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Editor of Newsletter

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EDITORIAL - The uses of centuries

Frequent readers of this column (are there any?) will recognize that I often look back a century as a way of surveying the history of oceanography and of highlighting some little-known but important events that seem to me to have had long-term significance. This preoccupation is one I have copied from my friend and colleague Jacqueline Carpine-Lancre, whose habit it was to look back into the century-old past of that great figure Albert 1er, Prince of Monaco, and to present aspects of the Prince's work one hundred years earlier to the modern audiences who came to Albert's Musée océanographique in Monaco.

Centuries may have a certain neatness as historical units, and the convenience of the decimal system, but they have little or no historiographic significance. One could choose any unit of time sufficiently long to allow historical forces to emerge from the woodwork of historical events. So with trepidation I once again look into the past a century ago, although with a certain malice aforethought, for of course it was in 1902 that the International Council for the Exploration of the Sea formally came into being. Perhaps the fact that it is one of the very few international scientific organizations still in existence after a century that gives it prominence. That birthday will be celebrated this year by an international scientific symposium in Copenhagen (the historical commemoration was held in Helsinki two years ago). More important to us as historians of science, the founding of ICES has been well reported and interpreted historically in print. First, there is the lead article in this issue of *History of Oceanography* by Helen Rozwadowski, a substantial contribution evaluating the significance of ICES. And then there is Dr Rozwadowski's new book, *The Sea Knows No Boundaries. A Century of Marine Science under ICES*, which is mentioned in detail later in this newsletter. The inauguration of ICES does dominate 1902, but what else was going on?

In Germany, the results of the *Valdivia* expedition, which under the Leipzig zoologist Carl Chun had gone to the South Atlantic in 1898-1899 to investigate the distribution of deep-sea animals, were beginning to appear. Gerhard Schott of the Deutsche Seewarte was the token physical oceanographer aboard. His monograph on the physical results, based on the first extensive new data from the deep-sea since *Challenger*, showed that the deep circulation of the Atlantic was a symmetrical two-celled one (as Schott saw it), just as Emil von Lenz had suggested more than half a century earlier. A world away in more than one sense, on the great plains of the United States, George F. McEwen, a young farm boy was studying civil engineering at Iowa State University. Six years later he was to call himself the first physical oceanographer in the United States, when he joined the staff of the laboratory that later became the Scripps Institution of Oceanography. While McEwen was studying in Iowa, the Berkeley zoologist W.E. Ritter was searching the California coast in 1902 for the right location for a marine station. He found it in 1903, in San Diego, an event that will be celebrated next year at the Scripps Institution of Oceanography , and, no doubt, mentioned extensively in the next issue of *History of Oceanography*. And in Norway, the young biologist Haakon Hasberg Gran (1870-1955) was putting the finishing touches to his doctoral thesis at Oslo, with the weighty title "Das Plankton des norwegischen Nordmeeres von biologischen und hydrographischen Gesischtspunkten behandelt."

This brings us back, indirectly, to ICES, for, to his good fortune, Gran was the beneficiary of some empire building by the distinguished Norwegian fisheries biologist Johan Hjort, one of the fathers of ICES. The new research vessel *Michael Sars* came into service in 1900, serving the demand by Hjort that the basis of fisheries should be examined from the standpoint of modern biology and physical oceanography. It later fitted neatly into the regular series of seasonal cruises carried out by the ICES nations. Gran, who had studied plant physiology with Wilhelm Pfeffer in Leipzig and bacteriology with Martinus Beijerinck in Delft and Texel, was appointed to examine the marine plants (phytoplankton in later terminology) from the early *Michael Sars* cruises. Although the German botanist Franz Schutt had noted a decade before that there was a close resemblance between the appearance of phytoplankton species in the sea in spring and the spring growth of plants on land, it was Gran in 1902 who coined the term "bloom" for the phenomenon, noting that there was a regular annual growth of diatoms in March-April (then again in the autumn) off the Norwegian coast. The problem was its causation, for as Gran noted, "such a universal phenomenon ... must have universal causes."

It took a further thirty years to develop Gran's early insights into a fully developed theory of plankton dynamics. Nonetheless, the combination in 1902 of a broadly-trained, unorthodox young biologist with the means for his work - a modern ship intended for contributions to an international research programme - had consequences that could not have been foreseen, and were certainly not *intended* by Gran and Hjort. This union makes 1902 of unusual significance for the history of oceanography, and forces me to acknowledge that centuries can have uses after all, if only to casual essayists on the history of oceanography.

Eric Mills

IN MEMORIAM: PHILIP F. (FRITZ) REHBOCK, 1943-2002

Our friend, close colleague and Vice-President of the Commission of Oceanography, Fritz Rehbock died in Honolulu on February 2. He was born in Seattle, was an undergraduate at Stanford, spent time in the United States Navy, and returned to academia in 1970. At John's Hopkins he worked on early 19th century philosophies of biology, and was awarded a Ph.D. in 1975. Fritz joined the University of Hawaii that year, first as member of the General Science Department, then in the History Department, and rose through the ranks to become a full Professor in 1992. His first book, *The Philosophical Naturalists* (1983), broke new ground in showing the complexity of early 19th century British biological thought and its relationship to several different kinds of idealistic thought. His second, *At Sea with the Scientifics: the* Challenger *Letters of Joseph Matkin*, took an entirely new look at the *Challenger* Expedition from the viewpoint of a non-scientific participant. He also co-edited with Roy MacLeod two important volumes on the history of science in the Pacific. Fritz served two historical scientific commissions of the Division of History of Science, the Pacific Circle, and the Commission of Oceanography, with great distinction. Most of all, he was a wise and humane person, full of humour as well as good sense.

This memorial to Fritz Rehbock could give many more details of his life and accomplishments. But it seems a greater tribute to give examples of his influence on his friends. My career was influenced greatly by him, and I know that is true of many others. We of the Commission of Oceanography would like to have our friend remembered in this way.

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***It seems odd that I can't remember when I first met Fritz. It seems that he has always been around in my professional life, as colleague and friend. But I think that we first met at the Third International Congress on the History of Oceanography in Woods Hole in 1980. I remember well the paper he gave, "The Victorian aquarium in ecological and social perspective," a perfectly-composed vignette of Victorian science. We talked a lot, and ended up on the same early morning bus leaving Falmouth for Boston and the airport. I was newly full of ideas about 19th century biology, having just found my way from the history of systematic biology and its clergyman-practitioners into broader topics in British biology. I had problems - the strange and unfamiliar ideas that one encountered in the writings of the Manx-Scottish naturalist Edward Forbes, who had stimulated so much biological work in the first half of the century but had been derided by Darwin. Fritz knew what I had to know, for his book* The Philosophical Naturalists *was making its way into print. All the way to Boston we talked about the "philosophical biology" that had dominated the first decades of the 19th century - or, more accurately, Fritz talked and I listened with a sense of wonder and enlightenment that has never left me. A light came on as a result of his knowledge and enthusiasm that still illuminates my work* (Eric Mills)**

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Fritz Rehbock was the first historian of science I ever met, and the encounter has had a lasting impression. In 1973, as a young graduate student in history, I spent several months doing master's research in England. At the time I had few acquaintances in England, was not affiliated with any British institution, and spent my days working in the library of the British Museum. One afternoon, as a diversion, I decided to go the library of the Royal Society of London. There I met Fritz, a graduate student at Johns Hopkins who was spending the summer in London doing dissertation research. We spoke briefly and I mentioned that after completing my research, and a master's thesis at the University of Utah, I hoped to continue graduate work in history of science. Fritz's

comments were encouraging. He told me to stay in touch and mentioned that if I ever got to a History of Science Society meeting he would introduce me to people in the field. Later that year, at the annual meeting in December (meetings at that time were held during Christmas break) I ran into Fritz again, and true to his word he introduced me to Bill Coleman, Fred Churchill, and several graduate students in the Hopkins program. Fritz's efforts were more than an act of kindness; they had a profound impact on my decision to go to Indiana and pursue graduate work in the history of the biological sciences.

In subsequent years I saw Fritz only infrequently. As a graduate student I had few opportunities to attend national meetings, and Fritz, now a professor at the University of Hawaii, did not attend meetings on a yearly basis. But in 1983 we met again, and in addition to reminiscing about our time in London, we now discussed important, exciting work going on the field. Fritz had just finished his first book, **The Philosophical Naturalists**, *and was riding high. So was I, since I had just had written a review of the book. We spoke at length of Victorian science, Fritz's fascination with Edward Forbes, nineteenth-century dredging, and his current interest in the* **Challenger** *expedition.*

On other occasions we met at professional meetings, but one in particular stands out. In 1994 Jane Maienschein and I organized a workshop on extinction for the Dibner Summer Seminar in the History of Biology, and was Fritz was one of the participants. The seminar lasted an entire week, providing many opportunities for socializing and exploring important issues in history of science. At the time I was finishing up work on the history of paleontology and considering other topics of investigation. Earlier that year an opportunity to do some research at the Scripps Institution of Oceanography raised some intriguing possibilities, but I was uncertain about pursuing them. Mid twentieth-century oceanography was a far cry from my previous work on late nineteenth-century paleontology and evolutionary theory, and I spoke with Fritz of my concerns about moving into such a different field and time period. Again he was encouraging, emphasizing the opportunities in the field and the excellent resources at Scripps. A gathering some years later at the first Maury Workshop on the History of Oceanography at Woods Hole, provided me with the opportunity to publicly thank Fritz for his encouragement and acknowledge the important impact he had on my work.

