

Number 17

September 2005

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Editorial – Understanding the Golden Age

These reflections were stimulated by reading Jacob Hamblin's book *Oceanographers and the Cold War: Disciples of Marine Science*, published earlier this year by the University of Washington Press. In Hamblin's words, this book deals with "...one of the great paradoxes of oceanography during the first decades after World War II. Support for research was based on its usefulness for making war on other nations. At the same time oceanography retained an identity that tied it closely to international cooperation" (p. xviii). Those of us, like me, who began to work in oceanography in the 1960s, were aware, usually dimly, that we were participants in global affairs unfolding around us, and especially that an amazing expansion of the marine sciences was underway both scientifically and financially. One still, sunny afternoon in the Gulf Stream one of my colleagues said that we should forget about the golden Classical Age of the Greeks – we were in the true Golden Age. And so it was – for a time. Hamblin makes it clear in his outstanding study of the relationship between oceanography (mainly, although not entirely in the USA), the US military, and international affairs in the 1950s and 1960s what the dimly-seen context of our incipient careers was, and how the gold was alloyed with other metals. His book is the first to provide a deeply researched, historically sound, insightful and provocative account of how military goals, scientific motivations, and global political forces interacted to transform oceanography between the end of World War II and the 1970s.

If the US Navy could use the postwar growth of international cooperation in oceanography for its own ends, to get information from a wide variety of sources at relatively low cost, scientists could benefit too. But there was no unanimity that cooperative science had unalloyed benefits. Some influential oceanographers, among them George Deacon in the UK and Henry Stommel in the USA, believed that creating links between scientists and the military, and especially attempting to create an international network of marine scientists by bureaucratic means, would dilute science and risk decreasing the quality of scientific work on the oceans. The powerful myth of science, that it develops best from the bottom up, from scientists and their work, rather than top down, from directives arrived at by governments, committees and commissions, was under threat. Hamblin shows in detail how international cooperative enterprises and institutions such as the International Geophysical Year (the IGY - established 1957-1958), the Scientific Committee on Oceanic Research (SCOR – established 1957), the NATO Science Committee (ca. 1958 and after), Unesco's Intergovernmental Oceanographic Commission (the IOC – established 1960), the International Indian Ocean Expedition (IIOE – 1962-1965), and the International Decade of Ocean Exploration (IDOE – 1970s), could work to the advantage of scientists. But once grasped, like the broom by the sorcerer's apprentice, they could hardly be turned off. As Hamblin says of the US-inspired IDOE,

Like so many of the efforts of scientists to create "disciples of marine science" throughout the 1950s and 1960s, the IDOE resulted in a lot of money for scientific projects and can be judged a successful effort to induce a major government [that of the USA] to appreciate oceanography. At the same time, that appreciation politicized science, threatened scientists' autonomy, and took the initiative for shaping the international scientific community out of the hands of scientists themselves.

By the early 1970s, when Hamblin's book ends, oceanography in the United States, and to a lesser extent elsewhere, was inseparable from marine affairs.

. And yet, despite the quality and scope of Hamblin's book, there is something missing that may be best viewed from outside the USA. He succeeds magnificently within the bounds he sets, making the recent history of the development of oceanography intelligible for the first time.

But I am not convinced that concentrating on the great powerhouse of postwar oceanographic developments, the USA, tells the whole tale of the remarkable scientific change that occurred in the marine sciences between 1945 and the 1970s. It is certain that many marine scientists outside the USA hitched their wagons to the US train – but it is less clear what they intended to do, what their constituency was, and who their patrons were. We need more information, and particularly detailed studies of the development of oceanography in other countries, where the influence of the military was much less than in the USA. I believe that there are good historical and political lessons to be learned from countries such as Canada, France, India, Norway, and the United Kingdom, where the marine sciences prospered at the same time as in the United States, partly because of their connections to the USA and its navy, but also for reasons endemic to those nations. This is not a criticism of Hamblin's fine work, but a suggestion that we need views from other angles too if we are to fully understand one of the great, although tempered, scientific success stories of the modern era.

Eric Mills

ARTICLES

OCEANOGRAPHY IN ORTELIUS'S ATLAS TEXTS

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Abraham Ortelius (1527-1598, Antwerp) is generally considered to be the maker of the first modern atlas, an atlas being defined as a uniform collection of maps made with the purpose of together forming a book depicting the entire world¹. Whereas earlier works containing cartography such as Schedel's *Liber Chronicarum* (1493) or Münster's *Cosmographia* (1550) were essentially illustrated books, Ortelius atlas, *Theatrum Orbis Terrarum*, or *Theatre of the Whole World*, of which the first edition appeared in Antwerp in 1570, was primarily a map book, with supporting text on the backside of each map. In spite of the fact that the atlas was the most expensive book of the 16th century, it was a resounding commercial success, and altogether over 8000² copies of this ever expanding atlas were printed. Ortelius also published other books, such

¹ Peter van der Krogt (1998) *The Theatrum Orbis Terrarum: The First Atlas?* in: *Abraham Ortelius and the First Atlas*, M.P.R. van den Broecke, P. van der Krogt & P.H. Meurer, eds., 't Goy-Houten, HES Publishers, pp. 55-78

² Marcel van den Broecke (1986) How rare is a map and the atlas it comes from? Facts and speculations on production and survival of Ortelius' *Theatrum Orbis Terrarum* and its maps *The Map Collector* 36: 2-15. In this study, I calculated the number of atlases printed to be 7300. Recent research by Imhof of the Plantin Museum of Antwerp leads to a total number of Ortelius atlases printed of about 8175, cf. Imhof, D. (1998), *De wereld in kaart: Abraham Ortelius (1527-*

as lists of geographical names, and it was recently established that the last version of such a list, his *Thesaurus Geographicus* or Treasury (of place names) of 1596 contains the first observation of the phenomenon of continental drift³.

The texts on the backside of the atlas maps have mostly been ignored in historical cartography, mainly because of lack of knowledge of Latin on the part of historical cartographers. For Latin was the language of most of the 35 editions of this atlas⁴, the other languages being Dutch, German, French, Spanish, Italian and English. The texts have also been ignored because of the predilection of historical cartographers to study maps, rather than texts. Yet, when we examine these texts⁵ (which I have all translated into modern English), representing renaissance knowledge of the world in 1570, they contain numerous noteworthy observations, some of them of an oceanographic nature.

Theories about the relation between rivers and seas and the circulation of water on earth have first been formulated by ancient Greek philosophers. The best survey on the early history of oceanography can be found in Deacon (1971)⁶. Greek scientists in the 6th century B.C. abandoned the mythological interpretations of the universe in favour of explanations relying on natural causes. Aristoteles (384-322 B.C.) summarised these views by saying “At first the Earth was surrounded by moisture. Then the sun began to dry it up, part of it evaporated, and is the cause of winds while the remainder formed the seas. So the seas are being dried up. Others say that the sea is a kind of sweat exuded by the earth when the sun heats it, and that this explains its saltness, for all sweat is salt. Others say that the saltness is due to the earth. Just as water strained through ashes becomes salt, so the sea owes its saltness to the mixture of earth with similar properties.”

Plato (427-347 B.C.) in his *Phaedo* supposed that the origin of the water found in rivers and seas lay in a vast body of water oscillating to and fro the centre of the earth. From this reservoir ran a network of tunnels carrying water into the rivers and the seas. This theory was long lived, advocated as it was as late as the 17th century by Athanasius Kircher in his *Mundus Subterraneus*, and also to a considerable extent by Ortelius, as we shall see. Aristoteles, still the most influential scientist in Ortelius time, had a different view, as we just saw, and supposed, that the water vapour rose into the air where it was condensed by the cold temperature and fell as rain, and thus that the total amount of water on earth remained the same. It was this rain which supplied the springs and rivers, a view that is still respected today. The explanation for the sea's saltness as a dry exhalation of the earth in Aristoteles' *Meteorologica* is not the one taken over by Renaissance scientists. Instead, we find the idea that salt is the residue of water after evaporation, like the ashes remain after the process of burning, an idea also advocated by Plinius (23-79 AD).

Tidal variations were not noted, nor explained until Pytheas of Marseille (late 4th century B.C.) noticed Atlantic tides while circumnavigating Britain, just preceded in time by Alexander

1598) *en de eerste atlas*, Museum Plantin-Moretus, Antwerpen, (introduction and exhibition catalogue) 152 pp.

³ J.A. Romm (1994) A New Forerunner for Continental Drift *Nature* 367: 407-408.

⁴ For an exhaustive description of all editions, see Peter van der Krogt (2003) *Koeman's Atlantes Neerlandici* Volume 3AB, HES & De Graaf, 't Goy-Houten.

⁵ Marcel van den Broecke (to appear in 2007) ORTELIUS AS A HISTORIOGRAPHER; the texts of his atlas maps (1570-1641). The present paper forms a (very small) part of this study.

