MEETING THE DEMANDS OF HISTORIOGRAPHIC FASHION: THE PROBLEM OF MARINE SCIENCE ARCHIVES.

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Abstract

Changing fashions in the historiography of science should result in changes in the kinds of collections held in marine science archives. There is always a need for standard archival material. But because the marine sciences are interdisciplinary and relatively young it is important to represent the cultural setting in which they have developed, and to collect oral records while important persons in the development of these fields are still alive.

"Institutional history at its best will reveal the ways in which learned societies, museums, universities, laboratories and research centers provide an essential though sometimes tempestuous channel for the passage of personal and intellectual aspirations in the world of modern science." (1, p. 36).

"... meaning is a social accomplishment; it is something that actors achieve in the course of doing things with culture in concrete historical circumstances. Men make meaning." (2, p. 47).

Marine science archives present two problems. First, should they exist at all? I take it as given that they should, even though my opinion may be contested by cost-anxious administrators and a few excessively positivistic scientists. The second problem is more subtle and difficult: what should marine science archives contain, what should archivists attempt to collect, and what clientele do they serve? The answers to these questions are summarized rather well by the quotations beginning this essay. Nonetheless, I want to develop a case for an approach to archives and archival collections that will increase their usefulness as tools to the historian of the marine sciences. My approach is founded in my belief that the role of history - and of historiography, the writing of history - is to provide critical explanation of the past (3). Here the word "critical" is crucial; it is the locus of discussion in what follows, whether I am discussing what historical resources we have in the marine sciences or what we need in the future.
Historical resources in the marine sciences

The history of the marine sciences, taken as a unit of study, is seriously underdeveloped compared to, say, the history of geology, the history of physics, or the history of biology (4). No single journal serves the field, although *Eos and Earth Sciences History* sometimes make more than a tip of the hat to the marine sciences outside geology/geophysics when they can. The main problem is that very few historians of science have discerned the riches that exist in the history of the marine sciences, ranging from the study of explorations to the rise of institutions and collaborative research programmes. This makes the role of archivist particularly difficult. How can one or should one meet the needs of an undeveloped discipline? It requires some faith in the future of scholarship to build marine science archives. That faith is fully justified by significant historical problems posed by the historical writings now available on marine science institutions.

Book-length historical works on the history of marine science are relatively rare. The first, least recognized, and probably most deserving of critical analysis, is the polymathic John Murray's account of the history of oceanography published in the *Challenger Reports* (5). Sir William Herdman's *Founders of Oceanography and Their Work* (6) is still a standby for historians needing brief, potted biographies (in a late Edwardian mode) of a few major figures in the field. Nearly fifty years later Margaret Deacon's *Scientists and the Sea* (7) and Susan Schlee's *The Edge of an Unfamiliar World* (8) gave a much-needed boost to the history of oceanography when the science itself was at its peak after World War II. Deacon's book is oriented mainly toward physical oceanography and the significance of the *Challenger* Expedition, Schlee's is strongest on the development of American science in the nineteenth and twentieth centuries. Both, deservedly, have played an important role in interesting scientists in the history of marine science, as one can see by examining papers given at the Third International Congress of the History of Oceanography, held at Woods Hole in 1980 (9).

Institutional history, per se, plays a relatively small role in these four major works. What then is the corpus of historical work on marine science institutions? I have identified about 30 monographic works (that is, longer than papers and up to the length of full fledged books) that allow the field to be delimited and its historiographic problems approached.

Understandably, national laboratories have received the most attention. At the head of these studies stands C.A. Kofoid's *The Biological Stations of Europe* (10), ostensibly an account of European laboratories for the University of California and the U.S. Bureau of Education, but a little recognized resource for the historian of marine sciences because Kofoid took the trouble, during his year in Europe in 1908-1909, to document the history of each laboratory. The result is interesting, tantalizing, and frequently useful. Even more useful would be the notes on which the book is based. As the archetype of its kind, the *Stazione Zoologica* at Naples, gets attention from Groeben and Müller (11),
Partsch (12) and Metz (13). The long-standing link between Naples and the Marine Biological Laboratory, Woods Hole, is a major theme in the work edited by Metz. The MBL itself is described and accounted for by Lillie (14) in a classic account now about to be reprinted. The development of the first laboratory at Woods Hole, the U.S. Fish Commission Laboratory, dating from 1875-1885, and its successors, is described by Galtsoff (15).