The last time I saw Fritz was at the 2000 History of Science Society meeting in Vancouver. We had been corresponding for several months about the possibility of my taking over as treasurer of the Pacific Science Circle, and Vancouver enabled us to discuss the matter in detail. As one of the founders of that organization, Fritz was eager to get additional historians of science involved, and after speaking passionately about the Circle and its objectives, and making some kind comments about similar work I had done for other organizations, I was persuaded. We then adjourned to a lunch time session, sponsored by the Circle, on museums, colonization, and the Pacific world. At the time I had no idea that Fritz was ill, and he made no mention of his bout with cancer, so it was with great surprise and great sorrow that I learned of his death earlier this year. To me that last meeting highlights many of Fritz's admirable qualities: speaking enthusiastically of his own interests and activities; always asking about and encouraging other people; and heading off to a session of papers to learn more about new and exciting work in the history of science. This semester, as I teach a new course on the history of natural history, I recall with great fondness our conversations on mid nineteenth-century dredging, aquariums, and oceanic expeditions, and only wish that I had Fritz's new novel by my side, or that I could call on him for his insight and passion. Fritz's generosity, enthusiasm, and knowledge touched the lives of many people, and in my case had a profound impact on my life and career. He will be sorely missed.

(Ron Rainger)

SCIENTIFIC RESEARCH, MANAGEMENT ADVICE: EVOLUTION OF ICES'S DUAL IDENTITY

[Editorial note: this paper by Dr Helen Rozwadowski was delivered on June 17 at the Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada, as part of the celebration of the 40th anniversary of BIO. Dr Rozwadowski agreed to have it printed here, where it serves as a contribution to the centenary of the International Council for the Exploration of the Sea (ICES)]

Introduction Many marine scientists I met as I conducted research in ICES member countries had critical things to say about the state of government science today. Some worried about insufficient funding for so-called 'basic' science relative to investigations that support management advice. Others worried about negative effects of the shift from direct funding of government laboratories to project funding. Although today's political and economic climate is, of course, distinctive, such concerns are not new. Indeed, one way to frame the history of any scientific institution, including the International Council for the Exploration of the Sea (ICES), is through tensions between the pursuit of new scientific knowledge and the uses intended for that knowledge.

ICES has throughout its history provided a forum for many important advances in fisheries science and other branches of marine science, including oceanography. Yet ICES's identity is broader than a purely academic institution would be, encompassing from its founding a practical mission alongside its scientific goals. Promotion of rational exploitation of the sea's resources was an ideal embraced by ICES founders. Indeed, ICES scientists felt keenly the responsibility to take a proactive role in both fisheries' *promotion* and *regulation.*

This paper examines the evolution of the dual nature of this institution. I begin by explaining how ICES's dual identity dates from its founding. Then, I consider fisheries science under ICES and how ICES remained committed to active involvement in international regulation, particularly for the heavily exploited North Sea fisheries. Third, I look at Council efforts to pursue combined hydrographic and biological investigations whose results were intended to promote fisheries, especially arctic and other open sea fisheries. In conclusion, I briefly mention ICES's pursuit of environmental science starting in the 1960s, emphasizing that Council leaders pursued an advisory role in this area in tandem with development of the science. Although ICES's advisory role has changed over time, the organization has consistantly valued both the production new scientific knowledge about the sea and the role of guiding societal application of that knowledge to maximize marine resource use.

ICES's dual role dates from its founding The story of ICES founding has been told with several different emphases. Those who understanding ICES as primarily a fisheries science institution stress the pressing concerns about overfishing that appeared in many European nations toward the end of the 19th century. Those more interested in oceanography note that Otto Pettersson's synoptic hydrographic investigations set in motion international efforts to organize the body that became ICES. Both interpretations, of course, contain elements of truth.

There is no question that Pettersson's vision of cooperative international hydrography inspired scientists in several countries to work together to wrest knowledge from the sea. Pettersson's vision, which drew upon precedents in meteorology and geophysics, rendered obsolete the tradition of great voyages exemplfied by the British *Challenger* and the German *Gazelle* in the 1870s. On the other hand, Pettersson himself was profoundly motivated by the peculiarly Scandinavian notion, not much embraced by scientists in other countries, that studying

the ocean's currents would help to solve the mysteries of fisheries fluctuations. The example that motivated Pettersson was the infamous Bohuslän herring fishery, which suddenly reappeared off the Swedish Skaggerak coast in 1878 for the first time since 1810. He and other Scandinavian scientists hoped that synoptic hydrographic observations would enable the linkage of hydrographic features to the appearance and disappearance of fish.

Not all scientists concurred with Pettersson's vision, but ICES founders agreed that both hydrographic and biological investigations must be part of the international research program they formulated. Like hydrographers, biologists recognized advantages to international collaboration, including the collection of accurate catch statistics and the possibility of surveying areas of the sea not sampled by the fisheries. There was a big difference, though, between the interest of scientists in banding together and the interest of governments in paying for international science. Bluntly put, the key to government interest in ICES was national interest. Only France, of the original nations invited to join the Council, declined on the grounds that its commercially important fish populations were in the Atlantic, not in the North Sea where the rest had their major fisheries.[1] Profound concerns about the possibility of overfishing motivated governments to back calls by scientists and fisheries organizations for an international marine research program.

Advocates of internationalism in science shared a belief that technical experts, essentially international civil servants, should manage resources to maximize benefits for the cross-national populations which relied on them. This embrace of technocracy was almost universal at the turn of the century, crossing political and ideological lines. In the United States, the Progressive -era conservation movement reacted to the perceived closing of the American frontier, whereas Europeans, who faced a very different environmental situation, had long entertained the idea that governments should control the use of natural resources. In the case of fisheries, this shared belief in the power of science to mitigate social problems helped make ICES palatable to governments, which considered science a neutral authority on which to base decisions about possible international action.[2]

Discussion at the two preparatory conferences leading to ICES's formation kept practical fishery questions in the foreground. This focus expanded the scientific program to include significant biological investigations, but confirmed the delegates' underlying conviction that science must lie at the heart of the organization. Delegates affirmed the primacy of science precisely so that it could form the basis for action, as the founding statement makes clear.

> **Considering that a rational exploitation of the sea should rest as far as possible on scientific inquiry, and considering that international cooperation is the best way of arriving at satisfactory results in this direction, ... it [should] be left constantly in view that their [the international investigations'] primary object is to promote and improve the fisheries through international agreements...[3]**

ICES's original scientific program, in fact, aimed at problems simultaneously scientific and practical. One biological committee investigated fish migrations to shed light on the problem of huge fluctuations in fish catches. The hypothesis at the time, that small catches resulted from migration of fish from one global stock to other parts of the sea, made simultaneous data-collection over a large area the only logical approach. Another committee attacked the so-called "overfishing question," namely whether or not the new steam trawlers were harvesting too many fish. Such allegations were levelled by groups of fishermen against others, but were impossible to prove without comparable statistics from all countries whose fleets exploited a particular fishery. The need to compile such statistics, along with the necessity for international regulation in the event that overfishing could be demonstrated provided the key to national interest in ICES. Countries with important North Sea fisheries could hardly afford not to be involved. The scientific program also included hydrographic investigations, although not ones that were explicitly tied to questions of fisheries fluctuations. In short, ICES began life as an institution committed to both hydrographic and biological research, the latter firmly aimed at solving contemporary fisheries problems.

Fisheries Science and Regulation

ICES was originally established as a five-year cooperation to execute the original scientific program. After the decision to extend the investigations, the Overfishing Committee was re-named the "Plaice Committee," in recognition of the commercial importance of that fishery. During the second five years of the Council's existence, many of its scientific experts began to embrace the idea that their work should provide the foundation for regulation to improve fisheries. General Secretary Christian Drechsel described the main purpose of the Council this way: "The most essential object of the International Investigation of the Sea is to procure the necessary data for international agreements as to protection of the fisheries from overfishing, and the institution of measures for the improvement of same."[4]

By 1913, a year after the Council's tenth anniversary, the Plaice Committee extended its conclusions beyond a summary of scientific results to propose regulations it believed would benefit the fishery. The Committee agreed that the stock of North Sea plaice had suffered a decrease in larger sized fish and a corresponding increase in landings of small ones. They concurred on the desirability of preserving smaller plaice for capture after these fish had grown to a more valuable size. The Committee believed that closing of nursery grounds would accomplish this aim most effectively, but recognized the political difficulty of instituting such a measure internationally. It therefore recommended a minimum landing size for North Sea plaice.[5] At this point in ICES's history, scientists at Council meetings agreed on recommendations which the general secretary then incorporated into draft regulations and submitted via the Danish Foreign Office to the foreign offices of member countries.

