Stanford, California: Stanford University Press, 328-350. [Compares diaries of Peary, Scott and Stefansson in analysis of Arctic science.]

Bologa, Alexandru S. and Nicolae C. Papdopol. 1999. Evolution des moyens nautiques de recherche océanologique en Roumanie (1893-1966). I. Recherches sur la mer noire. *Travaux du Comité Roumain d'Histoire et de Philosophie des Sciences* 24: 165-176.

Bourgeois, Isabelle. 1999. La place des chercheurs Québcois francophones dans le développement des sciences

biomarines de l'estuaire et du golfe du Saint-Laurent entre 1920 et 1978. ***Dissertations Abstracts International*** **60: 230-A.**

Carter, Edward C., II. 1999. ***Surveying the record: North American scientific exploration to 1930.*** **Philadelphia: Memoirs of the American Philosophical Society 231: 344.**

Conroy, James W.H. 1999. The Scottish National Antarctic Expedition. ***Scottish Naturalist*** **111:159-182. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]**

Cosel, Rudo von. 1998. Mayor Lischke and the Japanese marine shells. A bio-bibliography of Carl Emil Lischke and a brief history of marine malacology in Japan with bibliography. ***J. Malacozool. Ass. Yamaguchi*** **6, no. 1: 7-50.**

Credland, Arthur G. 1999. Some notes on the development of cetology, popular interest in the whale tribe, and a famous literary whale. ***Scottish Naturalist*** **111:93-126. [Paper presented at Natural History and the sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]**

Cutter, Donald C. 1998. Malaspina and the shrinking Spanish lake. In: Margaret Lincoln, ed. ***Science and exploration in the Pacific: European voyages to the southern oceans in the 18th century*****. Woodbridge, UK.: Boydell Press in association with the National Maritime Museum, 73-80.**

Danforth, Susan. 1998. French interest in Benjamin Franklin's chart of the Gulf Stream. ***Imago et mensura mundi*****,177-189**

David, Andrew. 1995. Alessandro Malaspina's two visits to the Falkland Islands. ***Malaspina '93: Alessandro Malaspina e la sua spedizione scientifica 1789-1794*****. Atti del Congresso internazionale nel bicentenario della massima impresa di Alessandro Malaspina…A cura di Blanca Saiz. Cadiz: Real Academic Hispano Americana; Mulazzo: Centro "Alessandro Malaspina," 1995.**

Day, Deborah. 2000. Bergen west: Or how four Scandinavian geophysicists found a home in the new world. ***Historisch-Meereskundliches Jahrbuch*** **6: 69-82.**

Dietz, Dan. 1998. How did the Titanic sink? ***Mechanical Engineering*** **120: 54-58.**

Durant, Graham P. And George E. Farrow. 1999. On the rocks in the southern and Atlantic oceans - changing geological perspectives. ***Scottish Naturalist*** **111:127-136. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]**

Ellis, Richard. 1998. ***The search for the giant squid*****. New York: Lyons Press, ix, 322.**

Evans, N.J. 1998. Gentlemen and players in malacology: An appreciation of A.E. Boycott and H.E. Quick. ***Archives of Natural History*** **25: 389-399.**

Fantini, Bernardino. 2000. History of the Stazione Zoologica Anton Dohrn, An Outline. In: ***Stazione Zoologica Anton Dohrn Napoli, Activity Report 1998/1999*****. Naples: Printed at Arti Grafiche Solimene for Stazione Zoologica, 71-107. [In English.]**

Filliozat, Manonmani. 1994. D'Apres de Mannevillette, captain and hydrographer to the French East India Company (1707-1780). ***Indian Journal of History of Science*** **29: 329-42.**

Glassby, C.J. and G.B. Read. 1998. A chronological review of polychaete taxonomy in New Zealand. ***Journal of the Royal Society of New Zealand*** **28, no. 3: 347-374.**

Green-Musselman, Elizabeth. 1999. Science as a landed activity: scientifics and seaman aboard the U.S. Exploring Expedition. In: *North American scientific exploration to 1930*, edited by Edward C. Carter II. Philadelphia: American Philosophical Society, Memoirs of the American Philosophical Society, volume 231.