Johannes Petersen's role in European marine science and the work of the Danish Biological Station is the subject of a monograph by Harald Blegvad (16). The biological stations of Bergens Museum and the University of Bergen have many links to the rest of European marine science, including oceanography, as Brattström (17) shows. Theel (18) outlines the history of Sweden's Kristineberg Zoological Station. The first marine biological stations appeared in France during the nineteenth century (at Concarneau, 1859); in an early work Lacaze-Duthiers (19) describes the origins of the stations at Roscoff and Banyuls-sur-Mer, while a recent work by Tregouboff (20) deals with the Station Zoologique at Villefranche-sur-Mer. Useful printed works on British marine laboratories also exist, including M'Intosh's (21) on the Gatty Marine Laboratory at St. Andrews, a compilation by various authors (22) on the Dove Marine Laboratory at Newcastle-upon-Tyne, and Southward and Roberts's (23) centenary account of the Plymouth Laboratory. Sheina Marshall's (24) lengthy account (undated) of the laboratory at Millport, Scotland has never been published.

Marine science commissions and governmental organizations come next. First in the field, the origin and scientific work of the Kiel Commission (Kommission zur wissenschaftlichen Untersuchungen der deutschen Meere in Kiel), was outlined briefly by Brandt (25). Poulsen's monograph (26) of the Danish Commission for Fisheries and Marine Research is the main source on a Scandinavian government commission. The International Council for the Exploration of the Sea, which brought together many strands of European marine science during and after its foundation at the turn of the century has been examined historically several times (27,28,29,30) but a definitive history, linking its origins and activity to wider European culture is overdue. Studies of North American marine science institutions are scarce, they include Hachey's (31) and Johnstone's (32) books over the now extinct Fisheries Research Board of Canada, and Pinsell's work (33) on the United States Naval Oceanographic Office. Johnstone's book, in particular, contains many useful personal accounts of events in Canadian marine science and accepts explicitly that it developed in a political setting. Internationally, the history of the Intergovernmental Oceanographic Commission of UNESCO is outlined by Roll (34).

Finally, oceanographic institutions, which now dominate work in the marine sciences (at least in North America), have been rather poorly investigated historically. Only the Scripps Institution of Oceanography, since its origins as the laboratory of the Marine Biological Association of San Diego, has been treated at book length (35,36). Both
accounts focus on the internal development of Scripps, leaving the broader context in which it developed (especially after World War I) almost entirely untouched.

This brief review, which is not intended to be synoptic, indicates that there is a little-known substratum of historical work on marine science institutions. But examined carefully, these historical works reveal several problems in the historiography of the marine sciences and of the archival resources on which the historiographical reconstructions are based. To focus on these, I will move on to a close examination of a few works that allow me to examine styles of writing history as they are - or can be - applied in the history of the marine sciences.

**Historiography in the marine sciences - a personal view**

Styles in the writing of history change, just as do all styles. This can be clarified, by analysing the approaches taken - explicitly or implicitly - by the authors of historical monographs during the past 50 years or so. To make my case I am going to step outside the strict limits of marine science histories, but without pushing them entirely aside. Each of the works I will mention bears in some way on the history of marine sciences, though not necessarily in a direct way. Specifically, I will examine briefly Goddard's (37) history of the Natural History Society of Northumberland, Durham and Newcastle-upon-Tyne, Gage's (38) history of the Linnean Society of London, Johnstone's (32) account of the rise and demise of the Fisheries Research Board of Canada, then contrastingly, Howarth's (36) versus Thackray and Morrell's (40) account of the British Association for the Advancement of Science.

Goddard's book on the history of a northern English natural history society is a classic of its kind. Although he begins with Euripides' suggestive epigram that the study of nature leads to knowledge and peace (a widely used rationale for social harmony through group action in the nineteenth century), Goddard's approach is one I characterize as the "outstanding landmarks" style. Chronologically, the accomplishments and vicissitudes of the Society (which supported marine biological research in northeast England) are set out in order as though they had no relation to the wider society in which its members lived and worked.