This 1913 regulatory initiative got lost in the start of the First World War, but ICES scientists remained committed to the need for protective regulations, even given the expected recovery of stocks during the wartime fisheries closures. The closure offered an unprecedented opportunity to study the effect of intensive restriction on the fishery. Because the fishery would restart quickly after the war, the Council attached the highest importance to immediate resumption of investigations and the chance for governments to bring the guidance of scientific research to bear on "the foundation of a rational economy of the sea."[6] Governments, though, were in no mood to entertain the idea of regulations immediately after the war, when stocks were again high due to wartime closures. Their commitment to the thrust of ICES scientific work -- defining the effects of fishing on stocks -- continued unabated. In the wake of such a divisive and destructive war, ICES scientists felt keenly the necessity of promoting international science as the bulwark for regulation.[7]

Recommendations of the Plaice Committee were, in fact, not implemented until after the Second World War, in part because scientific controversy arose about the possibility that underfishing led to crowded grounds and reduced growth of individual fish. Nevertheless, when the Council celebrated its silver Jubilee in 1927, it expressed confidence that it had an important role to play in fisheries regulation. Also by the 1920s, the fishing industry recognized that science contributed to industry through its "guidance of legislation and regulation by ascertained facts and not by what was presumed to be facts."[8] The Economic Committee of the League of Nations confirmed this sense of confidence in 1927 when it deferred to the Council as the expert body from which to seek advice regarding exploitation of marine resources.[9]

The Council's optimism and confidence in the propriety of its active role in fisheries regulation stemmed from scientific advances that seemed to promise an unprecedented degree of control over nature. As early as 1909, the Norwegian biologist Johan Hjort asserted that it was equally or perhaps more important to describe variations in fish stocks than to understand their causes. "We must aim," he insisted, "at a more practical object. We must also try if it is possible to obtain a prognosis."[10] By the time he prepared his famous 1914 paper explaining fish stock fluctuations in terms of year-class variations, Hjort confidently concluded that scientists now possessed the tools to fortell, for example, the numbers of haddock that might be brought to market several years in advance.[11] Readers of Hjort's work easily recognized that this potential for prediction had regulatory implications. In his review for Nature, E. J. Allen, plankton scientist and future director of the Plymouth Laboratory, observed that Hjort had "established a method of predicting the probable future course from year to year of some of our most important fisheries, which should be of utmost value both to those engaged practically in the fishing industry and to those responsible for fishery administration."[12]

In fact, scientists working in the ICES area made the first successful catch predictions in 1929, of haddock and herring. These accomplishments relied on Hjort's important work, as well as the contributions by British biologists E.S. Russell and Michael Graham to quantify the effects of fishing on stocks.[13] That year, ICES assigned a committee to take stock of progress in the international investigations, especially "to find out whether any work was quite ripe for practical action."[14] At the same time that prediction became possible, Council scientists embraced the practice as an appropriate responsibility for their institution.

The work of Michael Graham, along with that of Hjort, Russell and others, implied clearly that fisheries required regulation, in order to combat the inevitable economic and biological problems of free fisheries. As Graham put it, in italics for emphasis, "*Fisheries that are unlimited become unprofitable*."[15] In the 1930s Graham became deeply involved in efforts initiated by ICES to achieve international agreement for controls on fisheries. Although the postwar abundance of fish had dampened scientists' efforts at regulation, when catches declined in the mid 1930s, governments proved more willing to listen. By 1937, ICES had instigated an international congress at which North Sea nations discussed regulations for plaice.[16] The Council's Plaice Committee recommended a minimum landing size, reinforced by minimum mesh sizes. Conference delegates accepted the recommendations and concluded the London Overfishing Convention of 1937, whose ratification was interrupted by the onset of war.

After World War II, ICES scientists saw an opportunity to avoid repeating the mistake of the previous war by implementing fishing regulations while stocks were again high after wartime fisheries closures. Governments, too, had reason to continue their support of the Council, because major theoretical advances in the 1930s provided mathematical tools to calculate optimal catches. By this, scientists meant maximizing the weight of catches. It seemed as though ICES's founding aim was finally within reach. ICES scientists pursued these goals most obviously by reinvigorating moribund efforts to regulate North Sea fisheries, this time not limited to plaice but including other commercial species as well. In 1946 Britain again called an international conference. Delegates, many of whom also represented their countries in ICES, recognized the limits of a convention that instituted specific restrictions and "consider[ed] ... whether an organisation can be created which allows the fishing industries to take only the yearly production of the stock."[17] Council scientists believed that biology and economics went hand-in-hand. Simply put, they argued that maximizing the weight of the catch but keeping the harvest at the level of yearly production would maximize fisheries' yields. No one questioned the premise behind Council recommendations for regulation, namely that these should be formulated by scientists and based on biological objectives. Indeed, the 1946 Overfishing Conference created a permanent commission empowered to review and revise regulations, then stipulated that this new body rely on ICES for scientific guidance. From 1953, ICES served as the scientific advisor to the Permanent Commission and its successor, the Northeast Atlantic Fisheries Commission (NEAFC).

The formation of several international fisheries commissions after the Second World War created a partnership between science and management which tightened as important commercial fish stocks began to decline under heavy fishing pressure in the 1960s. This partnership significantly changed the nature of ICES's advisory role. Instead of direct and proactive communication with governments, ICES began to work with managers of resources, through international regulatory commissions, responding to requests for scientific advice. A major theoretical advance, one which ICES scientists considered the crowning achievement of half a century of fisheries science, provided them with quantitative tools to estimate the probable effects of changes to such regulatory measures as mesh size. Two young scientists working at Lowestoft after the war, Raymond Beverton and Sidney Holt, created a series of equations and presented their work within ICES in the early to mid 1950s.[18] Their methods were quickly taken up by the Liaison Committee, which had been created to serve as the channel for advice between ICES and the Permanent Commission. From the perspective of the late 1950s, ICES appeared to be fulfilling the dreams of its founders. It served as a critical forum for many fields of marine science and simultaneously benefited society by maximizing fisheries resources and guiding their equitable exploitation.

Anyone even distantly familiar with subsequent collapses of many important fisheries will recognize how illusory this confidence was. But these next episodes of fisheries science, including VPA and TACs, belong to

another story. The adoption of TACs and the 1977 extension of exclusive economic zones to 200 miles from shore under the new Law of the Sea regime coincided with an increasingly strong separation of science from management, a trajectory begun by the creation of the Permanent Commission and ICES's advisory role to it.

Fisheries Hydrography and Promotion of Fisheries **Although regulation was a strong preoccupation of ICES from its early years, the promotion of fisheries was also critically important. During the first five-year period of investigations, scientists performed and reported results of transplantation experiments and recommended that governments mount large-scale operations to move small plaice from crowded nursery grounds to unoccupied banks. In fact, the delay in imposing plaice regulations in the 1920s stemmed from arguments deployed by scientists involved in this research. Although the Council's original scientific program did not explicitly aim to link hydrographic conditions to fish stock fluctuations, ICES hydrography (i.e., what we call today physical oceanography) did attempt to promote fisheries.**

From its founding, ICES delegates always included advocates of the pursuit of international hydrographic research for its own sake. Voices within the Council also urged meaningful cooperation between hydrography and fisheries biology, which always existed to a greater degree within ICES relative to most other marine science institutions. At the start of the second five-year term of investigations, hydrographer Martin Knudsen advocated an approach that would provide the critical link between hydrographic conditions and the appearance of fish, namely, observations "at the time and on the places where fishing is going on."[19] Although the quarterly cruises represented the main focus of ICES research before the First World War, the 1920s saw an effort to articulate a new vision of international hydrography. The biologist Johan Hjort led this effort, rallying the Bureau to create a special hydrography committee. While Hjort shared Pettersson's conviction that fish and their environment should be studied in concert, he also championed a role for hydrography independent of fisheries questions, in addition to its traditional supportive role.[20]

Just before the outbreak of the Second World War, Council hydrographers held out hope that their work might soon shed light on the long-standing question of causes of fish stock fluctuations. In 1938, a sub-group of the Hydrographical Committee that focused on so-called "combined hydrographical and biological investigations" met to consider two research proposals, one hydrographic with potential benefit to meteorology, and the other focussed on phytoplankton. Its deliberations touched off a huge debate that became known as the "Gulf Stream debate." It involved an extended committee of 22 scientists, including biologists as well as non-ICES people. The controversy derived, as Aberdeen hydrographer John Tait put it, because "the present proposal ... may be taken to imply the failure, more or less, of hydrography to render this service [to elucidate marine biological problems.]"[21]

The proposals related to hydrographic investigations in the open Atlantic and were intended, in part, to contribute to an international survey planned by the International Association for Physical Oceanography (IAPO). Scientists wanted to know whether variable currents from year to year brought different amounts of heat, affecting weather in the ICES region. This meteorological aim featured in the proposal by Swedish scientist Johan Wilhelm Sandstroem, which suggested seasonal hydrographical sections year after year (much as the original quarterly cruises had done). Meteorology had been one of the original scientific motives for founding the Council, but it had not become a central focus. On the other hand, variations in currents might also drive fluctuations in fisheries, as Norwegian Haaken H. Gran recognized. His proposal urged that hydrographic work include investigations of phytoplankton production, especially the timing of cruises to correspond with plankton blooms. European hydrographers noticed that data from one oceanographic station sometimes revealed huge variations within a short period of time, more than even average variations by season. The questions facing hydrographers were: how many and what kind of observations would give an accurate picture; and how frequent must they be to discern variations from the mean?

The amount of controvery generated by these proposals belied the fact that most Council hydrographers no longer believed that the model of the quarterly cruises was sufficient for hydrography. Indeed, Gran's proposal was on firmer footing, in part because he suggested a finite, one-year project rather than an indefinite, on-going one.