Hauser-Schublin and Gundolf Krüger, eds. 1998. *James Cook: Gifts and treasures from the South Seas: The Cook/Forster Collection, Göttingen.* Munich: Pnestel, 351.

Headland, Robert K. 1999. The natural history of Antarctica: The early voyages. *Scottish Naturalist* 111:9-36. [Paper presented at Natural History and the Sea: A Conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Hegarty, Neil. 1998. Unruly subjects: sexuality, science and discipline in eighteenth-century Pacific exploration. In: Margaret Lincoln, ed. *Science and exploration in the Pacific: European voyages to the southern oceans in the 18th century*. Woodbridge, UK.: Boydell Press in association with the National Maritime Museum, 183-197.

Henderson, Margaret. 1999. The Cold Spring Harbor Laboratory archives: something for everyone. *Mendel Newsletter* 8: 19-26.

Hennings, Ingo. 1999. Imaging of oceanic surface features on radar satellite scenes already indicated on Micronesian stick charts. *Historisch-Meereskundliches Jahrbuch* 6: 7-18.

Hossfeld, Uwe. 2000. Von statistischen Untersuchungen an "Pleuronectes platessa L." (Scholle) zum Kleinhirn der Knochenfische (Osteichtyes). *Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur Geschichte der Hydro- und Meeresbiologie*, 7-32.

Ifland, Peter. 1998. *Taking the stars: celestial navigation from argonauts to astronauts.* Newport News, Virginia: Mariner's Museum; Malabar, Florida: Krieger, xv, 222.

Jahn, Ilse. 2000. Die Humbold-Stipendien für Planktonforschung und die Haeckel-Hensen-Kontroverse (1881-1893). *Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur Geschichte der Hydro- und Meeresbiologie,* **47-60.**

Jones, Jean. 1999. Marine science in the correspondence of James Hutton and Joseph Black. *Scottish Naturalist* 111:157. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Lajus, Julia A. 2000. Zwischen Wissenschaft und Fischerei: Meeresforschung im Russischen Norden am Ende des 19. und im ersten Viertel des 20. Jahrhunderts. *Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur Geschichte der Hydro- und Meeresbiologie*, 61-73.

Landsberg, Hannelore. 2000. "Die wissenschaft wird streng und nuechtern richten…" (Carl Chun 1900) - 100 Jahre Deutsche Tiefsee-Expedition "Valdivia." *Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur Geschichte der Hydro- und Meeresbiologie*, 75-90.

Leipper, Dale. 2000. Letters of Oceanographers. *EOS* 81, no. 18: 198, 201.

Liao Chuqiang. 2000. The impact of Zhenghe's sea voyage on Southeast Asia. *Zheng He Study* 1: 2-5. [In Chinese.]

Littlewood, Kevin and Beverley Butler. 1998. *Of ships and stars: maritime heritage and the founding of the National Maritime Museum Greenwich.* London/New Brunswick, NJ: Athlone Press, xiv, 275. [Forward by The Duke of Edinburgh.]

Liu Guoan. 1999. Contributions to the understanding of ocean in ancient China. *Maritime culture studies in China* 1:54-62. [In Chinese.]

***Malaspina '93: Alessandro Malaspina e la sua spedizione scientifica 1789-1794*. Atti del Congresso internazionale nel bicentenario della massima impresa di Alessandro Malaspina…A cura di Blanca Saiz. Cadiz: Real Academic Hispano Americana; Mulazzo: Centro "Alessandro Malaspina," 1995.**

Marsden, Rosalind R.G. 1999. The Discovery Committee-motivation, means and achievements. *Scottish Naturalist* 111:69-92. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Martín del Castillo, Francisco. 1997. Una idea frustrada: El Laboratorio Oceanográfico de Canarias (1927-1935). *Llull* 20: 161-172.