⁶ Margaret Deacon (1971) *Scientists and the Sea 1650-1900, a study of marine science*, Academic Press, London, New York, her first and last publication on the subject, as Mrs. Deacon assured me. The present survey is based on this study. In spite of its title, this book discussed oceanography from early Greek times onwards.

the Great's observation of tides as he descended the Indus river. Pytheas made the first recorded observation of a relationship between the tides and the movements of the moon. Plinius claims that Pytheas observed tides rising to a height of 120 feet on the coast of Britain. The next person of importance concerning tides is Eratosthenes (275-195 B.C.), who first recorded the law of the semi-diurnal tide in the ocean. Another tidal study was that of Seleucus of Babylon (abt. 150 B.C.) who accepted Eratosthenes' idea of a heliocentric universe. He discovered, as Strabo (64 B.C.–after 24 A.D.) reports about him, “a certain irregularity in these phenomena, or regularity, according to the differences in the signs of the zodiac; if the moon is in the equinoctial signs, the behaviour of the tides is regular, but in the solstitial signs, irregular, with respect to both amount and speed, while in each of the other signs, the relation is proportional to the nearness of the moon's approach.”

Posidonius (1st century B.C.), as Strabo reports, travelled to Cadiz and made tidal observations both there and at other places on the Atlantic coast of Europe. He not only discovered that the tides were coming in and going out alternately twice a day, but also that they increased and decreased in size for alternate weeks, the greatest floods and ebbs occurring at the conjunction and at full moon. During the fortnight that separated these peaks, the size of tides grew smaller to reach their minimum at the quarters, and then increased again.

Duhem⁷ who concentrates on tidal phenomena, quotes the 6th century philosopher Priscien of Lydia, telling us that Posidonius (135-50 B.C.) believed the tide-raising force to be the astrological power of the moon, possibly through the agency of the winds, and that this interpretation remained paramount throughout the Roman period, since nothing else seemed to explain the obvious interdependence between the movement of the moon and of the sea.

Plinius followed the earlier writers in describing the diurnal and monthly cycles of the tides. He was correctly informed that the diurnal tides are geared to the lunar day, and therefore progress in time relative to the solar day. This view persisted until well after Ortelius' days, and will serve as a framework when we now examine Ortelius' map texts dealing with aspects of oceanography.

The most interesting text is the one *on verso* the first world map (Ort1⁸), in popular, non-scientific editions only, viz. 1571/1573 Dutch, 1572/1573 German and 1581 French. The same text also occurs on the second world map (Ort2) in the editions 1587 French and 1598 Dutch. Finally, it also occurs on the third world map (Ort3) in editions 1598 French and 1613 Dutch. The text is almost identical in all these editions, so we will restrict ourselves to that of the first world map (Ort1):

1.70. And because every part of the world will have its own map as well in this book, and will be discussed at some length, we will therefore refrain from discussing those here, and restrict ourselves to the seas, since together with the land they constitute the entire globe. Before us (as we think) nobody has planned and endeavoured to do this.

The reason given for using the world map to discuss the world seas is perfect, but the suggestion that no one has done this before cannot be upheld in view of what has been said by way of introduction above. Plato, Aristoteles, Posidonius, Strabo were all sources well known to and

⁷ Pierre Duhem (1913-1959) *Le Système du Monde: Histoire des Doctrines Cosmologiques de Platon à Copernic*, 10 volumes, Paris.

⁸ Numbering of maps and texts according to Marcel van den Broecke (1996) *Ortelius Atlas Maps*, HeS Publishers, 't Goy-Houten, Netherlands, 312 pp.

often quoted by Ortelius. It is remarkable that in contrast to most other cases, Ortelius does not mention his sources here. Now about the tides:

1.70. Ebb and tide in the seas is not the same everywhere. In our regions high tide occurs at full moon, but in India (as Vartoman says), at the waning of the moon. In our regions the water reaches a marvellous height, as also in the North Sea, at Cambaia in India and in Africa around "Rio Grande". We see the same thing in the Great Sea between America and the Moluccas and New Guinea, a sea called "del Zur". But the situation is quite different in the Mediterranean sea or the big sea between Europe and Africa on the one hand, and America on the other (excepting the "Rio Grande" as mentioned), called "Mar del Nort" by the Spanish.

1.71. Also, at the Isle of St. Thomas the water rises so moderately that it can hardly be noticed. And what is most remarkable, the sea near "Cabo Rosso" in Africa rises for four hours, but falls for eight hours.

Clearly, Ortelius sees a connection between high tide and full moon, although even for this there are counter-examples. But the Gulf streams he mentions are indeed a novel feature:

1.71...Also, the sea always runs in the same direction along the North coasts of America, and along the Isle of Spagnola it always runs Westwards, as is also the case in the sea we called "Mar Magiore" before, and again as happens in the Archipelago and in the Eastern or Finnish sea, although the water does not run so fast there.

This novelty is confirmed in the next quote from the same map text :

1.75. Mister Wind, called "Eolus", also displays a strange behaviour at sea. In our sea, he is so unpredictable that one can hardly count on him. Elsewhere, he is so reliable that you hardly need to rise from your chair, as for instance in the Indian sea where, when one travels from Calecut to the Molucquen, the wind will continue to blow from June to October Eastwards, and the next six months always Westwards. In Brazil at the "Rio de la Plata" it tends to blow Eastwards all year long.

In the next quote from the Ancient Mediterranean isles (Ort216), the idea that tides have to do with the moon is totally abandoned:

216.11.... "About" Euripus, ("where they say" Aristoteles "lived and died) very strange things are told by various writers, namely that it ordinarily has ebb tide and high tide seven times a day, and as many in the night, and those so violent and high that no winds can prevail against them, nay, and the tallest ships, though under full sail, they drive back and forth at leisure."

The height of the high tide, by Pytheas estimated at 120 feet around the British isles, is also given a high value by Ortelius in the map text of his Great Britain map (Ort16), but the cause of the tides is described more accurately than elsewhere:

16.5i...And the water of the river <the Thames,> has difficulty to return because of the city, and resumes its course through a depth called "Gegeutia". But after the water on this isle retreats into a vortex at ebb tide, it is certain that ships will find themselves stranded, waiting for the water to return as usual.

16.5j. And this high tide increases the water level often to a height of 15 ells or more, or if less, then to 11 ells. The waters thus flow and recede every day and every night. When the moon stands above the horizon, high in the sky or in the Southern part, the waters increase to their highest level, and if the moon is entirely at the opposite side, the waters are lowest.

Plato's theory of underground passages of water just discussed is still alive at this time (Ort1):

1.72. Some are of the opinion that beneath the Polar Star the waters go down as if they rush into an abyss and disappear, and never surface again. In some places the sea water tastes sweet, as often happens at shores

where large rivers empty themselves with a strong current into that sea, but this is also true for the entire sea in the North, Plinius called it "Scithicum", if we may believe him.

This theme recurs in the popular versions of the Northern Regions map too, where a group of inhabitants from Bremen go too far North so that some of them are swallowed by the abyss supposed to be located at the North Pole (Ort160), an idea advanced by Ortelius' contemporary cartographer, friend and fellow countryman Gerard Mercator:

160.28. Having passed all three of these islands, then God and their Patron Saint "Willibrord" incited them to further curiosity. And then they came in such misty and cold darkness, that they could see nothing at all, and the turning and pulling currents of the Sea frightened these unfortunate sailors, who could not think of anything but their impending death, have swallowed them. (These turning currents are the abyss of the sea, where all waters of the sea are swallowed and regurgitated).

160.29. These poor and frightened adventurers implored God's Grace and asked for Mercy for their souls. And this abyss then swallowed some of their ships, and then returned some of their ships to the surface and under the eyes of their companions pushed them out of danger. Thus, through Gods help and by rowing very hard, they were released from the danger which they had seen with their own eyes. When they returned from this darkness, they have, without having hoped for it, found an Island, surrounded by high cliffs (like a city by walls), on which they have landed to have a closer look.

160.30. And they found human beings there, who lived in holes beneath the earth, and there they found costly many barrels full of Gold and Silver, and carrying as much of these treasures as they were able to carry, they returned to their ships in joy. And they suddenly saw people of an unusual size, we would call them Werewolves, with exceedingly large dogs, walking right in front of them. These seized one of their company by surprise, and devoured him before their eyes. The rest safely got to their boats and returned after many troubles to Bremen, where they related all this to the Bishop, and thanked God that he had saved them and had brought them home safely, etc.

The theme of water going underground is by Ortelius also applied to rivers, as in the Spain map (Ort25), but with some doubts:

25.10... And the third <wonder> is a bridge, on which daily ten thousand head of cattle are fed, meaning the river "Guadiana" which hides itself under the ground for a distance of seven miles, after which it comes out into the open again. It must be conceded that this last one is a thing which has rather sprung from people's uninformed opinions than that it is based on the truth, as I have been informed by "Don George" of "Austria", Governor of "Harlebeck", an eye witness most worthy to be believed, <he> being a man familiar with all kinds of histories, and a wonderful researcher and admirer of natural philosophy.

