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EDITORIAL - *On people and places*

This third *History of oceanography newsletter* has been prepared just after the appearance in print of two new, important publications on the history of the marine sciences. Both tell us of resources for research on our field and should warn us of the danger of losing them.

The proceedings of the 5th International Congress on the History of Oceanography, edited by Walter Lenz and Margaret Deacon have been sumptuously produced by the Bundesamt für Seeschifffahrt und Hydrographie as a special issue of the *Deutsche Hydrographische Zeitschrift* under the title *Ocean sciences: their history and relation to man*. This volume consists of 74 papers by many authors and, as expected, is Eurocentric, oriented to the marine science of Germany and other western nations. But there are also welcome contributions from China, India, Egypt, the Sudan, West Africa and South America. There are number of first-person accounts of the history of oceanography, and especially of international organizations such as I.C.E.S., SCOR and the IOC. And a remarkable unpublished work by Alexander von Humboldt on the Gulf Stream and oceanic circulation is discussed for the first time. Among all the exciting riches of this volume, I was especially interested in the contributions from eastern Europe, taking us back to the varied and little-known science being done in and around the Austro-Hungarian Empire at the beginning of this century. And I was impressed by how important personal reminiscences may be in the history of oceanography. In my opinion human memory is *the* great, nearly untapped resource in the history of oceanography - and one that time takes away from us all too rapidly. Oral history is not without flaws, but as historians of oceanography we will lose the irreplaceable if we spend all our time reading and do not record the memories of those who saw history take place.

The third of Dr. Christian Carpine's catalogues (1991) of oceanographic instruments in the Musée océanographique de Monaco deals with biological samplers. An earlier catalogue (1987) described the Musée's collection of photometers and current meters, and another volume, being prepared, will deal with water sampling instruments. Each instrument is beautifully photographed, and each is given a brief but information-packed account, including the origin and manufacturer of the instrument, its dimensions and use, and a list of references dealing with its technical aspects or scientific use. These catalogues are important works of scholarship and rich sources of information. They are only an indication of the value of the Musée océanographique de Monaco; its instruments, specimens, even the fabric of the Musée itself, spectacularly situated on the cliffs of Monaco-Ville, overlooking the Mediterranean Sea toward Corsica. The library of the Musée in Monaco is unparalleled in historical riches, but is very little known to historians and scientists. Just as we need to pay more attention to our colleagues as historical sources, we should designate the Musée Oceanographique de Monaco, because of its instrument collections and library, a World Heritage Site of the history of science. Recognizing the value of the Musée and of one or two other remarkable institutions is only a first step toward assuring them a bright future.

Eric Mills

THE OCEANOGRAPHIC STAMPS OF MONACO:

THE STORY OF ANAPHYLAXIS

By

Tony Rice

IOSDL, Wormley, Godalming, U.K.

Ninety years ago, in August 1901, two French bacteriologists began a series of curious experiments in the middle of the Atlantic which ultimately led to the most significant medical advance arising directly from oceanography (Figure 1).



Figure 1. The 1953 Monaco stamp issue to commemorate the discovery of anaphylaxis appeared in three denominations, 2F, 5F and 15F, all with the same design but with different colour combinations. In addition to Prince Albert, Portier, Richet and *Physalia*, the stamp anachronistically depicts *Hirondelle II*, the Prince's fourth and final vessel which was not launched until 1911 and therefore had no direct connection with the anaphylaxis story.

The two scientists, Charles Richet a 52-year-old Professor of Physiology in the University of Paris, and Paul Portier an assistant in the Laboratory of Physiology at the Sorbonne and 16 years Richet's junior, were the guests of Prince Albert I of Monaco on his yacht, *Princesse Alice II*. Prince Albert has been undertaking research cruises each year since 1885, initially on a small two-masted sailing schooner which he had bought in Torquay in 1872 and, since 1892, on specially built vessels. The 1901 cruise was on the *Princesse Alice II*, a 73 metre long steel-hulled two-masted schooner with a 1000hp triple expansion steam engine, built by Lairds of Birkenhead and launched in 1897. The ship left Toulon on 5th July for a cruise around the Canaries, Madeira and the Azores mainly to make biological collections with plankton nets, trawls and traps. During the cruise Richet and Portier intended to make observations on marine bacteriology, a rather avant garde subject at the time, but Albert encouraged them also to take an interest in the toxic qualities of the Portuguese Man-o-War, *Physalia physalis*.