The storm of interest instead signalled the fact that hydrographers were ready to tackle the problem of large, transient variations that they recently observed. Accordingly, the Council's combined hydrography-biology sub-group drew up plans for a one-year intensive, multi-ship study of the Faroe-Shetland Channel and the northern opening of the North Sea. On the hydrographic side, the goal included laying the groundwork for one day determining the variation of the inflow of Atlantic water through the Channel, a critical question for understanding the hydrography of most of the Council's region. Ultimately, organizers aimed discerning the relationship between changes in hydrographical and plankton conditions and fish stock fluctuations.[22]

Participants in the discussions leading to this proposal also considered the larger question of what hydrography in the service of biology might look like. They anticipated synergy between the Council's proposal and the celebrated work of Alister C. Hardy's Continuous Plankton Recorder surveys. They also noticed that, on the technological level, the invention of the bathythermograph (BT) promised exactly the kind of data apparently needed for fisheries research.[23] Ferment about the direction of hydrography extended across the Atlantic to include Henry B. Bigelow and Columbus Iselin, both of the Woods Hole Oceanographic Institution (WHOI), who concurred that the Council was discussing essentially the formation of a new scientific field. Because of the growing deep-water preoccupation of oceanographers, Iselin argued that special "fisheries hydrologists" would have to be trained, scientists whose primary interest would be the application of hydrographic findings to the solution of fish population problems.[24] Within several ICES countries, especially Norway, such a tradition of hydrographic work in the service of fisheries already existed.

Even before Iselin's call, scientists active in ICES had already begun to promote the establishment of a field "now often called fishery-hydrography."[25] Tait, who in 1938 delivered the Buckland Lectures on the subject of "fisheries oceanography," explained that fisheries biologists were less interested in knowing the average hydrographical conditions and regular seasonal variations than in learning about deviations that might have some influence on fish behavior and movement. Hjort elaborated on this from a biologist's point of view. He predicted that in the near future biologists and hydrographers working together could solve "the old problems" of causes of year-class fluctuations. Indeed, he foresaw "the possibility even of prognosis," which was, of course, also the abiding aim of fisheries scientists of the 1930s.[26]

Plans for the Faroe-Shetland project topped the agenda at the 1939 Hydrographical Committee meeting held during the tense annual meeting that year in Berlin. The meeting ended on a positive note, with scientists from all fields convinced that the planned hydrographic sections would obtain good results. The outbreak of war, of course, halted plans for the proposed field work, but the issue of fisheries hydrography resurfaced immediately after the war. Marine science, oceanography in particular, had grown enormously during the Second World War. Scientists in the International Council and elsewhere anticipated major expansion of their science, which had proved of immense value to the war effort. The postwar need for food in Europe meant that fisheries scientists were as confident as their physical oceanography colleagues that their expertise would be sought in the immediate future.

Lowestoft hydrographer and editor of the Council's *Journal du Conseil*, John R. (Jack) Lumby, offered an example of how hydrography could work in concert with biology, with positive practical results. Trawlers on the Bear Island grounds in the entrance of the Barents Sea spent much of their time looking for fish. Targeted hydrographical work could, Lumby argued, reduce hunting time in proportion to fishing time. Lumby could reasonably hypothesize that the fish might prefer the mixed water on the boundaries of the two currents prevailing in the area. Hydrographers and biologists should test this hypothesis. Then, if correct, they could chart the currents in detail, observe their variation over time, and look for some means by which fishermen could tell, before they shot their trawls, whether water conditions were suitable or not.[27]

In the years immediately after the war's end, the Council's renewed hydrographic-biological subcommittee swung into action. It arranged surveys to study plankton distribution in relation to various physical and chemical characteristics of waters throughout the Council's area. By the 1949 Council meeting held in Edinburgh, attention to the combined hydrographical-biological investigations reached the top level of the Council. Interest was

propelled in part by a special symposium held that year on climate change, at which contributors demonstrated biological responses to ocean warming in the north.[28] The following year, discussion of the hydrography-biology problem dominated the annual meeting. Observing the intensity of discussion but lack of consensus, the Consultative Committee asked the area committees, mostly led by biologists, to outline the problems they wished hydrographers to address. Not all participants in the fisheries hydrography debates saw this as an appropriate tactic. Tait, for example, asserted the primacy of physical science: "it should often be easier for the hydrographer to advise the biologist on the kind of hydrographic information he needs than the other way round." Regardless of who should set the research agenda, it was clear to all concerned that the lines of communication needed to improve.[29]

The Norwegian oceanographer Harald U. Sverdrup addressed this issue of communication in his opening remarks to the Council's special 1951 meeting on "Fisheries Hydrography." He urged, on an institutional level, that hydrographers and biologists should "meet regularly at tea, or coffee, for informal discussions of their problems." It is necessary, he added, that they "learn to understand each other's languages."[30] Sverdrup, one of the foremost physical oceanographers of his day, was more famous for his leadership of the Scripps Institution of Oceanography and his polar explorations than for his involvement in ICES. Nevertheless, he chaired the Council's Hydrographical Committee during this period of intense dedication to building fisheries hydrography.[31] He went on, in 1955, to become only the second physical oceanographer to serve as president of ICES (the first was fellow Scandinavian Otto Pettersson).

Sverdrup's contribution to the 1951 symposium expressed well the place of hydrography in the fisheries research program of the International Council. He began by rehearsing the ultimate purpose of fisheries research, namely the establishment of a rational basis for utilizing natural resources of the sea. Because ICES felt a responsibility to advise fishermen in instances where resources were underutilized and governments when stocks needed protection, hydrography should help fisheries science in its goal of prediction. Sverdrup expressed confidence that hydrographers could indeed help their biological colleagues. Furthermore, the Council held the responsibility to make this happen because it alone was in a position to draw the numerous national laboratories together and thereby influence the direction of marine research.[32]

Participants at the special meeting called for laboratory study of fish behavior and simultaneous collection of biological and hydrographical data, but especially for improved avenues of communication. One manifestation of this impulse was the decision made to create the *Annales Biologiques*, first issued in 1943. This yearly summary provided standardized records of size and age-composition of stocks, along with fishing effort data and the environmental (chiefly hydrographical) factors that affected fish populations. In the early 1950s, the Council agreed to create monthly synoptic charts of surface temperature, salinity, and wind conditions. Although biologists initially greeted these charts with enthusiasm, they did not, in fact, use them extensively.[33] Other initiatives during the 1950s suggest that a core of scientists within ICES tried earnestly to create a fisheries hydrography distinct from physical oceanography. These included summaries of national work on hydrographical conditions of significance for marine populations as well as international current meter experiments during spawning seasons.[34]

What happened, then, to this tradition of fisheries hydrography that aimed to promote the expansion of fisheries in the post World War II period? The answer combines three trajectories or stories, each of which I can only mention here.[35] First, fisheries hydrography within ICES was somewhat marginalized by the International Geophysical Year (IGY) and subsequent major, multi-national, multi-ship expeditions organized through ICES from the late 1950s onward. Second, the growth of pollution research within ICES meant that some inquiries about correlations between hydrographic conditions and the presence or absence of fish were redirected to questions about the fate of contaminants. Third, declines in fish catches throughout the ICES region starting in the 1960s made the operational tradition of fisheries hydrography seem less pressing than regulation. In conjunction with this, biologists who began to suspect that recruitment of fish populations was not independent of stock size urged instead an ecological approach to fisheries hydrography. There were, throughout the 1960s, continued efforts

under ICES auspices to promote fisheries hydrography, but it was really not until the 1990s that fisheries oceanography emerged as a recognized sub-field within fisheries science.

Conclusion **Other episodes of ICES history also reveal the same impetus to create for the Council a dual role to produce new scientific knowledge and to direct the use of that knowledge to maximize marine resource use. One striking example was the Council's initiative in whaling research and the creation of the International Whaling Commission.[36] Another, more recent example, was the incorporation of marine environmental science into ICES. The expectation of advice-giving accompanied the very first moves into this new arena, perhaps reflecting how firmly that role had become part of the Council's identity.[37]**

This paper has tried to show that ICES's dual identity as a scientific and advisory body derived from ideals and practices embraced by its founders. Pursuit of an advisory role was not by any means limited to regulation, but rather applied to the broad spectrum of marine sciences covered by ICES. Even after the founding generation retired, Council biologists were involved in forging a scientific advisory role for ICES *vis a vis* the new international management commissions, while hydrographers aimed to help ICES contribute to the expansion of fisheries, especially in the open sea. Although the exact nature of ICES's advisory role has changed over time, the founding aim -- to promote "rational" use of the sea's resources -- continued. The definition of "rational use" provided by long-time Council president Henry Maurice (who served between the two World Wars) probably still encapsulates ICES's goal: of providing the scientific basis for "turning [the sea's] resources to the best advantage in the present without prejudice to the future."[38]

Acknowledgements **I want to thank Michael Sinclair, director of the Bedford Institute of Oceanography, for inviting me to speak in celebration of Bedford's 40th anniversary. This paper derives from many conversations I have had with him about ICES history and why it is important to understand, both for the history of science and for practicing marine scientists, especially government scientists. Thanks also to Eric Mills for his unflagging support and assistance, with this and other work.**

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[1.] Nations invited to join the Council included Belgium, Britain, Denmark, Finland, France, Germany, The Netherlands, Norway, Russia, and Sweden. Belgium was not a founding member, but joined in 1903. The remaining eight countries founded ICES. Note, however, that Norway at the time was in Union with Sweden and Finland was a Grand Duchy of Russia.