The Nile also seems to be part of this subterranean system, as appears in the map text of the Ancient Mediterranean Isles (Ort216):

216.38...Plinius "writes about the fountain or head of the river" Inopus "which, fully in the same manner and at the same moment as the river" Nilus "shows ebb and high tide, so that the people truly believe that it comes through a secret passage at the bottom of the sea from the" Nilus "to them".

The following quote from the map text of Wales, which has miraculous overtones, also qualifies to be mentioned in this connection (Ort21):

21.10. "Geoffrey" of "Monmouth" writes that in these parts of "Wales", near the river "Severn" there is a pool which the country people call "Linliguna". When the sea flows into this, he says, <the pond> accepts the water like a bottomless pit, and takes up the waves in such a manner that it is never full, nor runs over. But when the sea recedes at ebb tide, the waters which before had been swallowed, will swell like a mountain, which then dash about and overflow its banks. If at that time all the people of that shire should stand near the pool, with their faces towards it, so that the water should dash into their clothes and garments,

they would hardly be able to avoid danger, and be drawn into the pool. But if their backs should be turned to it, there is no danger at all, even if they stand at the very edge of it.

In spite of the above texts referring to the idea of water being connected by underground passages now abandoned, Ortelius makes a very astute and accurate observation about the influence of the sea on nearby land in the *Parergon*⁹ discussion of France (Ort196), but not an original one, as the quote specifically mentions Emperor Julianus (4th century AD) as its source:

196.10. Let us also hear what Iulianus, the Emperor, an eye witness, has to say about this country <= France> in his Misopogenes in his words addressed to Morentinus. The winter here is very mild, because of the warmth of the Ocean, as one thinks, or else this may be due to a certain soft gale of wind that blows from there; and the sea water seems to be warmer than the fresh <river> water. Whether it is for this reason <that the climate in France is mild> or for any other unknown to me I cannot tell, yet I am sure that it is true. The Winter in this land is very temperate and mild to its inhabitants. Moreover, the best vines grow here. And many also, by their art and industry, have succeeded in making figs grow here, which in winter they are careful to cover with wheat straw or stubble and such things, by way of clothes, to defend them with these against the violence and attacks of the wind. So far Iulianus.

In summary, the texts written by Ortelius in the last part of the 16th century provide a revealing and so far hardly known source of knowledge about oceanography at this stage of the Renaissance. Most probably, the texts found on the backside of the atlas map made by Mercator, Hondius, Janssonius and Blaeu, together representing the golden age of 17th century cartography, will contain comparable information about advances of oceanography in the century after Ortelius.

THE *FLYE* REVISITED

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[This article appeared in *History of Oceanography* 16, but with a badly mangled table, making its interpretation impossible. With the editor's apologies to Drs Hughes and Wall, their article is reprinted here with a corrected table provided by Dr Hughes]

A sixteenth century piece of hydrography has been lost. The last recorded existence of the *Flye*, in 1937, was when Eustace Bosanquet brought attention to it.¹⁰ Nowadays, requesting the British Library for the document results in the explanation that it can not be found. A

⁹ The *Parergon* or accessory work was a historical section introduced by Ortelius into his *Theatrum*, depicting what he considered how the Romans viewed the world to look like in their time. It grew from 2 maps in 1579 to 44 maps in the 1624 separate *Parergon* edition.

¹⁰ Eustace Bosanquet, *The flye*, The Library, Fourth series XVIII, 1938, 194-200.

similar circumlocution is found in the Short Title Catalogue. Repeated non production means that the document is essentially lost. Fortunately, Bosanquet published a good reproduction.

The *Flye* is a beautiful diagram of tidal information for North West Europe. The *Flye* was made by Philip Moore in 1569. The diagram is complex, and requires an interpretation as to its usage; beyond the title, it is without any accompanying text. In the same year, William Bourne published *A Regiment for the Sea*.¹¹ Bourne sets out some of the same material as the *Flye* and indicates how the diagram might be used; importantly he showed how to calculate the moon's age.

Both diagram and text deal with the direction of the syzygy moon to predict high water. The syzygy moon is when it is either new or full. The mariner had to consider a notional or mean moon. The direction of the syzygy moon was used to indicate the moment of high water; this could also be expressed in time as well as with the reciprocal direction. Thus: at the Lizard, high water will come when the full moon bears west; notionally this will be at six in the evening. It will also be high water when bearing east, at six in the morning. The diagram unusually sets out the direction of the moon in the quarters. The title of the *Flye* indicates that the tabulation was called by some mariners – the flye.

The *Flye* does not give an actual rectangular table. What it does give is a diagram of concentric circles. Tidal information is then contained within segments of the diagram. The word *Flye* was contemporaneously used to indicate a compass card.¹² The diagram does not have an explicit, direct orientation; although it is set north-up. It also sets out the tides around a rose of thirty-two points. The places are superficially set around the rose in geographic order; but closer inspection reveals they are in an order representing the advancement of the tide along the coasts. The three coasts are: the English east coast from north to south, the corner of France from Belle Isle around Ushant and the English south coast from west to east. Clockwise, they represent the conventional progress of the flood, and anti-clockwise the ebb. Therefore, the diagram basically considers the tidal stream. The diagram also gives symbols requiring further interpretation.










The following list is comprised of: an implied direction; the place¹³, symbol and time from the *Flye*; and three instantaneous states of the stream.¹⁴ The list, taken from a circular presentation, begins with Berwick because that is how the table begins in Bourne.

¹¹ Eva Germaine Rimington Taylor, *A regiment for the sea*, Hakluyt Society 2nd CXXI (Cambridge, 1963).

¹² Leonard Digges, *Panometria*, 1571; S.T.C. 6858.

¹³ The places named in the *Flye* have been substituted with suitable places extracted from the current Admiralty tide table.

¹⁴ Basil D'Oliveira, *The Macmillan Reeds Nautical Almanac*, 2002.

| Dir. | Place | Sym. | Est. | -1 hr. | HW | +1 hr. |
|------|----------------|---|-------|--------|-------|--------|
| NNE | Berwick |  | id | Ebb | Ebb | Flood |
| NExN | Holy Island |  | ii | Ebb | Ebb | Slack |
| NE | R. Tyne |  | iii | Ebb | Ebb | Slack |
| NExE | R. Tees |  | iiii | Ebb | Ebb | Slack |
| ENE | Bridlington |  | iiiid | Ebb | Ebb | Ebb |
| ExN | Spurn Head |  | iiiid | Ebb | Ebb | Ebb |
| E | Blakeney |  | vi | Slack | Ebb | Ebb |
| ExS | Cromer |  | vii | Slack | Ebb | Ebb |
| ESE | Winterton |  | viid | Flood | Slack | Ebb |
| SExS | Yarmouth |  | viii | Flood | Slack | Ebb |
| SE | Lowestoft |  | ix | Flood | Slack | Ebb |
| SexS | Orford Ness |  | x | Flood | Slack | Ebb |
| SSE | Walton Naze |  | xd | Flood | Flood | Slack |
| SxE | Sunk Head |  | xi | Flood | Flood | Slack |
| S | Southend |  | xii | Flood | Flood | Slack |
| SxW | Shivering Sand |  | i | Flood | Flood | Slack |
| SSW | Harwich |  | iii | Flood | Flood | Slack |
| SwxS | Belle Isle |  | iii | Flood | Flood | Flood |
| SW | Pen March |  | iii | Flood | Flood | Flood |
| SWxW | Fountness |  | iii | Flood | Flood | Flood |
| WSW | St. Mathieu |  | iiiid | Slack | Flood | Flood |
| WxS | Portsall |  | iiiid | Slack | Slack | Slack |
| W | Lizard Point |  | vi | Ebb | Ebb | Ebb |
| WxN | Start Point |  | vi | Flood | Ebb | Ebb |
| WNW | Portland |  | vi | Flood | Ebb | Ebb |
| NWxW | Bembridge |  | x | Flood | Ebb | Ebb |
| NW | Eastbourne |  | x | Flood | Flood | Ebb |
| NWxN | Rye |  | x | Flood | Flood | Flood |
| NNW | Folkestone |  | xd | Flood | Flood | Flood |
| NxW | Herne Bay |  | xi | Flood | Flood | Slack |
| N | Faversham |  | xii | Flood | Flood | Slack |
| NxE | Sheerness |  | i | Flood | Flood | Slack |

The *Flye's* explicit purpose, as stated in the title, was to give the ebb and flood. The state of slack water is always difficult to determine. Only recently has there been any real facility in making tidal measurements in the offing. At any given instant, the moment of slack water is a rare event. Therefore the fewest symbols, the six bisected ovals, may be thought of as representing slack – or high water. This is borne out by their then being an equal thirteen

representations each, of either flood or ebb, with the other two symbols. The plain oval is taken to be for flood, the trisected oval for ebb.

The purpose of the diagram was also to give the time, at which the state of the stream was in. An almanac, slightly earlier than the *Flye*, set out tidal information in repetitive sheets for each compass point. A modern and much used extension of this concept can be found in a tidal stream atlas; which is a series of pictures, of the coast under consideration, related to each tidal hour at a control point – such as Dover.¹⁵ One of these atlases has been used to extract the streams represented in the above list. There is a good fit for the streams when the coasts are seen at the moment of high water Dover.