The painful burning weals produced on human skin by the stinging tentacles of *Physalia* were, of course, only too familiar to scientists and fishermen alike, but a curious phenomenon occurred when the Man-o-war's toxins attacked its more usual prey such as a small fish. During earlier cruises, Prince Albert and his permanent scientific director,

Jules Richard, had noticed that as soon as such a fish swam into the slender and delicate tentacles of a Man-o-war it would be rendered totally immobile. A single flick of the tail would probably free the fish, but it would seem to be quite incapable of doing so even though the movements of its gill covers showed that it was far from dead.

By early August *Princesse Alice* was encountering abundant *Physalia* and Richet and Portier were able to observe the effects of the toxin at first hand. In the ship's laboratory they ground up the stinging tentacles of the Man-o-war in sea water and extracted the toxin as a rather pretty blue liquid which was then injected into ducks, pigeons, guinea pigs and frogs which had been taken aboard for the purpose. Within minutes the injected animals were immobile and apparently unconscious, just like the little fish, and the physiologists christened the toxin "hypnotoxin" accordingly. A gruesome accident graphically confirmed the anesthetic qualities of the toxin when an unfortunate pigeon, left on deck in this comatose state while the scientists were dining with the Prince, unprotestingly allowed the skin from its head and neck to be removed by the ship's parrot!

Richet and Portier could not carry their experiments any further on the ship but they continued the study after they returned to Paris. Unable to obtain further specimens of *Physalia*, they used instead the similar, but less virulent, toxins of the Man-o-war's shore-inhabiting relative, the snakelocks anemone *Anemonia sulcata*, which could be readily collected at the university's marine laboratory at Roscoff. The toxins of these animals, extracted in glycerine and injected into dogs, gave precisely the same results as those obtained on the ship. Further experiments determined the lethal dose of the toxin for various victims and the initial aims of the study were thus completed.

If the work had stopped at this point, then the results would have been interesting but not exceptional. But the scientists went on to investigate the effects of repeated sub-lethal doses of the toxin and in doing so raised the study onto a quite new plane. Ironically, in view of the later distribution of the subsequent acclamation, this seems to have been Portier's idea, with Richet showing little or no enthusiasms for it initially. At any rate, over the winter of 1901-1902 a number of pigeons, guinea pigs and dogs were injected with initial doses of the toxin which were either known to be beneath the lethal threshold or had been inactivated by heat treatment. After an incubation period of a few days the treated animals were re-injected, usually with a somewhat stronger dose than the first.

Portier clearly expected the subjects to develop immunity to the toxin as found in the well-known studies of Pasteur and von Behring published in the 1880's and 90's. But quite contrary to these expectations, the results were very confusing, for many of the animals appeared to show an increased sensitivity to the second dose rather than immunity. At first Richet refused to believe Portier's results, maintaining that he must have made mistakes in the experimentation. Portier repeated the experiments, obtained the same result and convinced his colleague that there had been no mistake. Now there followed a period of intense activity. A whole series of dogs was injected with small doses of the toxin at varying intervals, with results that became more and more intriguing.

The effect of the initial injection would always be relatively minor and short-lived, within an hour or two the dog becoming alert, active and showing no ill-effects. A similar dose injected within a few days would produce a rather more dramatic reaction, but the dog would soon recover. But the longer the interval between the two injections, the larger

the effect, and a second injection four or five weeks after the first would almost invariably lead rapidly to death.

Dog after dog was subjected to the procedure, many of them showing appalling symptoms including vomiting, acute muscular tremor and internal hemorrhage. Modern minds recoil from the later recollection of the height of the research by Richet's son, who remembered his father's laboratory being littered with dogs in varying states of deterioration ranging from minor discomfort to imminent death. But their sacrifice was to help prevent untold human suffering. Richet christened the hypersensitive phenomenon anaphylaxis, meaning without or against protection and intimating, perhaps, that it was quite distinct from the immune reactions discovered by Pasteur and von Behring and already being exploited in therapeutic applications. But the new discovery helped to explain the disturbing reports of cases in which serious, and sometimes fatal, reactions had followed the injection into humans of antisera prepared in animals. Within two years of the announcements of the discovery of anaphylaxis by Richet and Portier, von Pirquet was able to introduce the concept of "allergy" to encompass both hypersensitivity and immunity.