Martinez, José Ramon Garcia. 1995. El viaje de circumnavegacion de la corbeta de S.M.C. Ferrolana (1849-1852): Estadas practicadas en El Callao y Guayaquil. *Malaspina '93: Alessandro Malaspina e la sua spedizione scientifica 1789-1794*. Atti del Congresso internazionale nel bicentenario della massima impresa di Alessandro Malaspina…A cura di Blanca Saiz. Cadiz: Real Academic Hispano Americana; Mulazzo: Centro "alessandro Malaspina," 1995.

Mizogushi, Hazime. 1998. Japanese biologists at the Naples Zoological Station, 1887-1956. *Historia Scientiarum* 8: 99-113.

McCosker, John E. 1999. *The history of Steinhart Aquarium: A very fishy tale.* Foreword by Gary Larson. Virginia Beach, VA: The Donning Company, 1999, 160pp.

Mizoguchi, Hazime. 1998. Japanese biologists at the Naples Zoological Station, 1887-1956. *Historia Scientiarum* 8: 99-113.

Montel, Nathalie. 1998. Établir la vérité scientifique au XIXe siècle: La controverse sur la différence de niveau des deux mers (1799-1869). Genèses 32: 86-109.

Moriarty, Christopher. 1997. Fish and fisheries. In: *Nature in Ireland: a scientific and cultural history*, edited by John Wilson Foster and Helena C.G. Chesney. Montreal: McGill-Queen's University Press, xii, 658.

Morrison-Low, A.D. 1999. Marine sampling and collecting equipment in the collections of the national museum of Scotland. *Scottish Naturalist* 111:137-155. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Munro, David M. 1999. Naturalists at work: The photographic archives of the Scotia Voyage. *Scottish Naturalist* 111:183-195. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Musselman, Elizabeth Green. 1999. Science as a landed activity: scientifics and seamen aboard the U.S. Exploring Expedition. In: *North American Scientific Exploration to 1930*, edited by Edward C. Carter II. Philadelphia: American Philosophical Society, Memoirs of the American Philosophical Society 231: 77-101.

Nakano, Eizo, Hajime Mizoguchi, Yokio Yokota, editors. 1999. *A history of Japanese scientists at the Naples Zoological Station*. Tokai University Press, xiiii, 251. [In Japanese.]

Neushul, Peter and Lawrence Badash. 1998. Harvesting the Pacific: The blue revolution in China and the Philippines. *Osiris* 13: 186-209.

Neushul, Peter and Zuoyue Wang. 2000. Between the devil and the deep sea: C.K. Tseng, mariculture, and the

politics of science in China. *Isis* 91, no. 1: 59-88.

Nornvall, Fredrik. 1999. Reasons for marine science: arguments for hydrographic research in Sweden. *Historisch-Meereskundliches Jahrbuch* 6: 35-58.

Orchiston, Wayne. 1998. From the south seas to the sun: The astronomy of Cook's Voyages. In: Margaret Lincoln, ed. *Science and exploration in the Pacific: European voyages to the southern oceans in the 18th century*. Woodbridge, UK.: Boydell Press in association with the National Maritime Museum, 55-71.

Oreskes, Naomi. 2000. Laissez-tomber: Military patronage and women's work in the mid 20th century oceanography. *Historical Studies in the Physical and Biological Sciences* 30, part 2: 373-392.

Oreskes, Naomi and Roland Rainger. 2000. Science and security before the atomic bomb: the loyalty case of Harald U. Sverdrup. *Studies in the History and Philosophy of Modern Physics* 31, no. 3, 309-369.

Palmieri, Paolo. 1998. Re-examining Galileo's theory of tides. *Archive for History of Exact Sciences* 53: 223-375.

Parsons, Timothy R. and Humitake Seki. 1995. A historical perspective of the biological studies in the ocean. *Aquatic Living Resources* 8: 113-122.

Peng Zhaorong. 1999. "Red-haired alien": A value-added version of pictographs-the image of "alien from aborad." *Maritime culture studies in China* 1: 101-106. [In Chinese.]

Portolés, Carmen Magallón. 1999. *Pioneras Españolas en las ciencias: las mujeres del Instituto Nacional de Física y Química*. Madrid: Consejo Superior de Investigaciones Cientificas, Estudios Sobre la Ciencia 24, 406 pages.