[2.] F. S. L. Lyons, *Internationalism in Europe* (Leyden: A. W. Sythoff, 1963), 121-133. Elisabeth Crawford, Terry Shinn, and Sverker Sörlin, "The nationalization and denationalization of the sciences: An introductory essay," in Crawford, Shinn, and Sörlin, eds., *Denationalizing Science: The Contexts of International Scientific Practice* (Boston: Kluwer Academic Publishers, 1993), 1-42. Samuel P. Hays, *Conservation and the Gospel of Efficiency: Progressive Conservation Movement, 1890-1920* (University of Pittsburgh Press, 1999). **In Canada, government control of natural resources was granted at Confederation in 1867, but science did not play a role in fisheries until 1915. Janet Foster, *Working for Wildlife: The Beginning of Preservation in Canada* (Toronto: University of Toronto Press, 1978, 2nd ed 1998). Thanks to Eric Mills for this analysis.** Otto Pettersson, "International fisheries legislation," The Nineteenth Century: A Monthly Review 264 (February 1899): 295-303.

[3.] Documents from the preparatory conferences in Stockholm (1899) and Kristiania (now Oslo, 1901) were reprinted for ICES's 25th Jubilee in Rapports et Procès-Verbaux 47(1928): 5-23; quote is on p. 11 and in French. The usual English language translation appears in A. E. J. Went, *Seventy Years Agrowing: A History of the International Council for*

the Exploration of the Sea, 1902-1972, Rapports et Procès-Verbaux, 165(1972) 252 pp., 10. Hereafter, Rapports et Procès-Verbaux referred to as RPV.

[4.] C.F. Drechsel, "Mémoire sur les Travaux du Conseil Permanent International pour l'Exploration de la Mer pendant les Années 1902-1912," RPV 16 (1913), 1-83, p. 8.

[5.] General Secretary Drechsel to Members of the Plaice Committee, 11 June 1913, Rigsarkivet, Copenhagen (Danish State Archives), International Council for the Exploration of the Sea, Arkiv nr. 10.649 Box 32, 1.G, Plaice, 1910-30. This collection of ICES is hereafter referred to in the notes as ICES.] The Committee also recognized the necessity for the Council to extend their investigations to ascertain the effects of measures put into place. The Committee recommended a minimum landing size of 20 cm, raised to 22 cm during the spring and summer months when the destruction of small plaice chiefly took place. See manuscript minutes, "First Meeting of the Plaice Committee," London, 26 June 1913, ICES Box 79, 6.I, 6.J. See also Friedrich Heincke, "Investigations on the Plaice. General Report by Dr. Friedrich Heincke. I. Plaice Fishery and Protective Measures," RPV 17(1913):1-153.

[6.] Drechsel to The Delegates of the International Council for the Exploration of the Sea, 1 June 1913, with enclosures including letter, Drechsel to Delegates, 30 May 1918, ICES Box 131, 8.B, 1913-24.

[7.] Drechsel, for example, believed that the Council's work was "to prepare international laws for the protection of fisheries based on scientific investigation." Drechsel to C. Dehile Burns, Esq., Intelligence Division, Ministry of Labour (London), 10 April 1920, ICES, Box 127, folder: 7.F, 1913-24.

[8.] "What science has done, and may do, for the fishing industry: A review of the activities of interested bodies both past and present," Special Supplement. Fish Trades Gazette, Nov. 7, 1925, iii-xxix, p. xix.

[9.] League of Nations, Economic Committee, 'Exploitation of the Products of the Sea', Geneva, 26 March 1928, ICES, Box 135, folder: 9.C, 1927-28, UN.

[10.] Hjort to Bureau of the International Council for the Study of the Sea, 21 September 1910, ICES, Box 130 8.b, Herring, 1906-24.

[11.] Johan Hjort, "Fluctuations in the Great Fisheries of Northern Europe Viewed in the Light of Biological Research," RPV 20 (1914).

[12.] E.J. Allen, "Fluctuations in the yield of sea fisheries," Nature 93(1914): 672-673.

[13.] Michael Graham, *The Fish Gate* (London: Faber, 1943). Graham, "Overfishing and Optimum Fishing," RPV 132(1952), 72-78. E. S. Russell, *The Overfishing Problem* (Cambridge: Cambridge University Press, 1942).

[14.] Minutes of Consultative Committee meeting, 26 May 1930, ICES Box 83, 6.P, 1926-45.

[15.] Graham, *Fish Gate*, 155.

[16.] For detailed discussion of 1930s advances in fisheries science and ICES's role in achieving the 1937 Overfishing Convention, see Rozwadowski, *The Sea Knows No Boundaries*, 77-110.

[17.] Johan Hjort, "Hjorts Tale und Middagen??" [typescript of opening remarks], 27 March 1946, ICES, Box 4, folder: 1.A.3, 1946-48.

[18.] R. J. H. Beverton and S. J. Holt, *On the Dynamics of Exploited Fish Populations*, Fisheries Investigations, Series 2 (United Kingdom: Ministry of Agriculture, Fisheries and Food, 1957).

[19.] Knudsen to Drechsel, 10 March 1909, and Knudsen to Drechsel, 23 March 1909, ICES, Box 131, folder: 8.B, 1913-24.

[20.] [typescript of meeting, 13 September 1924], ICES, Box 72, folder: 6.F, 1902-28II. Vera Schwach, *Havet, fisken og vitenskapen. Fra fiskeriundersøkelser til havforskningsinstitutt 1860-2000* (Havforskningsinstituttet/John Grieg AS, 2000), 57-88.

[21.] John B. Tait, "Memorandum on Combined Hydrographical and Biological, Hydrographical and Meteorological Investigations," 12 October 1938, 33-39, in "Remarks to Circular of 3 June 1938," ICES Secretariat [collection of historical documents retained at the Secretariat], folder: Gulf Stream debate. [This collection of documents discussing these proposals is hereafter referred to as "Remarks to Circular of 3 June 1938."] For a fuller account of

this debate, see Rozwadowski, *The Sea Knows No Boundaries*, 115-120.

[22.] "Recommendations by the Sub-Committee on Hydrographical and Biological Investigations," enclosed with General Secretary to Combined H-B Committee," 16 November 1936. Knudsen to Combined H-B Committee, 16 November 1938, 23 December 1938, 6 March 1939. The General Secretary also sent out a circular letter to request comments on the research proposal before it was submitted to the 1939 annual Council meeting, 27 March 1939. All these documents are in ICES, Box 18, folder: 1.D, Council Meeting, Berlin 1939. Jens Smed described this proposed investigation in "History of international North Sea research (ICES)," in Jürgen Sündermann and Walter Lenz, eds., *North Sea Dynamics* (Berlin: Springer-Verlag, 1983), 5-6.

[23.] Several reviewers pointed out the advantages of the new BT for fisheries work, including H. Pettersson, 29 August 1938, 23, Carruthers, "Memorandum," 8 August 1938, 31, and Iselin, 29 June 1938, 15, in "Remarks to Circular of 3 June 1938."

[24.] Quote is from Columbus Iselin, "Problems in the oceanography of the North Atlantic," Nature 141(1938): 73-76. Iselin, "Pro Memoria 1," [1939], 1-5, ICES Secretariat, folder: Gulf Stream debate (copy also at the Woods Hole Oceanographic Institution Archives). Response from Bigelow, 30 June 1938, 10-11, Response from Iselin, 11-16, in "Remarks to Circular of 3 June 1938."

[25.] Quotation is from E. S. Russell, "Fishery research: Its contribution to ecology," The Journal of Biology 20(1)(1932): 139-140. For a review of hydrographic work conducted under the ICES umbrella from its 25th to 50th year (really from the late 20s until 1952), see Helge Thomsen, "The Milieu," RPV 132(1952): 21. A more recent review of Hydrography Committee work is Arthur J. Lee, "The ICES Hydrography Committee: A review of its activities since 1945." RPV 185(1984): 7-29.

[26.] Tait, "Memorandum on Combined Hydrographical and Biological, Hydrographical and Meteorological Investigations." Tait, "Hydrography in relation to fisheries," *The Buckland Lectures* (London: Edward Arnold, 1952). J. H. Steele, "John B. Tait," Journal du Conseil 36(2)(1975): 99-100. Johan Hjort, "Pro Memoria 2," [1939], 1-3, ICES Secretariat, folder: Gulf Stream debate (underlining in original).

[27.] J. R. Lumby, "Oceanography and Fisheries," in "Discussion on Oceanography (held at the General Meeting of The Linnean Society, 21 March 1946)," (London: Linnean Society, 1946), 12-13.

[28.] "Report from the meeting of the Sub-Committee for Organization of Combined Hydrographical-Biological Investigations, December 7-10, 1947," RPV 124(1949): 9-11. Combined H-B Committee, 5 and 7 October 1948, RPV 124(1949): 44-45. ICES, *Climatic Changes in the Arctic in Relation to Plants and Animals*, RPV 125(1949). "Report from the meeting of the Sub-Committee for Organization of Combined Hydrographical-Biological Investigations, 3 October 1949," RPV 127(1950): 45-47. Lee, "The ICES Hydrography Committee," 10-11.

[29.] Tait, "Hydrography and fisheries research (from the view-point of a fisheries hydrographer," 1950, ICES, Box 74, folder: 6.F, 1937-52. Knudsen took the opposite position in "Remarks on the organisation of the Council's hydrographic work," [1951], ICES, Box 71, folder: 6.E, Madrid, etc.