This unifying concept played an important role in stimulating the subsequent work on immune and hypersensitive reactions to all manner of "foreign" substances. By 1913 the discovery of anaphylaxis, and Richet's later work on the subject, were recognized by his award of the Nobel Prize for physiology, but in his acceptance speech Richet made only a passing reference to Portier's contribution. The younger man apparently accepted this somewhat unjust situation without rancour and remained on good terms with his senior colleagues until Richet's death in 1935. Even before the 1901 experiments, Portier had shown a major interest in the biochemical and physiological aspects of marine biology. He persisted in this interest instead of following the promising immunological path, becoming a professor at the Institut Océanographique in Paris in 1906 and subsequently publishing numerous papers on the physiology of marine animals. His contribution to the anaphylaxis story was, however, eventually acknowledged, for he survived until 1962, having received international acclaim during the celebrations to mark the fiftieth anniversary of the discovery which included a Congress of Clinical Medicine held in Monaco in 1953 and the issue of a series of commemorative stamps.

Few of the millions of beneficiaries of the work of Richet and Portier would realise that it all began with experiments with a jellyfish and some unfortunate pigeons on the sunlit waters of the Atlantic one summer's day in 1901.

ACKNOWLEDGEMENT

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THE OTTO PETTERSSON PAPERS

From Uppsala Newsletter, No. 13, pp. 4-5,
relayed by Anita McConnell, London

The papers of Otto Pettersson (1848-1941) have come to light in Sweden. Pettersson was Professor of Chemistry at the Stockholm Högskola (1881-1909) and a close friend of Svante Arrhenius. From 1880 onwards, Pettersson did research on the physics and chemistry of the sea. He left Stockholm in 1909 to devote himself fully to the oceanographic research station that he had set up on Bornö in the 1890's. It was on Bornö, in the outer skerries of the Swedish West coast, that his papers were kept until the Station closed down in 1985. The collection was then transferred to the Oceanographic Laboratory of the Swedish Meteorological and Hydrological Institute (SMHI) in Gothenburg where it is now. A preliminary inventory of the collection has been drawn up by Elisabeth Crawford. The collection (about 15 meters of shelf) embraces all the different phases of Pettersson's varied and often stormy life in the study of chemistry and oceanography.

PROFESSOR NILS JERLOV (1910-1990)

Translated and edited by Per Jacobsen, Stjørdal, Norway
from article by Gunnar Kullenberg in *Svenska Dagbladet*, 2 July 1990

Professor Nils JERLOV, Gothenburg, Sweden, has passed away at the age of 80. He graduated in 1932 and took his doctor degree in 1939 at the University of Lund. In 1963 he was appointed professor in physical Oceanography at the University of Copenhagen, Denmark, a position he held until 1978 when he retired.

Nils Jerlov took part in a number of expeditions, a.o. he participated in the Swedish world wide oceanographic expedition with the R/V Albatross 1947/48. Nils Jerlov had many specialities, but his great interest was optical oceanography, the knowledge of the optical properties of the sea water, including light penetration and processes that influence the light penetrating sea water. Nils Jerlov was stimulated to his optical research by the late professor Hans Petterson. In this field he became one of the most outstanding scientists for several decades.

Nils Jerlov was member of a number of international associations such as the International Association for physical oceanography, the Scientific Committee on Oceanic Research, the Nordic Committee on physical oceanography and the Danish National Board for Oceanology as well as many others.

In cooperation with the professor B. Kullenberg Jerlov made outstanding investigations of the optical properties of sea water. His fundamental optical investigations

together with the measurements from the Albatross expedition laid the background for the optical classification of sea water which is known as the "Jerlov classification".

Jerlov was very active in many fields. He wrote publications on nuclear physics, the heat budget of the sea water, pollution problems, in addition to a great number of publications on optical oceanography. He concluded his own and other research colleagues' work in the book "Optical Oceanography", later revised, extended and published under the title "Marine Optics". In Copenhagen Jerlov and his staff established an institution which became world famous in optical oceanography. Many scientists visited the institution and many world wide projects and sea-going expeditions were initiated.

Jerlov was a man of peace and had no understanding of disputes between colleagues about publication of scientific results. He was very cooperative and took many initiatives to accomplish national and international cooperation.