This kind of internal account is carried to an even greater extreme by A.T. Gage in his mainly chronological account of the names and events in the lengthy life of the Linnean Society of London, which spawned a number of other British professional societies. With some wit, Gage seldom strays far from the four walls of Burlington House where the Society is still located.

An unpretentious account of a far different kind is Kenneth Johnstone's journalistic account of marine science in Canada from mid-nineteenth to mid-twentieth centuries. Johnstone depends heavily on first-person accounts (in letters and audiotapes) of scientific and political machinations in and around the Biological Board of Canada and
its successor (after 1932), the Fisheries Research Board of Canada. One does not have to scratch very deeply to find here a historiography acknowledging that science can be greatly affected by - and play a role in - the political sphere. Johnstone does not make that point, but it is hard to escape this conclusion even upon a superficial reading of The Aquatic Explorers. It would be hard to find a greater contrast to the dry-as-dust, dates and places approach.

Two histories of the British Association, which among other activities supported Edward Forbes's marine investigations in the Aegean and around Britain during the 1840's, are useful illustrations of the transformation of historiographical style that has occurred between the 1930's (perhaps even the 1960's) and the 1980's. O.T. Howarth's history of the B.A., written for its centenary in 1934, is a competent account in the "great men and great researchers" tradition. In the first page or two Howarth acknowledges that somehow the B.A. could be linked to "the history of the times", including the political climate created by the Industrial Revolution and the Napoleonic Wars. Thereafter, theory aside, the progress of science is the unabashed theme of the book. The B.A. takes on a life of its own, perhaps linked in some unspecified ways to the larger world outside, so that, from the vantage point of 1934, "to voluntary service in the interests of science the whole record of the British Association stands as one great memorial" (39, p. 264).

But the B.A. may be used as the subject of a quite different kind of history, for example that of Morrell and Thackray in their book Gentlemen of Science, which deals with the origin and first few years of the B.A. While Howarth saw the improvement of science as the noble ideal of the B.A., Morrell and Thackray throw a hard light on the uses of science by the B.A. and its members, pointing out that "what came to be defined as scientific knowledge was especially in demand as a form of rational amusement, as theological edification, polite accomplishment, technological agent, social anodyne, and intellectual ratifier of the new industrial order" (40, p. 12). Moreover, they have taken pains to show, in their own words, "how certain intellectual creations, of Victorian science bear not only the mark of the nature they sought to explain but also of that culture in which they were inextricably embedded" (p. xxi). Here then, is historiography of a quite different kind, in which science is seen existing not just in its own right but as a reflection of social processes, of the "social realities", of nineteenth century Britain.

The most sophisticated and useful recent summary of current historiography in the history of science is Steven Shapin's paper "History of science and its sociological reconstructions" (2). Shapin's approach, characteristic of the "Edinburgh School" of the history and sociology of science, is to explore the complex and often unexpected ways that science (seemingly a rational exercise) and the world of which it is a part (including groups of scientists, the socio-political setting, and intellectual milieus) may be related. Science becomes a human activity rather than a somewhat disembodied ideal produced out of pure thought by purely rational minds. Without question, science affects society.
So too, based on a great deal of recent evidence, science shapes itself in ways demanded by the social groupings in which it is carried out. "Men make meaning" - men must make meaning - because the observable facts of nature seldom if ever prescribe a single explanation of their meaning or single, uniquely specifiable chains of causation. It is the duty of the historian to recognize, and to explicate, the "multifunctional" (Shapin's word) links between science and its society.

None of this will be news to any historian of science who keeps track of the current literature of the field. It is probably not news to many archivists and librarians either. But recognition of the social historiography of science has barely made a dent in the classical collection practices of libraries and archives. I contest that it should make a difference, and that the history of the marine sciences may be an exceptionally useful and interesting area in which "sociological reconstruction" and exegesis can be applied if we have the resources to do so.