[30.] Sverdrup, "Remarks on the place of hydrography in fisheries research," October 1951, Statsarkivet I Bergen (National Archives of Norway, Regional Branch in Bergen), Fiskeridirektoratets Arkiv, 25/3, ICES 1951-53, folder: 39th Meeting, 1951.**

[31.] H. U. Sverdrup, M. W. Johnson, and R. H. Fleming, *The Oceans: Their Physics, Chemistry and General Biology* (Englewood Cliffs, NJ: Prentice-Hall, 1942). J. E. Fjeldstad, "Harald Ulrik Sverdrup," Journal du Conseil 23(2)(1957). Robert Marc Friedman, "The Expeditions of Harald Ulrik Sverdrup: Contexts for Shaping an Ocean Science," (Scripps Institute of Oceanography, 1994). Naomi Oreskes and Ronald Rainger, "Science and security before the Atomic bomb: The loyalty case of Harald U. Sverdrup," Studies in the History and Philosophy of Modern Physics 31 B(3)(2000): 309-369. Warren Wooster, interview by Ronald Rainger, 21 July 1997 (transcript provided by Rainger).

[32.] Sverdrup, "Remarks on the place of hydrography in fisheries research," October 1951, Statsarkivet I Bergen (National Archives of Norway, Regional Branch in Bergen), Fiskeridirektoratets Arkiv, 25/3, ICES 1951-53, folder: 39th

Meeting, 1951. This last sentiment appeared in the published version of Sverdrup's remarks, same title, in ICES, *Fisheries Hydrography, 1951*, RPV 131(1952): 7.

[33.] Arthur Lee has argued that the recommendations which emerged from consideration of these papers at the 1951 symposium influenced hydrographical work through the mid-1980s in the areas of synoptic charting and current measurements, as well as fisheries hydrography. Lee, "The ICES Hydrography Committee," 11-16. F. S. Russell, "Suggestions for plankton programme," 17 August 1938, 8-9, and Response from Farran, 23 August 1938, 9-10, in "Remarks to Circular of 3 June 1938." E. S. Russell, "The proposal for a Bulletin Biologique," ICES, Box 18, folder: 1.D, Council Meeting, Berlin 1939. K. A. Andersson, "Reply No. 6, re: Bulletin Biologique," 9 February 1939, ICES Secretariat, folder: Gulf Stream debate. J. R. Lumby, "A note on synoptic hydrographic charts," [1950], ICES, Box 74, folder: 6.F, 1937-52. Jens Smed, "Service Hydrographique of the International Council for the Exploration of the Sea." Journal du Conseil 32(2)(1968): 155-171, p. 159. Went, *Seventy Years Agrowing*, 226, 234. Lee, "The ICES Hydrography Committee," 12.

[34.] Thomsen, "The Milieu," 21-27. K. A. Andersson and B. Kullenberg, "Sweden," RPV 132(1952): 19. R. E. Craig, "The Scottish programme of herring hydrography, 1951," 108-110, Lionel A. Walford, "Recent fishery hydrographic results in the United States," 111, and G. Böhnecke, "Some remarks on the German position in fishery-hydrography," 112-113, in ICES, *Fisheries Hydrography, 1951*, RPV 132(1952). Lee, "The ICES Hydrography Committee," 13. Went, *Seventy Years Agrowing*, 116.

[35.] Rozwadowski, *The Sea Knows No Boundaries*, 126-136, 139-145, 213-219.

[36.] Rozwadowski, *The Sea Knows No Boundaries*, 86-96.

[37.] Rozwadowski, *The Sea Knows No Boundaries*, 212-244.

[38.] Henry Maurice, quoted in Went, *Seventy Years Agrowing*, 72. Although Maurice said this first, the same words also appear in C. E. Lucas, "Aspects of marine fisheries research," The Advancement of Science, 21 (1964): 11.

THE VIIth INTERNATIONAL CONGRESS ON THE HISTORY OF OCEANOGRAPHY KALININGRAD, SEPTEMBER 2003

A premiere event in the history of the marine sciences will take place in the autumn of 2003. The VIIth International Congress on the History of Oceanography will be held in Kalingrad, Russia from 8-14 September, centered on the Museum of the World Ocean and the famous research vessel *Vitiaz*. The first call for papers will soon be sent by mail to all the recipients of *History of Oceanography*, but the organizers have kindly agreed that it may be printed here. This version has been edited to save space, without changing the contents.

FIRST CALL FOR PAPERS

VII International Congress on the History of Oceanography

8-14 September 2003

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- Ministry of Culture of the Russian Federation
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- Intergovernmental Oceanographic Commission, UNESCO
- Commission of Oceanography of the International Union of History and Philosophy of Science, Division of History of Science

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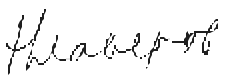

MUSEUM OF THE WORLD OCEAN

The Museum of the World Ocean was established as per the Resolution of the RSFSR Government on 12 April 1990. The museum carries out research in the area of the history of oceanography. The exposition of the museum is placed aboard three vessels, in the exhibition hall, and on the open-air grounds. The major museum object, the legendary r/v VITYAZ, presents memorial research laboratories: benthos, ichthyologic, plankton, geological, echo-sounding, hydrological, and meteorological ones, which represent scientific achievements of the 1950s-1970s. Visitors get acquainted with the history of the World Ocean exploration since old times until the present.

In 2001, the diesel-electric submarine *B-413* became the museum's object. She is the only Russia's museum submarine, which was built after WWII. Now the exhibition "From the History of Russian Underwater Fleet" is housed on her board.

The research ship of the Russian AeroSpace Agency *KOSMONAVT VICTOR PATSAEV* presents the exhibition "Space Odyssey" dedicated to the history of exploration of the Space Ocean. This ship is the only vessel of satellite communication to house a museum exposition. On the museum grounds, there is an inshore survey craft, the submersible manned vehicles *TETIS* and *PISCES*, a collection of anchors and other oceanographic and marine equipment.

The funds of the museum keep personal belongings and archives of well-known Russian oceanographers – those of P.P.Shirshov, M.V.Klenova, B.G.Bogorov, V.P.Zenkovich, A.D.Dobrovolsky, P.L.Bezrukov, V.A.Bubnov, and others.

The Museum of the World Ocean established and maintains contacts with numerous research and museum centers dealing in the history of oceanography. Since 1991, the staff of the museum have taken part in fifteen conferences and congresses on the history of oceanography. In 1998, at the World Exhibition "EXPO-98" in Portugal, devoted to the Ocean, the workers of the museum created an exhibition "Russian Geographic Research and Discoveries in the World Ocean", which was on display in the pavilion of Russia. In 1996 and 1999, the museum was the initiator and organizer of International Conferences "History of National Oceanology". Representatives of 40 institutions from 5 countries submitted 140 reports for the Conferences.

Considering the interest of scientific community towards the history of ocean research held by the USSR (and later, by the Russian Federation), as well as the efforts of the Museum of the World Ocean to preserve research ships, 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 the 7th International Congress on the History of Oceanography in Kaliningrad in 2003. The ICHOs have been held since 1966. The first congress took place in Monaco (1966), then in Great Britain (1972), the USA (1980 and 1993), Germany (1986), and China (1998).

The Museum of the World Ocean is highly honored to play host to the Congress on the History of Oceanography, which will be held in Russia for the first time.

WELCOME TO KALININGRAD!

We shall be happy to welcome the Congress participants in Kaliningrad, the westernmost city of Russia, situated on the Baltic coast. The interesting history of Königsberg-Kaliningrad has been lasting over seven centuries; historical places, monuments and museum expositions give evidence of the opposition between ancient Prussians and Teutonic knights, the battles of the Seven Years' War (1756-1762), Napoleon's campaign, and the assault of the city by the Soviet troops in 1945.

After WWII was over, the Potsdam Conference issued the Resolution to transfer one-third part of East Prussia together with the City of Königsberg to the former Soviet Union; Königsberg was later renamed to be Kaliningrad.

The region, situated on the Baltic Sea coast at a short distance from several European capitals, has become one of Russia's tourist centers. Visitors are attracted by the mild climate, sandy beaches (they stretch as far as about 100 km), numerous picturesque sites: the National Reserve "Kurshskaya Kosa", resort towns Svetlogorsk and Zelenogradsk. Königsberg-Kaliningrad is prominent for its unique architecture, which still keeps the echo of old times. This is the city of Kant and Hoffmann, fishermen, the navy, ocean researchers.

Five Higher educational institutions of the city prepare specialists to work at sea. The Atlantic Branch of the Institute of Oceanology RAS and the Atlantic Research Institute of Marine Fisheries and Oceanography are the largest Russian

scientific centers for ocean research. Their unique research fleet includes the flagship of the scientific-research fleet of the country r/v "Akademik Keldysh", from on board of which work the deep-water manned vehicles "Mir"s.

Kaliningrad is famous for the Museum of Amber, the only in Russia, for the oldest Zoo in Europe, theatres and Philharmonic Society, the Art Gallery and the Local Museum of Fine Arts and History.

Owing to a specific geographical position, Kaliningrad is connected with the countries of the world by sea, air, motor- and railways.

Numerous hotels, cafes and restaurants offer the guests of the city services of a European level.

We look forward to seeing you in Kaliningrad.

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Would you like to receive follow-up information? (Yes/No) _____

If you are going to participate in Congress-2003, please, fill in this form and send us the information required at our address or by e-mail not later than 1st November 2002.