NEWS AND EVENTS

HISTORY OF OCEANOGRAPHY IN GERMANY. The Deutsche Gesellschaft für Meeresforschung (address Bundesstrasse 55, 2000 Hamburg 13) has established a working group on the history of marine research. It is open to all those interested in German marine science, including history of natural sciences, mathematics and technology; history of discoveries and geography, economic history, political history, and maritime history. It is hoped to begin a yearly series of publications and to establish a database along with other projects. Further information: Walter Lenz, c/o DEM at address above.

OCEANOGRAPHY AT ROYAL MUSEUM OF SCOTLAND. A new scientific instruments gallery, planned by Alison Morrison-Low, has opened at the RMS in Edinburgh. It includes oceanographic instruments representing the distinguished history of oceanography in Scotland.

THE EXTENDED U.S. TERRITORIAL SEA. At a meeting at the Law School, University of Hawaii, in January 1991 Professor Harry Scheiber and his co-author Chris Carr of the University of California at Berkeley presented a paper on problems of United States fisheries oceanography and management in relation to extended jurisdiction policies, 1945-1989. A paper by Jack Archer and David O'Connor, also historical, dealt with the public trust doctrine and the territorial sea.

OCEAN RESOURCES: INDUSTRIES AND RIVALRIES SINCE 1800. A volume with this title, edited by Harry N. Scheiber, contains a number of historical papers (see bibliography in this Newsletter). Based on papers prepared for the 10th International Economic History Congress, Leuven, Belgium, it is available for U.S. \$14 postpaid from the Center for the Study of Law and Society, University of California at Berkeley, Berkeley, CA 94720, U.S.A.

DOCUMENTA MARITIMA. Dr. Herman Heberlein of Breganzona-Lugano, Switzerland has contributed his outstanding private collection of 6500 books and large numbers of documents on the history of marine and freshwater research to the Deutsche Schiffahrtsmuseum in Bremerhaven. "Ein Geschenk von Himmels" according to an official of the DSM, the collection was transported to Bremerhaven in 352 cartons.

FIRST INTERNATIONAL CONGRESS ON DISCOVERIES AND HEALTH. A congress organized to commemorate 500 years of Portuguese maritime discoveries was held in the Escola Nacional de Saúde Pública, Lisbon, 10-13 September 1990. Fifty participants from Portugal, the U.K., Japan, U.S.A. Spain and France presented papers on medical subjects related to Portuguese maritime discoveries and their era. Proceedings will be published by the Escola Nacional de Saúde Pública, Av. Padre Cruz, 1699 Lisboa Codex, Portugal and the Ordem dos Médicos of Portugal.

HELP! - DATA AND THEORY IN PHYSICAL OCEANOGRAPHY

David Irvine

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Accepting the kind offer of Professor Mills, I would like to introduce my interests in history of oceanography, and also ask this community for assistance. I have been interested in history and philosophy of science for a long time, and now have an opportunity to engage that interest in the service of my current project with the NASA Master Directory.

The MD is an on-line, free access data directory with nearly a thousand references to data sets in both space and earth sciences, including more than two hundred in oceanography. One of my principal tasks is to expand the ocean science section of this directory. Because of the broad scope of the project, we cannot depend upon a fixed set of investigators to define relevant data. We sometimes find ourselves making decisions based largely on our opinion of how scientists use data. But how, in fact, DO they use data? The answer to that question depends upon how one views science. If scientists work to extend the range and accuracy of explanations of phenomena, then the relation between theory and data would seem to be straightforward. Science becomes a cumulative enterprise resting upon a growing set of observations. The role of data ought to be obvious in a descriptive, environmental science like oceanography.

But, in *THE STRUCTURE OF SCIENTIFIC REVOLUTIONS* (which I discovered as a graduate student), Thomas Kuhn pointed out the inadequacy of this "cumulative" view of science, which he claimed "did not fit the enterprise that historical study displayed". Nor, I would have added, did it fit my experience as a student and researcher. The conception of science as the formulation and testing of hypotheses is not wrong, exactly. But it was not a very good description of what I and those around me were doing, either. On the other hand, Kuhn's description of normal science as puzzle solving within the context of a discipline-dependent paradigm fit very well indeed. Within this view of science, the relation of data to theory is more subtle, requiring an understanding of this paradigm. This, in turn, seems to require an understanding of the history of the relevant science - which brings me to my research project.