The *Flye* has been interpreted as being for the establishment of each port. That is not its primary purpose. The symbols are given in a higher order of importance to the establishment. The earlier commentators were unable to come to an interpretation of the symbols.¹⁶ The explicit establishments are given in lower case Roman numerals, with a d for dimidia, or half-hour. Whilst, on each coast, the establishments are contiguous, they do not run onwards from the first numeral. Clearly Harwich and Shivering Sand are out of sequence in the above list. Their change of sequence would appear to be contrived to maintain the time continuity. Further contrivance is then exhibited in that the French coast, with times of iii and iiid, is inserted between Harwich and the Lizard, at iii and vi respectively.

The extent of the representative sheet of the *Flye* is heavily curtailed in the best surviving reproduction. On the left, out of alignment with the west point is a small mark; on the right, in line with the east point is a cut off word. At the bottom, in line with the south point, is the inverted word *South*. It could suggest that the diagram expresses a state of the stream. Implicitly it would have to be for some control point, such as Dover. More probably, as the above list terminates in the Nore (Sheerness), that would have been the point. There may then have been other similar sheets; each of which would have had the symbols slightly shifted for each of the remaining tidal hours.

One can only speculate on for whom the *Flye* was intended. Clearly, written in English, it is for the English. The dominance of eastern rather than southern ports would suggest a greater interest in the east. That it presents information skirting Ushant indicates its use to access Biscay. The omission of other French information in the Narrow Seas, combined with the presence of some southern English data, suggests the route adopted.

On the other hand it is easy to see the value of the information that the diagram provides. On a power driven ship, the mariner still navigates with a stream atlas open on the chart table. The information conveyed would have been even more vital on a ship under sail. At its crudest, the *Flye* tells the mariner if the tide will push him shorewards. It also tells him when he most risks the strand.

Whichever interpretation one takes, the *Flye* holds a bird's eye view extending across several hundred miles of ocean. Whilst the basic tidal cycle runs for a mean twelve hours and twenty-five minutes, its ordinary variance is from about twelve to thirteen hours. Additionally, the difference of longitude engaged with covers a local time difference of half an hour. The diagram succeeds well in coping with the, as then, undefined globe. The *Flye*, when it existed, appears to have represented a more advanced state of hydrographic knowledge than has so far been expressed.

¹⁵ See: Anonymous, *Brown's Tidal streams in twelve charts*, 17th edition 1972.

¹⁶ See: David W. Waters, *The art of navigation in England in Elizabethan and early Stuart times*, 1958, p129 & H. Derek Howse, *Some early tidal diagrams*, *Revista da Universidade de Coimbra*, **33** 1985, p380.

EARLY DUTCH RESEARCH IN THE RELATION BETWEEN SEA-TEMPERATURES AND FISHERIES

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Herring fisheries have long been an important economic activity in the Netherlands. Already in 1567 a corporate body was founded, the College of the Big Fisheries ("College van de Grote Visserij") for the regulation of these fisheries. Early in the summer the Dutch fishing vessels ("Haringbuizen") assembled near the Shetland Islands and gradually moved south with the main concentrations of fish along the Scottish and English coasts until they reached the Dogger Bank in fall (de Groot, 1988).

In 1853 a brochure was published in the Netherlands entitled *"Het stroomen van den oceaan, een veld van onderzoek voor den zee-thermometer"* (The currents of the ocean, an area of research for the sea-thermometer). The author was M.H. Jansen, a naval officer, who in April 1851 had visited Maury and there became interested in his use of meteorological data for navigation and in his plans for the organization of an international meeting on this subject. This latter activity resulted later that year in the Brussels Maritime Conference of 1853 in which Jansen played an important role (Otto, 2003).

At that time Jansen, together with the meteorologist Buys Ballot, had already attempted to get support for the establishment of a Netherlands meteorological institute, and one of the activities of this institute would be support for navigation along the lines suggested by Maury: the collection of marine meteorological and oceanographic data and publication of this information in maps and sailing directions. Although there was much interest in this project, a final decision by the government was delayed for various reasons.

The publication of the brochure can be seen as an attempt to convince the public of the importance of the collection of maritime data. The main part is on the importance of Maury's work for the improvement of navigation by better information on the oceanic current system. But at the end Jansen also discusses the need for better tidal data from the North Sea and, as if added at the last moment, he also mentions the possibility of using temperature data from the sea to improve the herring fisheries. This certainly was meant to evoke not only the interest of the commercial ship-owners, but also of the fisheries organizations, especially because at this time the government planned to change the support to fisheries. Jansen states (here translated from Dutch): "It is not unlikely that herring keeps within certain temperature ranges.... If so, than the fisherman should only consult the thermometer in the herring-area in order to know whether he is at a locality where a good catch is to be expected". And he continues with: "Undoubtedly the blessing comes from Above, but we pray for this blessing by industriously leaving no means untried and nothing undone to obtain fruits from our labour and to show we are worthy to accept those fruits". This latter remark clearly indicates that Jansen expected opposition to the introduction of novelties in a traditional profession like fisheries. But it also shows a rather optimistic view of the usefulness of a science, also for fisheries.

When half a year after the Brussels Conference, in 1854, the Netherlands Meteorological Institute was established, Jansen became the first director of the maritime department. Because of various problems with the director-in-chief, Buys Ballot, Jansen left after only a year. But under his successors, J. van Gogh (1855-1859) and K.F.R. Andrau (1859-1863), naval officers like him,

the maritime department was very active in collecting and publishing data. And, as can be seen in the annual reports of this department, they soon also took up the idea of investigating the relation between sea temperature and herring. The commander of the naval schooner that each year escorted the herring fleet, Zr. Ms. *Atalante*, is said to have suggested "the preparation of a herring-chart like the whale chart of Maury". But it is unlikely he was ignorant of Jansen's brochure. The idea was favourably accepted by the "College of the Big Fisheries", and in 1856 a special log-book was developed for use on board of fishing vessels, instruments were provided and skippers instructed. Rewards for the best kept log-books were made available. Information on this project can be found in the annual reports (in manuscript) from the director of the maritime department to Buys Ballot and the report from Buys Ballot to the ministry. A factor that may have been important in the introduction of this project was the new fishing-law of 1857, which increased some of the advantages for the fishing with "Haringbuizen" compared with that by flat-bottomed "Bomschepen" operating in the southern North Sea.

The results were encouraging: among the 90 "haringbuizen" sixty log-books were distributed, and forty-five were returned, thirty-five of which were of satisfactory quality. In them, data was to be given on fishing, including latitude and distance from the coast (apparently longitude determination was not customary on board the fishing vessels). Furthermore, there were data on the depth and bottom conditions, wind direction and wind force, and general weather data. Temperature data (in °C): air, surface and at (different) depths. And finally there was the catch and quality of the herring. The temperature at depth should be determined from water taken at depth by means of a tube that could be closed at depth after a period of adaptation. The determination of the temperature should be done directly on board in a bucket. It is clear that the sub-surface temperature easily could be in error.

This Netherlands initiative also came to the attention of British authorities. Information received from Mr. James Adams (Edinburgh) includes extracts from the *2nd Annual Report of the Fishery Board for Scotland* (1883) and the *Report of the Commissioners for the British Fisheries* (1857). As stated there, the Board of Trade in 1857 also started a project and issued instructions for the collection of herring samples through the year from all parts of Scotland. In the absence of information on the fate of these samples, one only can guess at the idea behind this initiative, but it appears that a more biological approach was what they had in mind.

The analysis of the Netherlands data was primarily for correlation of the catch with sea temperature and wind. From this it was concluded that the best catch was at sea temperatures (surface) between 12 and 14 °C. Also attempts were made to analyse the movement of the herring from the location and catch of the fishing fleet. The results were not surprising: the fishing was at those places where, according to experience, the herring concentrated. These results therefore were not new, but "what everybody had learned from his profession was now substantiated by observations, and continuation of this research during many years will result in indications of the places where in each month chances for a good catch are maximal". In later years the programme was continued. The number of log-books, however, gradually decreased. In 1857 the catch was found to be the best at a (surface) temperature 2 °C higher than in the previous year.

In 1861 the results collected were combined in a "herring-chart", which, however, did not give scientific information that was not available from practice. Also in the following years it became clear that there was not sufficient correlation between the surface sea temperature and the occurrence of herring. The College of Sea-fisheries, which in 1857 had replaced that for the "Big Fisheries," doubted, therefore, that the observations could be made useful, and in 1863, after seven years, the project was terminated. However, a new attempt would follow.