Registration Fee	Before 1st April 2003.	After 1st April 2003.
Full	$ 200	$ 250
students and post-graduates	$ 50	$ 70
accompanying persons	$ 70	$ 100

Contact us at:
MUSEUM OF THE WORLD OCEAN **Fax: (+7) 0112 – 340 211**
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CLASSES ON THE HISTORY OF MARINE SCIENCES - AN APPEAL FOR INFORMATION

To my knowledge, the only regularly scheduled class on the history of oceanography and the marine sciences is given at Dalhousie University and the University of King's College in Halifax, Canada, under the title *History of the Marine Sciences*.

During 2002/2003, an new class will be offered at Princeton University under the direction of Dr Graham Burnett titled *Science across the Seas: Ships, Islands, and Knowledge, 1676-1876.* Perhaps there are others already in existence or in the planning stages. If so, I would like to have information on what you teach or plan on teaching. In the next *History of Oceanography* I plan on beginning a series of articles on teaching the history of marine sciences, in the form of the curricula and reading lists of existing classes. Please send me information you would like to have included, either by regular mail or by e-mail (E.Mills@Dal.Ca).

Eric Mills

BOOK ANNOUNCEMENTS AND REVIEWS

Just published, and of special interest to readers of *History of Oceanography*, are the following.

Bennekom, Johan van, 2001. *Geschiedenis van het Zoölogisch Station en het Nederlands Instituut voor Onderzoek der Zee.* Het Zoölogisch Station der Nederlandse Dierkundige Vereiniging (1876-1960) en het NIOZ (vanaf 1960) als Nationale Instituten voor zeeonderzoek. Den Burg-Texel: Nederlands Instituut voor Onderzoek der Zee. 127pp.
Available from Nederlands Instituut voor Onderzoek der Zee, Postbus 59, 1790 AB Den Burg - Texel, The Netherlands.
A beautifully illustrated and handsomely produced account in Dutch of the history of the zoological stations ancestral to today's NIOZ (Netherlands Institute for Sea Research), including an account of other 19th century marine stations. A valuable appendix gives accounts and wonderful pictures of research vessels associated with Dutch marine biology from the 19th century to the present. There is a helpful summary, chronological listing of events, and list of figure captions in English. This important publication deserves close attention by historians of the marine sciences

Benson K.R. & P.F. Rehbock (editors), 2002. *Oceanographic History. The Pacific and Beyond.* Proceedings of the Fifth International Congress on the History of Oceanography, Scripps Institution of Oceanography, La Jolla, California, July 1993. Seattle: University of Washington Press. xii + 556pp. US $60
Seventy-one essays on the full span of the history of the marine sciences; an essential reference, along with the volumes produced after the other International Congresses on the History of Oceanography.
Available from University of Washington Press, PO Box 50096, Seattle, WA 98145-5096, USA (www.washington.edu/uwpress) In Canada: University of British Columbia Press, 2029 West Mall, Vancouver, B.C. V6T 1Z2, Canada (www.ubcpress.ubc.ca/). In Europe: Plymbridge Distributors Ltd., Estover Road, Plymouth PL6 7PY, UK (orders@plymbridge.com).

Rozwadowski, H., 2002. *The Sea Knows No Boundaries. A Century of Marine Science un der ICES.* Seattle: University of Washington Press. 448pp. US $50
Available from the addresses above.
Commissioned for the centenary of ICES, this book is more than an institutional history, providing a full consideration of the scientific and social circumstances under which ICES originated during the late 19th century and developed into the 21st. Essential for a full understanding of this long-lived and important international scientific organization.

Weir, Gary, 2001. *An Ocean in Common: American Naval Officers, Scientists, and the Ocean Environment.* College Station, Texas: Texas A&M University Press. xx + 404pp.
An important study of the relationship developing between often skeptical U.S. Naval officers and oceanographers, concentrating mainly on the interwar period and on World War Two. Weir makes the case that some scientists, notably Columbus Iselin of Woods Hole Oceanographic Institution, were effective intermediaries between scientists and naval officers, to the benefit of both.

THREE UNPUBLISHED THESES ON TIDAL HISTORY. 1. Thomas R. Eckenrode, "Original Aspects in Venerable Bede's Tidal Theories with relation to Prior Tidal Observations", St. Louis PhD thesis, 1970, pp xiv + 287.
2. Michael S. Reidy, "The Flux and Reflux of Science: The Study of the Tides and the Organization of Early Victorian Science", Minnesota, D.Phil. dissertation 2000, pp iv+427 including 11 figures.
3. Benjamin C. Sheesley, "A Humboldtian Science Framework for William Whewell's Tidal Maps", University of Wisconsin MSc thesis, 2002, pp vii + 109 including 39 figures + 6 plates.
Whilst no longer brand new, Thomas Eckenrode's thesis has been included because of a forthcoming article on a similar theme, Carolingian tidal data. (In "Early Science and Medicine", Spring 2003.) The thesis is quoted by Faith Wallis in "Bede: the reckoning of time", by Marina Smyth in "Understanding the universe in seventh-century Ireland" and by Wesley Stevens in both his original and revised Jarrow Lecture on Bede's scientific work. The virtue of the work lies in its tidal extracts from antiquity, including the difficult Pytheas of Marsilla, and successfully identifies the early Church Fathers' writing on tides. However the thesis is based upon secondary printed sources rather than original Carolingian manuscripts and photographic reproductions.
The dissertation by Michael Reidy continues the detailed look into tidal history, begun by Eckenrode, and concentrates on some of the work of William Whewell. In compiling this work, Reidy spent more than one year identifying and transcribing unpublished scientific manuscripts held on both sides of the Atlantic. He has identified the elements which begun the systematic study, in the 1830s, into tidal prediction, observation and subsequent theory. It is Reidy who extends the concept of Humboldtian study to tides. The thesis gives much consideration to the philosophy of the contemporary science and sets it firmly into a tidally historical context.
Benjamin Sheesley travelled widely in the Summer of 2001 to collate Whewell's original cotidal maps and gather in the data for his thesis. His resultant tidal thesis was one of two at Master's level undertaken concurrently. The thesis is extremely lavish in illustration, which are each well reproduced. Sheesley takes up a theoretical approach to the history of cartography by examining Whewell's cotidal maps in great detail. The highly original isogonal nature of the maps is displayed and their production again set within a Humboldtian science framework.
Study into individual scientists tidal work and into general tidal history is currently on the rise. Is it now time for a specific conference on the History and Philosophy of Tidal Science to be convened?
(Contributed by Paul Hughes, 106 High Street, Airmyn, Yorkshire DN14 8LB, UK <kubernaut@btinternet.com> and <http://www.airmynyorks.co.uk> for web pages and links on tidal history)

PAPERS OF KEITH RUNCORN

The National Cataloguing Unit for the Archives of Contemporary Scientists, located at the University of Bath in the UK, has annnounced that it has completed cataloguing the papers of the geophysicist Stanley Keith Runcorn (1922-1995). The papers are located in the College Archives, Imperial College, London. Information on the catalogue is available from the unit by e-mail at <ncuacs@bath.ac.uk> or on the Web at <http://www.bath.ac.uk/ncuacs>.

Working at Manchester, Cambridge and Newcastle, and finally at the University of Alaska and Imperial College, London, Keith Runcorn was famed for his studies of Earth magnetism, culminating in the use of palaeomagnetism to demonstrate the positions of the ancient continents and to give support to polar wandering and plate tectonics, along with several other significant studies. He became FRS in 1965, was awarded the Vetlesen Prize of Columbia University in 1971, the John Adams Fleming Medal of the American Geophysical Union in 1983, the Gold Medal of the Royal Astronomical Society in 1984 and the Wegener Medal of the European Union of Geosciences in 1987.

Covering 1936 to 1995, the collection includes biographical material, diaries for 1967 to 1983, papers on the history of the earth sciences, notebooks, a little material from his times in Manchester, Cambridge and Newcastle, and extensive records of his research on magnetism and continental drift and of his membership on numerous national and international committees.

NEWS AND EVENTS

NEXT INTERNATIONAL CONGRESS ON HISTORY OF OCEANOGRAPHY. In September 2003, ICHO-VII will be held in Kaliningad, Russian Federation. See the entry earlier in this Newsletter. Our sister Commission on the History of Meteorology is organizing a one-day session on the Brussels Conference of 1853 which brought together the US and European nations to organize observation and recording of maritime weather and ocean currents. Other topical sessions will also be organized, along with a general meeting of the Commission of Oceanography.

CENTENARY OF ICES IN 2002. The centenary of the International Council for the Exploration of the Sea will be celebrated on October 4, during ICES's Annual Science Conference in Copenhagen October 1-5. ICES Centenary Day will be opened by Queen Margarethe II of Denmark and will include special lectures. For further information, see the Council's web site at <http://www.ices.dk/aboutus/centenary.asp>.

CENTENARY OF THE SCRIPPS INSTITUTION OF OCEANOGRAPHY IN 2003. In 2003, SIO will celebrate the arrival of the Berkeley zoologist W.E Ritter in San Diego in 1903. Ritter's first summer in extreme Southern California was spent, with a few students, occupying the boathouse of the El Coronado Hotel (which may still be seen as a high-class restaurant) as a marine biological station. From this, on another site to the north in La Jolla, grew the Scripps Institution of Oceanography. There is a year-long series of events, including lectures from January through March on the history of marine sciences. For information, see the special web pages developed for the occasion at <http://scripps100.ucsd.edu/>.