Social history and archives in marine sciences

I doubt that developments in marine science can ever be fully extricated from their social setting. Using my own field, oceanography, as the basis of discussion, I contend that the marine sciences are paradigmatically social, and that they have been unjustifiably ignored by historians working in modern historiographic modes. The field is ripe for a transition from the "progress of science" mentality to historical analyses based upon a complex of ways in which an interdisciplinary science like oceanography responds to changes in scientific fashions, the financial climate, developments in technology, and the changing winds of institutional support. Oceanography, an interdisciplinary complex of sciences, is particularly responsive to changes in grant funding, to fluctuations in the availability of laboratories, ships, and other expensive equipment (ranging from mass spectrometers to flow cytometers), and to fashionable new ideas in optics, fluid mechanics and plant physiology. How do scientific ideas originate and change in such a milieu?

Quite clearly the answer will have to depend on the historian's craft applied to archival material of one kind or another. What does the historian of the marine sciences have available? Typical oceanographic archival material appears to be like most other source material. It includes correspondence, especially letters between close colleagues, university and administrative correspondence and memos, calendar pads and manuscripts. Printed papers often play a large role, although they are seldom trouble-free historiographic aids because the conventions of scientific writing frequently disguise the historical sequence and weight of events. Word processor disks may be replacing manuscripts, and the telephone call (or electronic mail) often replaces the letter, so that historical reconstruction is probably more difficult for late twentieth century subjects than it was for the Gentlemen of the British Association if it relies on the printed (or typed) word alone.
Instruments, laboratory materials and collections have played a large part in the marine sciences since the 1870's. Scientific obsolescence of instruments and the loss of old and unwanted collections place troublesome barriers between the historian of oceanography and a realistic reconstruction of scientific practice more than a decade or so ago.

Books and libraries are more permanent and are likely to be preserved, although recently I have had contrasting experiences. Most of G.A. Riley's library still exists; his reprint collection, arranged by years and alphabetically, can be used to reconstruct his range of interests through three decades at Yale, Woods Hole and Halifax. On the other hand, most of the personal papers of G.F. McEwan, the first mathematical physical oceanographer in the United States, have disappeared, thrown out before the Archives of the Scripps Institution of Oceanography were established.

Many other resources may exist to document the history of the marine sciences: computer logs, library borrowing lists, records of telephone calls, applications for and reports upon grants, personnel files, diaries, journals and logbooks, audiotapes and films, recordings for broadcasts or for historical purposes (3, Chapter 11). All may serve as grist for the historical mill. The real problem is what remains, where (and if) it is accessible, and how to use archival material. This is the historian's choice.

The archivist, on the other hand, will want to know who is being served, and in what way collections should be gathered in a world of limited funds and nearly unlimited artifacts, produced daily by the increasing pace of obsolescence (the other face of technological change) in science.

It is not easy to give categorical answers that will apply across the board in the history of the marine sciences. Instead, I want to examine some unresolved historical problems in the field to give an idea what the historian of science can (and eventually will) look for in archives.

**Unresolved historical problems in the marine sciences**

The kinds of problems that historians choose will eventually govern the kinds of archival collections that document the history of the marine sciences. I believe that most archives are now oriented to the "great men and great events" genre of historiography. The kind of history-making, apart from its mythopoetic qualities, is valid, though of limited scope both historically and intellectually, as the preceding section showed. Other kinds of problems are of equal or greater significance.

One outstanding problem that has been recognised (e.g. by Wüst, 41) but not solved, is the reason for the shift in marine biology and oceanography from voyages of exploration to increasingly quantitative studies of marine processes late in the nineteenth century. Once the flurry of expeditions elicited in copy cat fashion by Challenger's voyage (1872-1876) had subsided, expeditions were decidedly outré. Was it because
they were too expensive, or too politically inexpedient, or that science was making new demands? The kind of scientific mentality that organizes a major sea-going expedition is quite different from the one that concerns itself with nitrogen fixation by Cyanobacteria. Yet both played a role in the history of biological oceanography. How have scientific, social and political forces interacted (if indeed these are the appropriate categories) to produce this very real but unexplained change in the history of oceanography?