I intend to study the role of data in the controversies that surrounded the evolution of ocean wave spectral models. I've selected this particular niche in physical oceanography for several reasons. First, I obtained my doctorate in ocean waves (unraveling a puzzle in the interpretation of some laboratory spectra), and worked for eight years in ocean wave theory relevant to satellite oceanography. I know some of the people who developed ocean wave spectral models. The data used in several important papers of the period were drawn from public archives, so I should learn something relevant to my work with the Master Directory.

Finally, though, I think that the study will show something interesting about the enterprise of physical oceanography, and how it uses data. In the modeling and prediction of wave spectra, there were (at least) two schools. One drew heavily on weakly nonlinear theory (wave-wave interaction), invoking statistical reasoning to show how these interactions would combine to produce some of the most characteristic features of observations. The other school looked more intently at the observations, using statistics

as the principal device for uncovering structure in the data, and regarded the nonlinear theories skeptically. The data played significantly different roles in these two schools.

I will close with a request for assistance. Though I spent two years on the faculty of St. John's College, learning philosophy and history from the 'great books', there is still much about philosophy of science I do not know. How do historians and philosophers view science? What is written about the relation of data to theory - especially in descriptive, environmental sciences such as oceanography? I would greatly appreciate references. Actually, I would be happy just to find someone interested in questions like those I propose to investigate.

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MEETINGS

- 18-20 October 1991. CANADIAN SCIENCE AND TECHNOLOGY HISTORICAL ASSOCIATION. Ottawa, Canada. Devoted to 75th anniversary of National Research Council of Canada, government and science, and history of Canadian science policy. Contact: Philip Enros, Science Council of Canada, 100 Metcalfe Street, Ottawa K1P 5M1, Canada.
- 30 October - 3 November 1991. HISTORY OF SCIENCE SOCIETY ANNUAL MEETING. Madison, Wisconsin, U.S.A. Combined with Society for History of Technology. Information: HSS/SHOT Local Arrangements, Department of the History of Science, University of Wisconsin, 4143 Helen C. White, Madison, WI 53706, U.S.A.
- 12-16 January 1992. THIRD LATIN AMERICAN CONGRESS OF THE HISTORY OF SCIENCE AND TECHNOLOGY. Mexico City. Inquiries: Comité Organizador III CLAHCT, Aparta do Postal 21-873, 04000 México DF, Mexico.
- 24-26 April 1992. VANCOUVER CONFERENCE ON EXPLORATION AND DISCOVERY. Burnaby, B.C., Canada. Commemorates 200th anniversary of Capt. George Vancouver's arrival off NW North America. Inquiries: The Vancouver Conference, Department of History, Simon Fraser University, Burnaby, B.C., Canada V5A 1S6.
- 26-28 July 1992. JOINT HISTORY OF SCIENCE MEETING OF History of Science Society, Canadian Society for History and Philosophy of Science, and British Society for History of Science. Toronto, Canada. Theme: history of laboratories and laboratory science. Local arrangements: Dr. Polly Winsor, IHPST, Victoria College, University of Toronto, Toronto, Canada M5S 1K7. Proposals for sessions on papers: Trevor Levere and Jed Birchwald, IHPST, as above.
- July 1993. Vth INTERNATIONAL CONGRESS OF HISTORY OF OCEANOGRAPHY. Scripps Institution of Oceanography, La Jolla, California. Theme: Oceanography - the Pacific perspective. Dates to be announced. Local arrangements: Deborah Day, Scripps Institution of Oceanography Archives, La Jolla, California 92093, U.S.A. Proposals for papers and sessions: P.F. Rehbock, History Department, University of Hawaii, 2530 Dale St. Honolulu, Hawaii 96822, U.S.A. or Keith Benson, Department of Medical History and Ethics, University of Washington, Seattle, Washington 98195 U.S.A. DATES AND INFORMATION IN NEWSLETTER #4.
- 22-29 August 1993. XIXth INTERNATIONAL CONGRESS OF HISTORY OF SCIENCE. Zaragoza, Spain. Information: Prof. Mariano Hormigon, Facultad de Ciencias (Matemáticas), Ciudad University, E-50009 Zaragoza, Spain.