In 1876 the Meteorological Institute was approached by some owners of "Haringbuizen" to resume the project. According to their information the Scottish Meteorological Society had been more successful in the study of the relation between herring and temperature. Buys Ballot inquired about this of Alexander Buchan of the Scottish Meteorological Society. There is no information on Buchan's reply, but in a study by Margaret Deacon (1996) we read that indeed the Society in 1873 had started the collection of sea temperatures in relation to herring catches. And in line with the Scottish findings the plans for a renewed Dutch project were now to look for correlation with the temperature at fishing depth. In the next year ten vessels were provided with the necessary instruments, but only three log-books were returned. In the following years additional instruments were provided, and the number of log-books received increased to eleven, but the response remained insufficient, and in 1879 this attempt also was discontinued. The Scottish investigations too were not adequate for more detailed studies. In his discussion on the Netherlands project Buys Ballot states that only simultaneous data from a wide area could be useful and that one should, when possible, communicate the information to the coast, from where it could be transmitted by telegraph (ideas typical of a meteorologist).

When, some decades later, ICES was established, international research on environmental influences on herring catches was one of the motivations. But in the meantime, because of the advance of technology, overfishing had become also another influential factor. And both biological and hydrographical research through ICES has shown that the hopes of Jansen and his successors for rapid scientific support to fisheries never would be fulfilled.

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MAURY AND THE AGULHAS RETURN CURRENT

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The popular scientific press has posthumously elevated Lieutenant Matthew Maury of the United States Navy to the position of "Father of Oceanography" and "Pathfinder of the Seas". The near-mythical aura with which he is currently surrounded stems largely from the popular success of his book of the 1850s, *The Physical Geography of the Sea* (7), which went through numerous editions and was translated into several European languages. In addition, he played a substantial role in furthering the establishment of the KNMI (*Koninklijk Nederlandsch Meteorologisch Instituut*: Royal

Dutch Meteorological Institute) (8) and was subsequently awarded a special medal by His Majesty King Willem II of the Netherlands in 1856 (2) for his efforts. Nevertheless, the best oceanographic minds of the time did not approve of his outdated theses on ocean circulation.

His biographer (7) has therefore stated quite bluntly that Maury “. . . could not be looked upon as representative of the best scientific thought of the eighteen-fifties.” His treatment of information on the Agulhas Return Current is an enlightening case study of the cavalier fashion in which this famous individual dealt with information conflicting with his dearly held ideas on ocean circulation.

Maury's concept of water movement in the surface layers of the ocean was simple: to balance the distribution of heat in the ocean, warm water has to flow poleward and cold water equatorward. This dogmatically held notion led him into some serious conceptual mistakes about the currents around southern Africa. He, for instance, claimed (3) that “. . . the most unexpected discovery of all is that of the warm [southward] flow along the west [sic] coast of South Africa, its junction with the Lagullas current, called higher up, the Mozambique, and then starting off as one stream to the southward.”

He was advised by a close friend and collaborator, Marin Jansen of the Dutch Navy, that this portrayal was incorrect (3). This constructive criticism was most probably based on the excellent work by Andrau (1, 9) and Van Gogh (6) of the KNMI that gave a truly prescient portrayal of the Agulhas retroflexion as well as of the Agulhas Return Current. These important new results on the current patterns south of Africa were in fact rapidly taken over by a number of other geographers (4, 5, 10), but not by Maury. And even more solid information on the Agulhas Return Current came to hand.

A ship's captain, one N. B. Grant, sailing from New York to Australia, reported unexpectedly high water temperatures south of Africa at 39° S. Temperatures of between 13 °C and 23 °C were found to extend to at least 41° E at this latitude. Maury correctly concluded, “Here therefore, was a stream – a mighty ‘river in the ocean’ – one thousand six hundred miles across from east to west, having water in the middle of it 23° [Fahrenheit; 13 °C] higher than at the sides.” Having this new information adequately portrayed in the main figure of his book (Plate IX) (3) would conceivably have contributed to the wide dissemination of this first proper understanding of the retroflexion of the Agulhas Current and of the existence of the Agulhas Return Current. This did not happen.

Maury was not to be disabused of his main thesis. He successfully swept all the offending new information under the proverbial carpet by assigning it to “. . . an illustration of the sort of *spasmodic* efforts – the heaves and throes – which the sea, in the performance of its ceaseless task, has sometimes to make.” An exception therefore, could legitimately be ignored in the greater scheme of things.

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A SUSPECTED OFFSHORE RIGHT WHALE GROUND IN THE OFFSHORE ATLANTIC, "MAURY'S SMEAR," IS SHOWN TO BE APOCRYPHAL ON HISTORICAL GROUNDS

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The present-day seasonal distribution of North Atlantic right whales (*Eubalaena glacialis*) is generally well known in coastal areas but poorly known in offshore, pelagic portions of the species' range. Recent photo-identification and satellite-telemetry data have demonstrated that right whales move long distances and range widely across the northern rim of the North Atlantic basin. The question is, do right whales congregate in offshore areas?

Two main areas of offshore occurrence have been known or suspected, based largely on evidence from 19th century American whaling logbooks. One is the Cape Farewell Ground east and southeast of the southern tip of Greenland, which Reeves and Mitchell (1986) found evidence for in whaling logbooks. The second is the so called "Maury's Smear" southwest of the Azores, which is known from the mid-1900 century chart titled *A Chart Showing the Favourite Resort of the Sperm and Right Whale* (Figure 1), which was derived from whaling logbooks by Lt. Matthew Fontaine Maury (1853). Maury's Chart shows right whales as blue areas, widely distributed in the Pacific and the South Atlantic. In the North Atlantic, where right whales were hunted down early, Maury only showed them in a localized area west of the Azores.

Figure 1 . Maury's 1853 "Favourite Haunts" whale chart, showing the offshore right whale ground in the North Atlantic, the so-called Maury Smear.



Cape Farewell Ground: Even though Maury's chart did not show right whales in this area, we had earlier demonstrated that old whaling logbooks identified right whales southeast of the southern tip of Greenland, the so called Cape Farewell Ground. This year that information was used by an expedition sailing out of Iceland for the Cape Farewell Ground. They succeeded in finding a single right whale there, establishing that the area was still used by right whales (Scott Kraus personal communication).

Maury Smear: The "Favourite Resorts" chart was itself based on Maury's earlier "Whale Chart of the World," where numbers of days on which whales were seen were shown in graphical form (Figure 2). Right whales were shown in the 5° squares, with those numbered 1, 2, 4, 5, 6, and 7 corresponding the Maury's Smear. Maury's detailed data sheets, where he and his assistants recorded whale sightings from the whalers' voyage logbooks, have been preserved. Using detailed maps of daily cruise tracks for individual voyages (Figure 3) that were derived from Maury's Abstracts, we were able to determine which whaling voyages he used to draw the Maury Smear.

Figure 2. A section of the North Atlantic from Maury's "Whale Chart of the World", showing numbers of whaling days (black lines), sperm whale days (red lines), and right whale days (blue lines) by month.

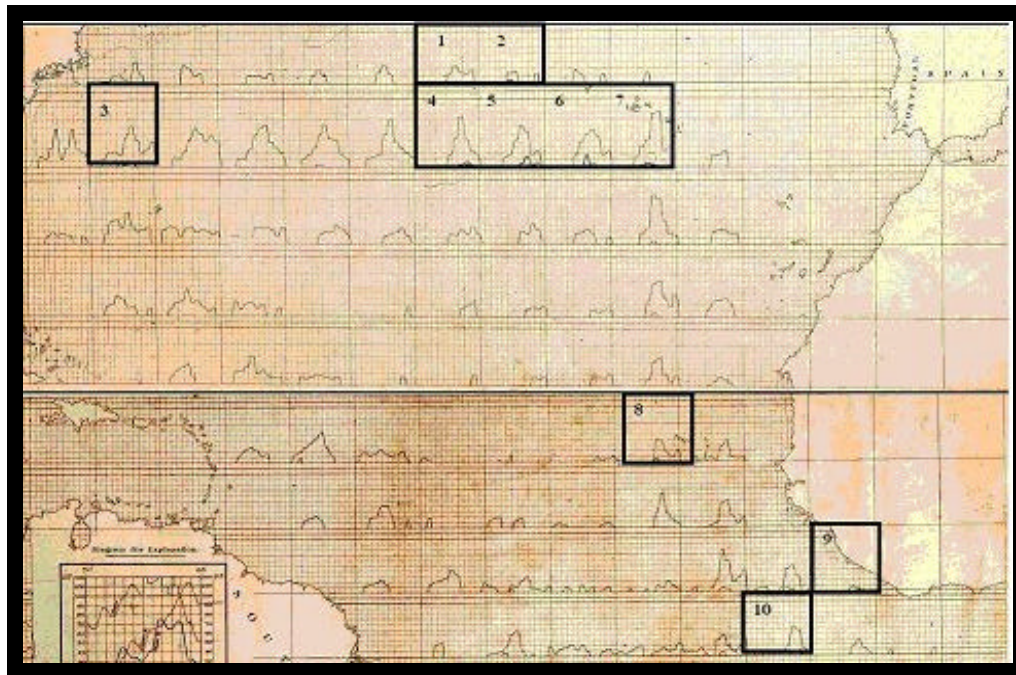
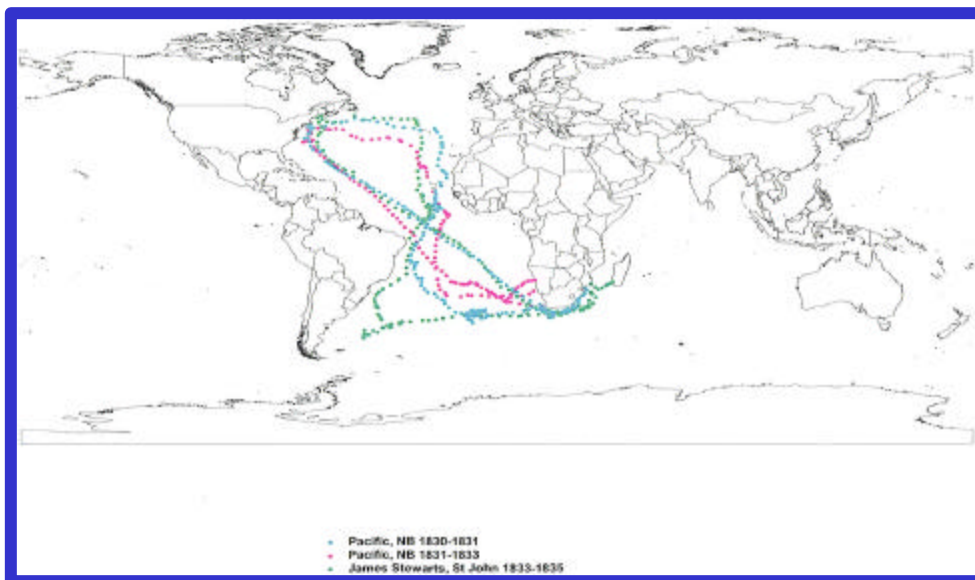