Of equal significance is the question how physics came to play such a large role in biological oceanography during the first four decades of this century. As early as 1908, W.E. Ritter, a zoologist, was looking explicitly for a physicist who could be brought to the laboratory of the Marine Biological Association of San Diego to follow a new way in marine science. Ritter was not alone in attempting to change the course of American marine science. C.A. Kofoid, writing from Europe during his travels in 1908 - 1909, tried to recruit D.J. Matthews, a first class chemist and hydrographer from Plymouth, also the iconoclastic young phytoplankton specialist from Kiel, Hans Lohmann, to Ritter's laboratory or to the Berkeley faculty. What vision did Ritter and Kofoid have? What made them dissatisfied with American marine science? What was the outcome of their dissatisfaction?

On the other coast, mathematical physical oceanography penetrated biological oceanography and began to grow within it about the time Gordon Riley and Henry Stommel began work at Woods Hole in the early and mid 1940's. Riley had come from Yale, where he had developed under the tutelage of G.E. Hutchinson into a quantitative ecologist quite outside the pattern of American ecology. Hutchinson's belief that mathematics was a symbolic language of equal or greater value than verbal descriptions of ecological processes had a great effect on Riley, who in the mid 1940's turned to mathematical modelling of biological oceanographic processes using up-to-date physical oceanographic methods. But although the outlines of this remarkable intellectual innovation seem crisp and clear, the real patterns that led to Riley's work - and to the general use of mathematics in biological oceanography - are unexplored.

Finally, an even more recent example will indicate the range of subjects awaiting the historian of the marine science. The first International Congress on the History of Oceanography, held in New York in 1959, was both retrospective and prospective (42). Many of its plenary speakers were the grand old men of the field, yet the Congress marked the beginning of oceanography's golden age, the 1960's and the 1970's, when nearly every aspect of marine science was revolutionarily changed, from marine geophysics to deep-sea biology. What forces led to the remarkable flowering of oceanography after 1959? Was it the delayed effect of World War II, which had brought the military with its money bags into oceanography? Was it the mutual reinforcement of scientific disciplines that had become increasingly quantitative during the preceding three decades? Was it the sheer weight of increased scientific manpower in an ebullient world economy? Perhaps all of these apply. One thing is sure: classical disciplinary
history of science will not provide the answers.

My examples have shown, just as Shapin suggests, that historiography is the production of models of historical reality. The grist for such historiographic mills will depend a great deal on the historian's choice of approach as well as on the contingencies of what remain in archives, in the published record, and in memory.

The problem of marine science archives

The unifying thread in all I have written is that context is important in the history of science, and that context has been neglected in one of its least-developed branches, the history of the marine sciences. The general historical setting as well as the detailed analysis of intellectual and social interconnections in the marine sciences - where they ought to be manifest - have been neglected or even eschewed in most historical accounts.

In practical terms, this means that we need to think hard and carefully about historiographic approaches, historical analysis and archival resources in the history of the marine sciences. We cannot expect the archivist to do the historian's work of research and analysis (although some do it quite expertly), but we can and should recognize that marine science archives must be more than banks of old data to provide true service to historians. Current archives vary greatly in this respect, according to my observations.

If what is needed is material documenting the economic, social, political, even cultural setting of developments in marine science, clearly the archivist cannot provide everything the historian needs. But the archivist can recognize trends in the historiography of science and respond by broadening the nature of marine science collections. In particular, because the marine sciences are relatively young, the ratio of living pioneers to dead ones is still quite high. Now is the time to devote extra resources to oral history, especially to gathering verbal accounts of the opening of new research areas, groups, and institutions. Letters, diaries and ephemera that throw light on personalities and on personal interactions are valuable, provide important insight, and are irreplaceable. But time is of the essence: since I began a study of the development of quantitative biological oceanography in 1981, four of the pioneers of that field have died.

Only archival collections can provide a constant substratum upon which our historiographic models of historical reality can be constructed. Archives allow us to find data, check the validity of our ideas, give us reasons for specific approaches, and allow us to correct and update our historiographic models, that is, our historical accounts of the marine sciences. They should reflect the needs of the historian rather than the housecleaning of the administrator. The imperative, after all, is history, which is an important aspect of human culture. We attempt to honour the tribulations and the accomplishments of our precursors through historical analysis; we also provide through history a badly needed humanistic input to science. Marine science archives have an important role in this - but their role will be adequate only if they reflect the culture in
which scientific accomplishment takes place.

References