Pyenson, Lewis R. 1998. The prestige of pure research: Naval support of science in the Dutch East Indies, 1840-1940. In Paul C. van Royen, et al., eds. *Frutta di mare: Evolution and revolution in the maritime wold in the 19th and 20th centuries.* Amsterdam: Batavian Lion International, 29-37.

Rainger, Ronald. 2000. Science at the crossroads: The Navy, Bikini Atoll, and American oceanography in the 1940's. *Historical Studies in the Physical and Biological Sciences* 30, no. 2, 349-371.

Ramón, Juan Bautista Bru de. 1996. *El atlás zoológico, el megaterio y las Técnicas de Pesca Valencianas, 1742-1799*, edited by José M. López. Valencia: Ayuntamiento de Valencia, 348pp.

Rennie, Neil. 1998. The Point Venus 'scene.' In: Margaret Lincoln, ed. *Science and exploration in the Pacific: European voyages to the southern oceans in the 18th century*. Woodbridge, UK.: Boydell Press in association with the National Maritime Museum, 135-146.

Richardson, W. A. R. 1992. Cartographical clues to three sixteenth-century shipwrecks in the Indian Ocean. *Great Circle: Journal of the Australian Association for Maritime History* 14, no. 1: 1-20

Rozwadowski, Helen M. 2000. Marine science in the age of internationalism. *Historisch-Meereskundliches Jahrbuch* 6:83-105.

Savours, Ann. 1999. The natural history of the Discovery's Antarctic voyages, 1901-1931. *Scottish Naturalist* 111: 37-68. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Scarce, Rik. 2000. Fishy business: salmon, biology, and the social construction of nature. Philadelphia: Temple University Press, Animals, Culture, and Society, xii, 236 pages.

Smed, Jens. 2000. The accession of Belgium to ICES. *ICES/CIEM Information,* number 36: 5-6.

Solemdal, Per. 1997. *The three cavaliers.* A discussion from the Golden Age of Norwegian marine science. In: *Early life history and recruitment in fish populations,* edited by R.C. Chambers & E.L. Trippel. London: Chapman & Hall, 551-565.

Speak, Peter. 1999. Bruce and the Arctic. *Scottish Naturalist* 111:197-206. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Swinney, Geoffrey N. 1999. A natural history collection in transition: Wyville Thomson and the relationship between the University of Edinburgh and the Edinburgh Museum of Science and Art. *Journal of the History of Collections* 11: 51-70.

Taylor, Joseph E., III. 1998. Making salmon: the political economy of fishery science and the road not taken. *Journal of the History of Biology* 31: 33-59.

Tendal, O. 2000. A little known picture of HMS 'Bulldog,' full of historical atmosphere. *Deep-Sea Newsletter* 29: 15-16.

Trigo, José M. Cano. 1995. La cartografia procedente de la Expedicion Malaspina. *Malaspina '93: Alessandro Malaspina e la sua spedizione scientifica 1789-1794*. Atti del Congresso internazionale nel bicentenario della massima impresa di Alessandro Malaspina…A cura di Blanca Saiz. Cadiz: Real Academic Hispano Americana; Mulazzo: Centro "Alessandro Malaspina," 1995.

Turnbull, David. 1998. Cook and Tupaia, a tale of cartographic reconnaissance? In: Margaret Lincoln, ed. *Science and exploration in the Pacific: European voyages to the southern oceans in the 18th century*. Woodbridge, UK.: Boydell Press in association with the National Maritime Museum, 117-1132.

Ulrich, J. And Jens Smed. 2000. The correspondence between Fridtjof Nansen and Otto Krümmel during the years 1899 to 1911. *Historisch-Meereskundliches Jahrbuch* 6: 59-68.

Vlahakis, G.N. 1999. *Oceanography in Greece, 18th - 20th centuries; Pictures from a journey in Greek seas, pictures from a journey in time.* Athens: Ion Publishers, 212p. [In Greek]

Wang Jianqing. 2000. On Zhenghe's purpose of his sea voyage. *Zheng He Study* 1: 11-13. [In Chinese.]