Figure 3. Selected Voyages of Captain Daniel McKenzie, showing daily positions of *Pacific* sailing out of New Bedford from 1830-1831 and from 1831-1833, and *James Stewarts* sailing out of Saint John New Brunswick from 1833-1835.



Using the voyage tracks as our guide, we then located some of the original logbooks in museums, and compared Maury's Abstracts with the whaling voyage logbooks that he had used. The question we were asking was if the data recorded on the Abstract was consistent with what was in the logbooks. It was not; the logbooks failed to show right whales where Maury's chart showed them.

While the expedition based on whaling logbooks was successful, our search for confirmation that the Maury Smear was real failed. There is no basis for believing that Maury's Smear, the mid-ocean area between 35-43°N and 30-49°W, was a major ground for right whales. Further, the occurrence of right whales in offshore portions of other ocean basins as indicated by the Maury chart is also cast into doubt. Further critical evaluation by reference to primary data sources is required.

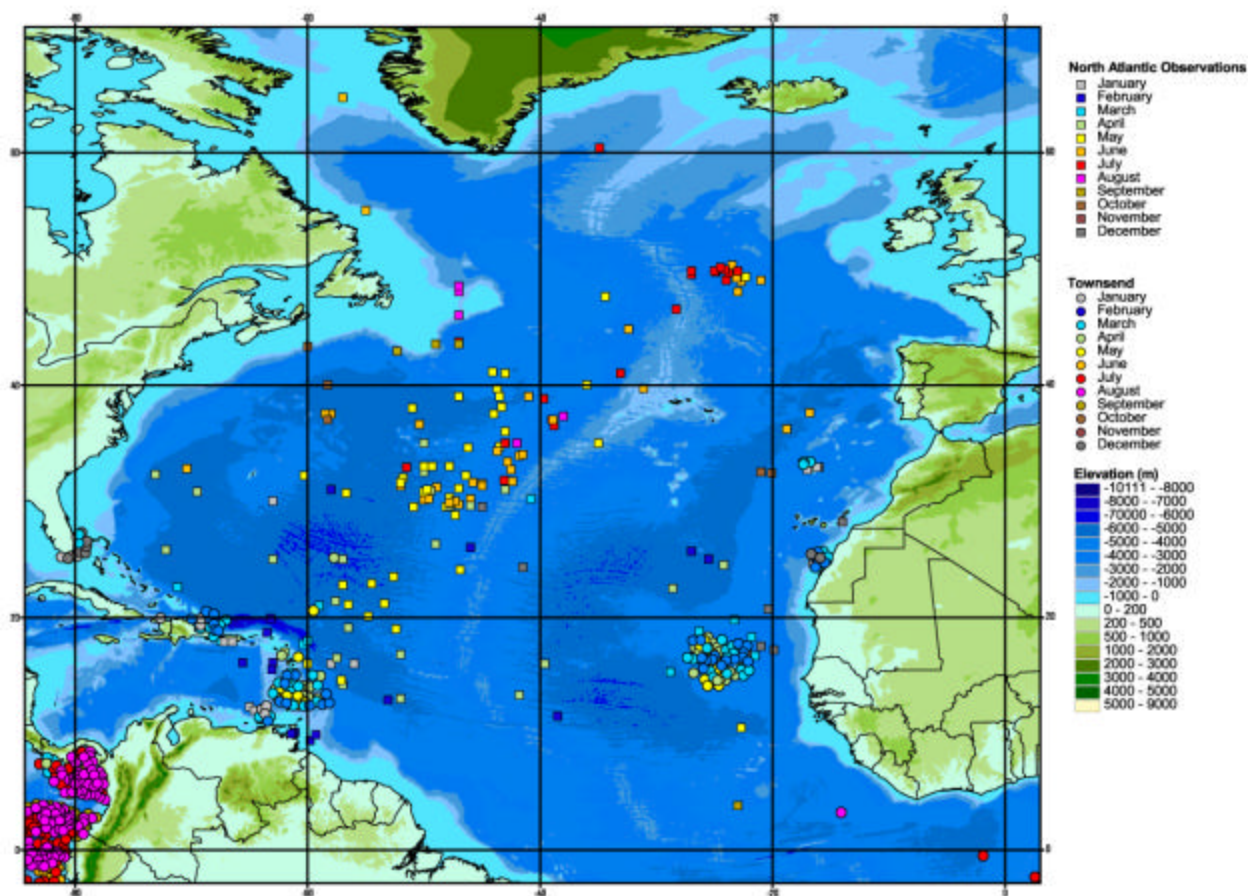
[From Reeves, RR, E Josephson and TD Smith. 2004. Putative historical occurrence of North Atlantic right whales in mid-latitude offshore waters: 'Maury's Smear' is likely apocryphal. *Marine Ecology Progress Series* 282: 295-305]

PREVIOUSLY UNKNOWN HUMPBACK WHALE FEEDING GROUND IDENTIFIED ON HISTORICAL GROUNDS

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Yankee whalers sighted humpback whales in the central Atlantic in the summer, far from the coastal feeding grounds associated with this species today. Whaling logbooks kept by American whalers in the 1800s included sightings of humpback whales. When shown by month on a chart of the North Atlantic (see map below), the previously known northward migration from the two breeding grounds in the Caribbean and the Cape Verde Islands is apparent. However, these newly extracted data reveal that some animals (red and lavender squares) remained in the central Atlantic in summer months, suggesting there may be a pelagic feeding ground. Previously, animals were thought to feed only in coastal regions in the Gulf of Maine, the Gulf of St. Lawrence, West Greenland, Iceland and Norway. These results demonstrate the potential value of historical whaling logbooks for study of seasonal distribution patterns of the large whales.

[From Reeves, R.R., T.D. Smith, E. Josephson, P. Clapham and G. Woolmer. 2004. Historical observations of humpback and blue whales in the North Atlantic Ocean: Clues to migratory routes and possibly additional feeding grounds. *Marine Mammal Science* .]



UNESCO and decades of marine science

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NOTE: This article, submitted to the Newsletter by S. Morcos, A. Suzyumov and G. Wright, is based on a longer one prepared by these same authors in collaboration with Dale Krause, Marc Steyaert and Dirk Troost. The expanded text has been submitted for inclusion in a substantial publication on 'sixty years of science at UNESCO: 1945-2005' (provisional title), scheduled for production later this year in celebration of the Organization's 60th anniversary. When available, the book will be announced on UNESCO Publishing's website (<http://publishing.unesco.org/>). The following presentation evokes some of the main contributions of UNESCO, through its Division of Marine Sciences, to capacity building in developing countries, as well as to coastal research and oceanographic methodology and standards; many of these achievements have been largely unsung in today's historical accounts. The above-named colleagues were staff members of the (former) Division of Marine Sciences. An electronic copy of the original full article (in draft form) can be obtained by special request (contact: selimmorx@aol.com).

The Editor



Throughout the last 40 years or more and as part of its multi-faceted services to the international community, UNESCO has continually pursued an ambitious policy of providing professional materials intended for practical use by scientists. One outstanding example of its successful marine-related publications was the adjacent exhaustive ichthyological guide (*FNAM*, 3 volumes, over 1500 pages; 1984-86), part of a series sponsored by the Division of Marine Sciences. It was followed by the 3-volume *Checklist of the Fishes of the Eastern Tropical Atlantic (CLOFETA)*, 1990).