LECTURES ON THE HISTORY OF MARINE SCIENCES. In connection with the centenary of the Scripps Institution of Oceanography, Eric Mills (Oceanography Department, Dalhousie University & History of Science Programme, Dalhousie and the University of King's College) will give a12-week series of lectures on the development of the marine sciences beginning in January 2003. Scheduled for Thursdays at noon, the series will deal with the oceans in the ancient world, the expansion of the world in the Renaissance, 18th Century developments, the atmosphere and oceans in the Newtonian era, nineteenth century controversies over ocean circulation, the *Challenger* era, fisheries and international oceanography, and the history of SIO.

SCIENCE ACROSS THE SEAS AT PRINCETON. Beginning in September 2002, Dr Graham Burnett of the Program In History and Philosophy of Science at Princeton University, will offer a seminar class titled *Science across the seas; ships, islands, and knowledge, 1676-1876*.The course syllabus says in part, "this course examines the sea both as historical object and object of knowledge. How did the oceans take shape in the European imagination from the early modern period to the end of the nineteenth century? How does one "know" the oceanic world? Its physical character and its denizens? Its shores and its depths? How has "being at sea" affected the thinking and practice of natural philosophers and voyaging naturalists? Answering these questions will deepen our awareness of the ocean environment in history, and prime our thinking of, and on, the oceans." For information, contact Dr Burnett at <dburnett@princeton.edu>.

PROCEEDINGS OF ICHO-VI. Last year's *History of Oceanography* contained the information that funding had been arranged to edit the proceedings of the 6th International Congress on the History of Oceanography, which took place in Quingdao, China in August 1998. The editing process, a lengthy and complicated one because of the large number of papers from many nations, is largely complete under the direction of Dr Selim Morcos and with significant help from Gary Wright, a professional editor with UNESCO. The editorial committee is now moving ahead with final editing and production.

HISTORY OF MARINE SCIENCE IN ROMANIA. The Commission of Oceanography's representative in Romania, Dr Alexandru Bologa (Romanian Marine Institute, Constantza; abologa@alpha.rmri.ro) has sent information about the acivities of the Romanian Committee of History of Science and Technology / Subcommittee Constantza. An administrative meeting of the Subcommittee, including organizational matters, proposals for activities, and introduction of honorary membership was held on May 25. On 15 June the annual scientific symposium included one marine history paper, " A novel imperial (Roman) sailing vessel at Constantza" by Eng. P. Covacef. A number of publications by members of the Subcommittee are included in this years' Annual Bibliography, the next section of this issue of *History of Oceanography*. And in October 2001, missed in last years issue, a celebration was held of the 75th anniversary of the Marine Biological Station "Prof. Dr. Ioan Borcea" in Agigea and Constantza. Six scientific sessions were held. This event, attended by about 180 people from universities, research institutes, and museums in Romania and Moldova, was marked by honorary diplomas and jubilee medals given to previous and present scientists of the Station and to all of those who contributed to the success of this first Romanian marine-related institution (1926), owned by the university Iassy since 1990.

INAUGURATION OF THE EARTH AND ENVIRONMENT FORUM. A new interest group of the US History of Science Society (HSS), the Earth and Environment Forum (EEF), met for the first time in the fall of 2001. EEF intends to bridge history of science and environmental history and will be of interest to readers of *History of Oceanography*. In advance of its formation, EEF organized a session at the Denver meeting of HSS titled "Landscapes of colonial knowledge: representing malaria in Europe, Jerusalem and North Africa," and at the organizational meeting Stéphane Castonguay of the Université de Québec à Trois-Rivières was elected president. Meeting participants discussed long and short term goals for the group, including the possibility of starting an newsletter. Of special interest to readers of *History of Oceanography*, Jim Fleming, President of the International Commission on the History of Meteorology (one of our sister Commissions), welcomed links with the EEF and discussed complementary goals. Helen Rozwadowski described the series of Maury Workshops on the History of Oceanography, especially the summer 2001 meeting (mentioned in *History of Oceanography* 13), which focused on the theme of technology and environment. Bill Garber suggested that EEF was well poised to extend its brief on the history of hydrology at the Water and Environment Federation and the International Water Association. To learn more about or join the EEF, see <http://www.cieq.uqtr.ca:591/EEF.htm> or contact Stéphane Castonguay at <stephane_castonguay@uqtr.ca. (Contributed by Helen Rozwadowski).

INFORMATION ON OLAV MOSBY. To date, no information has been available on the Norwegian oceanographer Olav Mosby, who came to North America as the first civilian physical oceanographer to the International Ice Patrol and the United States Coast Guard. Now his niece Mrs Mette Mosby Haugan of Straumsgrend, Norway has provided the following information.
Olav Mosby was born in Kristiansand on 15 October 1896. He studied chemistry, mathematics, astronomy, physical geography and oceanography at the University of Oslo, graduating in 1922. Between 1917 and 1923 he was scientific assistant to Fridtjof Nansen, and from 1923 to 1930 was an oceanographer in the Geophysical Institute in Bergen, then associated with Bergens Museum. From 1930 to 1932 he was chief oceanographer of the International Ice Patrol and with the U.S. Coast Guard, returning to Norway to teach high school in Bergen. He died on 24 February 1954. More information is available in the Scripps Institution of Oceanography Archives, La Jolla, California, USA.

A PERSONAL NOTE FROM A FISHERIES RESEARCH SHIP. Listed under Southampton University's School of Oceanography website are thirty three British government owned ships. Whilst some of the ships have a quasi military role most are involved purely on research. They are apportioned to different UK government departments and undertake research work for foreign governments also. Consequently the ships work around the world in both national and international waters. The ships, manned by mercantile crews, are merely platforms for peripatetic scientists to do their academic work from. I was Master of one of these ships engaged in fisheries research, *Corystes*, for a short cruise during the summer of 2002.

Corystes is fifty three metres long and was built, in the shape of a trawler, specifically for research purposes. Space onboard is at a high premium as the ship carries up to thirty one people, is configured with both a side gantry and for stern

trawling, and has three permanent laboratories. Half the complement of people carried onboard are scientists. The scientists are culled from both university and fishery institutions, and they work hard each day from breakfast until the end of the day's assignment. My crew and I sailed the ship from Lowestoft out into the North Sea to begin work first in the Thames Mouth and then in the Silver Pit. During the night, while the scientists rested, I sailed to the next designated place or stemmed in the same place for more work to be done there the next day.

The work involved beam trawling within the water column and inspecting the sea-bed area. We involved the sea-bed with side scanning and grabbing samples of what lay there, or coring and bringing up samples from within its top metre. The soundings, mud, vegetation, crustaceans and fish brought onboard were then analysed in the permanent wet-, dry- or acoustic-laboratories or in one of several temporary laboratories chosen for the particular voyage. As a seaman it was gratifying to be shown the eponymous 'corystes' crayfish.

I could not help but contrast attitudes and fish between the present and what I had first encountered forty years previously. In 1963 I had sailed on a sidewinder to Spitzbergen and Bear Island where we always caught well in excess of a tonne of fish in each trawl. Whilst deep-water commercial trawling then was primarily for cod and haddock the present scientific inshore endeavour was to look at the entire water column and to inspect all of the benthos. In the far north, fish had been longer than a teenager is tall, and also heavier than he, in the North Sea the fish specimens were but bare morsels. The commercial past induced radio led shoal hunting wheras the scientific present was a minute amassing of a bank of empirical data.

In half a life I have witnessed the ocean being fished out, and have valued this singular opportunity to see what oceanographers are doing to conserve the wild pelagic and return Neptune's riches. For an historian, the special interest lies in that it is the skills of the redundant trawlermen that are particularly being sought and utilised by the scientists to expedite their adventure. (Contributed by Paul Hughes, Airmyn, Yorkshire, UK)

ILLUMINATING NATURE. The 14th Annual Conference and AGM of the Society for the History of Natural History will be held in the Palazzo Nonfinito, Florence, Italy, 8-10 May 2003, devoted to how illustrations portray natural history, information derived from them, and the techniques involved. For information and registration, contact Gina Douglas, 23 Jeffreys Road, London SW4 6QU, UK; e-mail Gina.Douglas@ukgateway.net or Gina@linnean.org. The Society's website is http://www.shnh.org.

HISTORY OF SCIENCE SOCIETY ANNUAL MEETING. HSS will meet in Milwaukee, Wisconsin, USA, 7-10 November 2002. Major themes are topographies of knowledge; circulation: knowledge, objects, practices, people; and visual cultures of science, technology and medicine. For information and the program outline, see http://www.hssonline.org/2002meeting.

ORDERING THE WORLD IN THE EIGHTEENTH CENTURY. A meeting of the British Society for Eighteenth-Century Studies in Manchester, 12-13 September 2002, will include, among other topics, the ordering of physical space through topography, perspective and cartography in relation to political and social concepts. Information from fog@man.ac.uk or dianadonald@ukonline.co.uk.

HISTORY OF GEOPHYSICS. The History of Geology Group will hold a symposium on this topic at the Geological Society, Burlington House, London from 12-13 March 2003. Offers of papers by September 30 to Prof. Richard J. Howarth, University College, London (r.howarth@ucl.ac.uk).

SCOTTISH POLAR EXPLORATION. A meeting at the National Museums of Scoland, Edinburgh, 12 March 2003, to coincide with an exhibition celebrating the Scottish Polar Expedition of 1903 led by W.S. Bruce. Information from Geoff Swinney (G.Swinney@nms.ac.uk)

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