Wang Ying. 1999. *The records of Chinese marine geography, recollections of Chinese geography in 90 Years*. Xueyuan Press. [In Chinese.]

Wang, Zuoyue. 1997. Responding to 'Silent Spring': scientists, popular science, communication and environmental policy in the Kennedy years. *Science Communication* 19: 141-163.

Wei Meichang. 1999. Macao and its maritime culture. *Maritime culture studies in China* 1: 107-111. [In Chinese.]

Woodworth, Philip L. 1999. *A study of changes in high water levels and tides at Liverpool during the last two hundred and thirty years with some historical background.* Natural Environment Research Council. Birkenhead, Merseyside, U.K.: Bidston Observatory, Proudman Oceanographic Laboratory Report No. 56.

Wolff, Torben. 2000. The apparatus and equipment in the Monaco Oceanographic Museum. *Deep-Sea Newsletter* 29: 17.

Zheng Jinggao. 1999. Ocean and the rising of European civilization. *Maritime culture studies in China* 1: 48-53.
Zheng Yaoguang. 1999. *Recollections of marine economic geography, recollections of Chinese geography in 90 Years*. Xueyuan Press. [In Chinese.]

Zheng, Yijun. 1999. The maritime strategies and characteristics during the period of Zheng He's voyages. *Maritime culture studies in China* 1: 74-79. [In Chinese.]

BIOGRAPHIES

Baer, Karl Ernst von
Tammiksaar, Erki. 2000. Karl Ernst von Baer als Meeresbiologe. *Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur Geschichte der Hydro- und Meeresbiologie*, 111-117.

Banks, Joseph (1743-1820)
Gascoigne, John. 1998. Joseph Banks and the expansion of empire. In: Margaret Lincoln, ed. *Science and exploration in the Pacific: European voyages to the southern oceans in the 18th century*. Woodbridge, UK.: Boydell Press in association with the National Maritime Museum, 39-51.

Carson, Rachel Louise (27.V.1907, Springdale, Pennsylvania-14.IV.1964, Silver Spring, Maryland)
Carson, Rachel.1998. Lost woods: the discovered writing of Rachel Carson. Boston: Beacon Press, xiv, 267. [Edited and with an introduction by Linda Lear].

Lear, Linda J. 1997. *Rachel Carson: witness for nature*. New York: Holt, 634 pages.

Raglon, Rebecca. 1997. Rachel Carson and her legacy. In: *Natural eloquence: women reinscribe science*, edited by Barbara T. Gates and Ann B. Shteir. Madison: University of Wisconsin Press, 196-211.

Walker, Martin J. 1999. The unquiet voice of "Silent Spring': the legacy of Rachel Carson. *Ecologist* 29, no. 5: 322-325.

Wang, Zuoyue. 1997. Responding to Silent Spring: scientists, popular science communication, and environmental policy in the Kennedy years. *Science Communication* 19: 141-163.

Chun, Carl (1852.X.1-1914.IV.11)
Landsberg, Hannelore. 2000. Die Wissenschaft wird streng und nuechtern richten…(Carl Chun 1900) - 100 Jahre Deutsche Tiefsee-Expedition "Valdivia." *Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur Geschichte der Hydro- und Meeresbiologie*, 75-90.

Cousteau, Jacques-Yves (11.VI.1910, Saint-André-de-Cubzak-25.VI.1997)
Paccalet, Yves. 1997. *Jacques-Yves Cousteau dans l'océan de la vie: biographie*. Paris: Lattès, 547 pages.

Dietz, Robert Sinclair (14.IX.1914, Westfield, New Jersey-26.V.1995, Tempe, Arizona)
Bourgeois, Joanne and Steven Koppes. 1998. Robert S. Dietz and the recognition of impact structures on earth. *Earth Sciences History* 17, no. 2:139-156.

Edgerton, Harold Eugene (6.IV.1903, Fremont, Nebraska - 4.I.1990, Cambridge, Massachusetts)
Bedi, Joyce E. 1997. The man who stopped time. *American Heritage of Invention and Technology* 13, no. 1: 34-41.