The authors acknowledge with thanks the technical assistance provided by Micheline Turner and Michael Tran (UNESCO) in the preparation of this paper.

Introduction

For almost a quarter century (1971-1995), the Division of Marine Sciences and its successor unit (MRI, see further on) functioned as another marine science arm of UNESCO, complementing the work of the Organization's Intergovernmental Oceanographic Commission (IOC). The IOC's programmes, amply covered by the Commission's website (<http://www.ioc.unesco.org/>) and extensive documentation (available from IOC [see IOC website on how to obtain] and in libraries and documentation centres around the world), are probably familiar to many of our readers, but some of you may not know of the Division's erstwhile existence and mandate. This introduction deals with the foundation of IOC and the Office of Oceanography (which later gave birth to the Division of Marine Sciences) within UNESCO and sets the stage for the historical evolution of the relations between them.

Marine sciences have been included in UNESCO's programmes since the early years just after the Organization's founding in 1945; at first this was mainly in the form of training courses and fellowships to specialists¹⁷. Several recipients subsequently became leaders in their own countries, thus setting the stage to the ensuing phase of international cooperation. An outstanding example was the Russian Konstantin Fedorov (1927-1988), who later became the second IOC Secretary.

The Intergovernmental Oceanographic Commission (IOC) was established within UNESCO and became operational in 1961. This was accompanied by the creation of the Office of Oceanography (OCE) to serve in part as: (a) the Secretariat for the Commission and (b) to consolidate and carry

¹⁷ Directory of UNESCO Fellows, 1948-1968, UNESCO [not dated], Paris.

out UNESCO's marine science programme. The Director of the Office was also the Secretary of the Commission. The rapid expansion of IOC (it increased to 67 Member States in 1967) and the great demand on UNESCO's programme, to respond to the needs of the developing countries and the scientific community in general, put disproportionate pressure on the staff of the Office of Oceanography. This and the desire to give IOC a special role within the UN System as the Secretariat for the Inter-Secretariat Committee on Scientific Programmes Relating to Oceanography (ICSPRO) led to the decision in 1971 to reorganize, as separate entities, the IOC Secretariat and UNESCO Office of Oceanography. The latter was subsequently renamed the Division of Marine Sciences (keeping its original acronym of OCE). These two separate units of UNESCO, with different functions, existed side by side for 20 years until the Division was merged with the IOC Secretariat; the combination was then referred to as the Office of the IOC and (other) Marine-science Related Issues (IOC/MRI) in 1991. In the autumn of 1995, the UNESCO General Conference decided to discontinue MRI, leaving the IOC Secretariat to carry on as the sole marine science arm of the Organization.

Division of Marine Sciences

Programme mission and approach

The Division of Marine Sciences, located in the Organization's Headquarters, operated in conjunction with other Paris units and services as well as with UNESCO regional (or field) offices in various countries. Presented briefly herein are the strategic approach, mission and some of the major achievements of the OCE programme, from 1971 to 1991, and its successor MRI (until the end of 1995). The Division based its work on science – on the one hand, natural sciences, and on the other, social sciences – in its strategic approach toward the desired marine science development.

The mission of the UNESCO marine science programme was mainly to: (1) help the less-favoured countries develop their marine science capabilities, (2) cooperate with the international scientific community to develop universally accepted research criteria, methods and standards, and later (3) to concentrate, for both these areas, on coastal programmes. Everything done over the years since 1972 employed the experimental approach, either explicitly or implicitly, from which has come an understanding of how development and scientific cooperation can function hand in hand. For example, each marine science development project was, by definition, an applied experiment in social science. There were several significant steps in the evolution of the programme over the period since 1972.

Immediately after the separation of the two units (IOC and OCE), there were discussions with the Scientific Committee on Oceanic Research (SCOR, member of ICSU) about what might be the approach of the Division. In 1974, SCOR produced a working paper on the basis of an extensive enquiry on the 'Promotion of Marine Sciences in Developing Countries' that formed one of the bases for the programme's strategy in the following years.¹⁸

¹⁸ Working Paper, SCOR Executive Meeting, Canberra, 29 January – 2 February 1974; ICSU; 29 pp.

In 1980, as part of UNESCO's response to the 1979 UN Conference on Science and Technology for Development (Vienna), the marine science programme was re-organized with a visible concentration on coastal scientific problems under the coastal marine project COMAR (Major Inter-regional Project on Research and Training leading to the Integrated Management of Coastal Systems). At the same time, a decentralization of activities occurred giving rise to the strong cooperation between the Division and the UNESCO Regional Offices for Science and Technology (following their strengthening with marine science specialists during the 1980s) – namely in Cairo, Jakarta, Montevideo, Nairobi and Venice.

Marine science for development

Infrastructure-building; growth and challenges

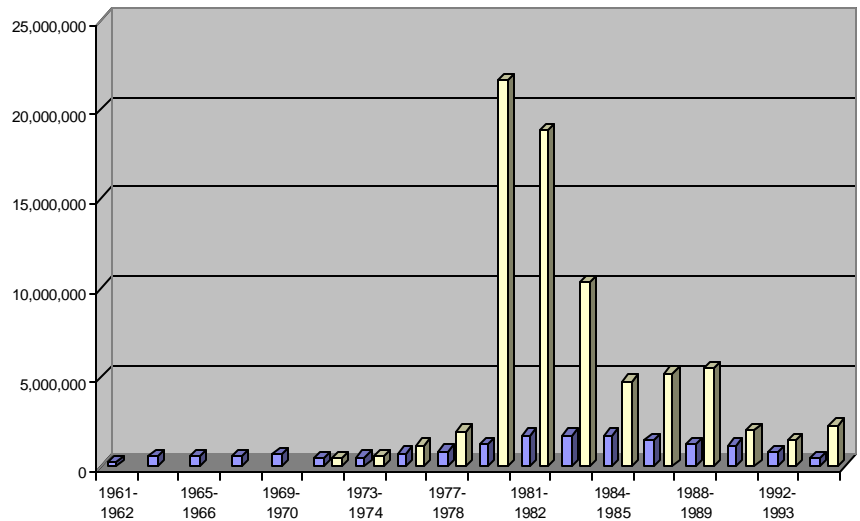
In the period 1974-1982, the Law of the Sea Conference took place – and it effectively put before governments the importance of marine science. In the Conference there was much debate (sometimes rather difficult) as well as tension amongst various groups. However, one positive aspect to emerge was that most of the developing countries decided to develop their own marine science capabilities, both through their national resources and with the help of UNESCO, which resulted in a rapid growth of UNESCO's extra-budgetary marine science development programme, reaching a peak in 1981.

A true achievement, evident by the end of the 1980s, was that most developing countries had established basic marine science capabilities, although they may have varied in size and quality. UNESCO may take some pride in having been associated with most of these developing countries in this achievement.

Over circa three decades (from 1960 through the 1980s), the marine scientific community of the developing world and of the world as a whole became ten times larger.¹⁹ Of significance, the relative growth in the developing countries began to exceed that in the industrialized ones. By 1983 the number of marine scientists in the developing world equaled the total number for the world in 1970, just prior to the establishment of OCE.

¹⁹ De Shazo, Y.M., and D.C. Krause, 1984. Marine scientists in the world: UNESCO, Paris, MARINF/53, 16 pp.

Note: the growth in the respective scientific community was also reflected in the *International Directory of Marine Scientists*, third edition, published in 1983 by UNESCO in cooperation with the UN, IOC and FAO. After the third edition (fairly exhaustive and well used throughout the world), no other global directories as such were published, at least not in printed form - although various directories by region or other groupings were compiled and made available. To be noted, in this respect: in 1997 the IOC launched GLODIR, the *Global Directory of Marine (and Freshwater) Professionals*, a database (later renamed OceanExperts) containing information on individuals involved in all aspects of marine or freshwater research and management.



Above graph: Resources of the Marine Science Programme (in US\$), 1961-1995.
Dark bars = regular programme funds; light bars = extra-budgetary funds. 1961-1972 – Office of Oceanography; 1973-1989 – OCE; 1990-1995 – MRI programmes.
 1981-83 was (exceptionally) a 3-year budgetary period in UNESCO. For the sake of comparison, it has been transformed here into two artificial biennia: 1981-82 and 1982-83. Reminder: the above figures do not reflect IOC budgets.

A primary strategy was to use UNESCO's action as a catalyst to generate large extra-budgetary projects and national commitments. The funds came from outside sources such as the United Nations Development Programme (UNDP), development banks and the member countries themselves. As shown in the preceding graph, the marine science extra-budgetary programme manifested high growth during the 1970s – from US\$480,000 with only a few projects in 1971/72, to US\$21,600,000 with 23 projects in 1979/80. By comparison, the regular budget of OCE grew from US\$491,000 for 1971/72 up to US\$2,426,000 for 1981/83. The extra-budgetary funds exceeded the regular programme budget by more than seventeen-fold in the 1979/80 biennium. Due to the global financial crisis and the withdrawal of the USA in 1984 – followed in 1985 by the UK and Singapore – funding declined. More innovative approaches, mainly through networking and cooperation, were undertaken by OCE and MRI to respond to the needier developing countries and small islands.