Fischer, Gustav
Schmidt, Isolde. 200. Die Rolle des Gustav Fischer Verlages bei der Herausgabe von Ergebnissen der Deutschen

Tiefsee-Expedition und anderer bahnbrechender naturwissenschaftlicher Werke. ***Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur Geschichte der Hydro- und Meeresbiologie,* 99-109.**

Frosch-Regen
Michel, Paul. 1998. Frosch-Regen: Meteorologie, Exegese, Ikonographie. *Daphnis: Zeitschrift für Mittlere Deutsche Literature* 27: 203-229.

Humboldt, Friedrich Wilhelm Heinrich Alexander von (14.IX.1769, Berlin-6.V.1859, Berlin)
Alexander von Humboldt: Bicentenario del viaje americano, 1799-1804. *Humboldt* 126: 1-109. [Entire issue on this subject.]

Holl, Frank, ed. 1997. *Alejandro de Humboldt en Mexico*. Mexico: Instituto Nacional de Antropologia et Historia; Instituto Goethe, 217.

Osterhammel, Jürgen. 1999. Alexander von Humboldt: Historiker der Gesellschaft, Historiker der Natur. *Archiv für Kulturgeschichte* 81:105-131.

Huxley, Thomas Henry
Lyons, Sherrie I. 1999. *Thomas Henry Huxley: The Evolution of a Scientist*. Amherst, NY: Prometheus Books, 347p.

Jones, Frederic Wood
Christophers, Barry E. 1995. Frederic Wood Jones: coral and atolls. *Australian and New Zealand Journal of Surgery* 65, no. 10: 749-760.

Kändler, Rudolf (11.12.1899, Waldhein, Sachsen, German-12.3.1993, Stuttgart)
Hempel, G. 1970. Professor Dr. Rudolf Kändler zum siebzigsten Geburtstag. *Ber. Dt. Wiss. Komm. Meeresforsch.* (NF) 21: 16-26.

Hempel, G. and K. Tiews. 1980. Prof. Dr. Rudolf Kändler 80 Nahre. *Jahresbericht Institut für Meereskunde Kiel für 1979*: 5-9.

Nellen, W. 1994. Rudolf Kändler 11.12.1899-12.3.1993. *Arch. Fisch. Mar Res*. 1995-1997.

Rumohr, Heye. 2000. Interview mit Prof. Rudolf Kändler (1899-1993) anläßlich seines 85. Geburtstages. *Historisch-Meereskundliches Jahrbuch* 6: 105-120.

Kane, Elisha Kent (3.II.1820, Philadelphia, Pennsylvania-16.II.1857, Havana, Cuba)
Joyce, Barry Alan. 1999. Elisha Kent Kane and the Eskimo of Etah 1853, 1854, 1855. In**: *North American scientific exploration to 1930*, edited by Edward C. Carter II. Philadelphia: American Philosophical Society, Memoirs of the American Philosophical Society 231: 103-117.**

Kofoid, Charles Atwood (11.X.1865, Granville, Illinois-30.V.1947, Berkeley, California)
Taylor, F.J.R. "Max". 1999. Charles Atwood Kofoid and his dinoflagellate tabulation system: an appraisal and evaluation of the phylogenetic value of tabulation. *Protist* 150: 213-220.

Loeb, Jacques (1859-1924)
Rasmussen, Charles and Rick Tilman. 1998. *Jacques Loeb: His Science and Social Activism and their Philosophical Foundations.* Philadelphia: American Philosophical Society, Memoirs of the American Philosophical Society 229, xiii, 176 pages.

M'Intosh, William Carmichael
Gunther, A.E. 1977. *The life of William Carmichael M'Intosh, M.D., F.R.S. of St. Andrews 1838-1931. A pioneer in marine biology*. St. Andrews University Publications, no. LXI .

Möller, Sophie Carlotte Juliane (17.6.1893, Koblenz, Germany-22.6.1973, Göttingen)
Brosin, Hans-Jürgen. 1999. Lotte Möller (1893-1973) und die gewässerkundlichen Arbeiten am Institut für Meereskunde Berlin. *Historisch-Meereskundliches Jahrbuch* 6: 19-34.

Murray, John (3.III. 1841, Coburg, Ontario, Canada- 16.III. 1914,Kirkliston, Scotland)
Deacon, Margaret B. 1999. A grounding in science? John Murray of the Challenger, his grandfather John Macfarlane, and the Macfarlane Museum of Natural History at Bridge of Allan. *Scottish Naturalist* 111: 225-265

Pettersson, Sverre (19.II.1898, Hadsel, Norway-31.XII.1974, London)
Phillips, Norman. 1999. Sverre Petterssen's autobiography. *Bulletin of the American Meteorological Society* 80, no. 7: 1433.

Schultze, Max (1825-1874)
Lorenzen, Harald. 2000. Max Schultze (1825-1874), Zoologe und Zellbiologe - Freuden und Leiden am Mittelmeerstrand. *Verhandlungen zur Geschichte und Theorie der Biologie, Band 5: Berichte zur geschichte der Hydro- und Meeresbiologie*, 91-98.

Siedler, Gerold (16.VIII.1933-)
Zenk, W.R., R. Peterson and J. Lutjeharms. 1999. Preface. Gerold Siedler. *Deep-Sea Research* 2, no. 46: 1-7.

Solander, Daniel (1733-1782)
Duyker, Edward. 1998. *Nature's argonaut: Daniel Solander, 1733-1782, naturalist and voyager with Cook and Banks.* Melbourne: Miegunyah Press, Melbourne University Press, 380.

Spilhaus, Athelstan (25.XI.1911, Cape Town, South Africa-30.III.1998, Middleburg, Virginia, USA)
Nierenberg, William A. 2000. Athelstan Spilhaus. Proceedings of the American Philosophical Society 144, No. 3: 344-347.

Stewart, Harris B. Jr. (18.VI.1922, Auburn, New York-25.IV.2000, Naples, Florida)
Stewart, Harris B. 1997. *The unpredictable mistress : intimate glimpses of an oceanographer's longtime affair with the sea*. Flagstaff, Arizona: Best Pub. Co., **xvii, 220.**

Thomson, Charles Wyville (5.III. 1830, Bonsyde, Scotland- 10.III. 1881, Bonsyde)
Swinney, Geoffrey N. 19987. Wyville Thomson, Challenger, and the Edinburgh Museum of Science and Art. *Scottish Naturalist* 111:207-224. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Thompson, D'Arcy Wentworth
Taylor, Michael A. 1999. D'Arcy Thompson, Alexander Rodger, and the second Bering Sea voyage of 1897. *Scottish Naturalist* 111:127-136. [Paper presented at Natural History and the Sea: A conference of the Society for the History of Natural History, Discovery Point, Dundee, 26-27 September 1997.]

Wegener, Alfred Lothar (1880-1930)
Greene, Mott T. 1998. Alfred Wegener and the origin of lunar craters. *Earth Sciences History* 17, no 2: 111-138.

Schroder, Wilfried. 1999. Wegener's work included studies of noctilucent clouds, auroras. *EOS: Transactions of the American Geophysical Society* 80, no. 32 (August 10, 1999): 357, 361.

Wilson, Mildred Stratton (1909-1973)
Damkaer, D. 1998. Mildred Stratton Wilson, copepodologist (1909-1973). *Journal of Crustacean Biology* 8, no. 1: 131-146.

Wolfenden, Richard Norris (18.I.1854, Bolton, Lancashire, England-18.VIII.1926, Grimsby, Ontario, Canada)
Damkaer, D. 2000. Determination and enthusiasm: Richard Norris Wolfenden (1854-1926), his *Plankton Studies*

and other things oceanographical. *Archives of Natural History* 27, no. 2: 209-229.

Yonge, Charles Maurice, Sir (9.XII.1899, Wakefield, Yorkshire - 17.III.1986, Edinburgh)
Morton, Brian. 1998. Charles Maurice Yonge (1899-1986). *Archives of Natural History* 25: 431-448.