OCE strategy

Good science in a regional approach

Tried and tested through experience, UNESCO's approach to marine science development was based on the building up of three kinds of capability: human resources, scientific infrastructure

and research programmes. If any one of these three components were missing, the whole development effort would fail.

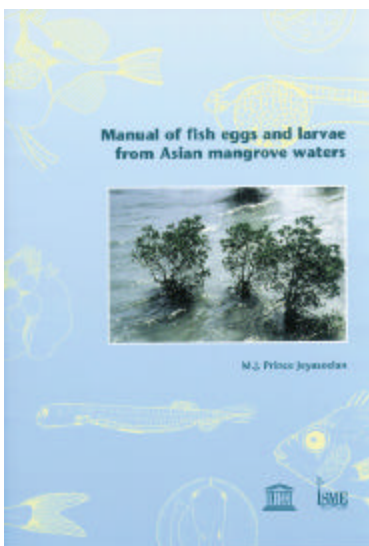
POEM – the Eastern Mediterranean

An exemplary achievement of the UNESCO marine science programme was the investigation of the Physical Oceanography of the Eastern Mediterranean (POEM), developed in the region in 1983 through the collaboration of the very scientists who wanted to conduct the research, and who in due course were responsible for carrying out the activities. At that time, thanks to some ongoing UNESCO/UNDP projects in several countries of the region, and a favourable environment of cooperation with overseas institutions, the national marine science capabilities had reached a satisfactory level of development. The ground was well prepared for fruitful cooperation. Carried out over almost ten years, POEM included planning workshops, multi-ship coordinated surveys, inter-calibration exercises, data validation and research workshops. The results, mainly concerning the formation of intermediate and deep waters and the dynamics of water circulation, were published in scholarly journals and led to a much-improved understanding of the Eastern Mediterranean, which was less known scientifically than the Western Basin.

Mangroves of Asia and the Pacific

As another example of its marine science strategy, UNESCO approached SCOR for advice on the mangrove ecosystem, and then took that advice to build up a large regional networking programme for research and training on such ecosystems in Asia and the Pacific, which systems stretched from Pakistan to Fiji. The UNDP provided financial assistance (US\$2,800,000) to the mangrove programme, and it was later recognized that this was one of the best regional projects with which the UNDP had ever been associated. In 1990, the mangrove project evolved into the International Society for Mangrove Ecosystems (ISME)²⁰, based in Okinawa, as a grass-roots initiative fostered by UNESCO and Japan. This NGO eventually carried on the types of work spawned and implemented by UNESCO, thus insuring continuity.

²⁰ ISME has a consultative status with the United Nations Economic and Social Council (ECOSOC)



The above manual (1998) was one of the many results of the Asian mangrove efforts of UNESCO and ISME. See mangrove-related paragraph on preceding page.

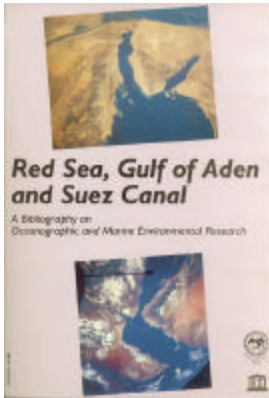


Through the Organization's Coastal Marine Programme for Africa, the Division assisted scientists and the local populations. Examples: ichthyoplankton investigations (*upper photo: S. Diop*) and mangrove reforestation (*A. Diame*).

Arab States' oceanographic institutions

In the Arab States, the regional approach of the marine science programme concentrated on the development of national capabilities, e.g. the establishment of several laboratories and university departments, as well as research vessels, involving ten countries and using (in the 1980s) US\$13,000,000 of extra-budgetary funding from the Arab region. UNESCO can be credited with the fact that these national projects and the initial technical support of the Organization's marine science programme contributed to the creation of two active sub-regional organizations: (i) the Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA, based in Jeddah) and (ii) the Regional Organization for the Protection of the Marine Environment (ROPME, based in Kuwait). In 1990 UNESCO and PERSGA published

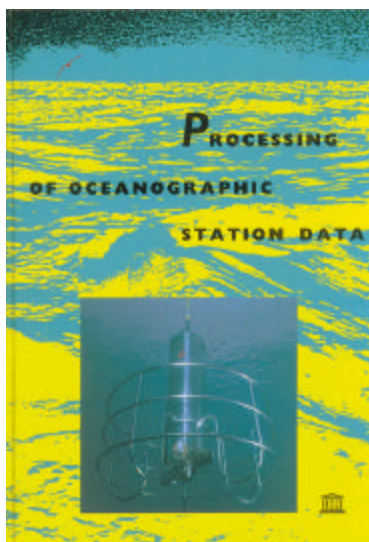
an extensive multidisciplinary bibliography on research in the respective marine areas (see right).



International marine research

International Oceanographic Tables

One of the major components of UNESCO's programme was to support the needs of the scientific communities in their efforts to develop joint methodologies and standards that insured common approaches to global scientific problems. Most of these activities were carried out in cooperation with the NGOs concerned – such as SCOR, IAPSO and IABO; the results were published by UNESCO. One of the early examples was the need for a universal standard and a method to measure salinity of seawater to replace the *Hydrographic Tables* (1901) and Knudsen's method, which became outdated by the more accurate measurement of electrical conductivity of seawater. In 1961 the UNESCO/ICES/SCOR/IAPSO Joint Panel on Oceanographic Tables and Standards (JPOTS) was established and UNESCO (through OCE) coordinated the work of the Panel on behalf of the sponsoring organizations.



The above manual (1991), based on the JPOTS findings, gives practical guidelines for computing the basic physical oceanographic parameters from raw data obtained from measurements at sea.



This 1990 publication, no. 9 in the monograph series, typically presented the guidance and advice of a SCOR working group. (See monographs, following page.)

The results of the Panel marked the fruition of research work carried out by many distinguished institutions and scientists. The Panel adopted a new definition of salinity – the Practical Salinity Scale (1979) – that also ensured the continued usefulness of salinity data collected since the beginning of the 20th century. A new International Equation of State of Seawater (1980) replaced the traditional equations that described the density of seawater as a function of temperature, salinity and pressure (depth). The culmination of this effort was the publication by UNESCO of two volumes of the International Oceanographic Tables in 1985 and 1987. The JPOTS findings were finally consolidated in a textbook manual (see the previous page), all of which were produced during the 25 years of the Panel's existence²¹.

Monographs, Technical Papers and Reports

A landmark reference series – UNESCO's Monographs on Oceanographic Methodology – was launched in 1966 with the publication of *Determination of photosynthetic pigments in sea-water*. The publication of the series followed a recommendation of SCOR to UNESCO in 1963. In this

²¹ Morcos, S., Poisson, A. and Mamayev, O. (1990). Joint Panel on Oceanographic Tables and Standards: 25 years of achievements under the umbrella of international organizations. In *Ocean Sciences: Their history and Relation to Man*, Proceedings of ICHO IV, Hamburg, Germany, 1987; eds W. Lenz and M. Deacon, *Deutsche Hydrographische Zeitschrift*, Hamburg, Ergänzungsheft, Reihe B, Nr. 22, 344-356.

highly successful collection (proven to be ‘best sellers’ among the UNESCO scientific books), which was largely an OCE activity (from the latter’s creation until the series was taken over in 1996 by the IOC), a total of eleven volumes were eventually published, providing guidelines and information for researchers – mainly in aspects of biological oceanography. The series is ongoing (the name to be shortened to ‘Oceanographic Methodology’). An OCE-produced example (No. 9) is shown on the previous page.

Well known for over three decades in the international marine science community were two document series entitled: (i) *UNESCO Technical Papers in Marine Science* and (ii) *UNESCO Reports in Marine Science*. The Technical Papers, totalling 67 volumes issued from 1965 up to 1994, informed the scientific community of recent advances in oceanographic research and on recommended research programmes and methods. They were mainly published as documents produced jointly with scientific NGOs, such as SCOR. The Reports series (69 volumes in total issued from 1977 to 1996) served specific programme needs and reported on developments in projects conducted in the context of UNESCO’s marine science-related activities.

Marine science education and training

Curricula development

As a support for capacity building and in response to wishes expressed by the scientific community and IOC meetings, a workshop on teaching marine sciences at the university level was convened in UNESCO in 1973, where university curricula in the main disciplines of oceanography were developed and recommended. This workshop was followed by a series of other workshops such as for training marine technicians, for use in secondary schools and universities (courses in fishery sciences, ocean engineering etc.). This was followed by the preparation and distribution (in six languages – Arabic, Chinese, English, French, Russian and Spanish) of the forward-looking study: *Year 2000 Challenges for Marine Science Training and Education Worldwide*.

After the merger of IOC and OCE (into IOC/MRI) at the end of 1990, two major training initiatives were launched: (1) the Floating University (see below), and (2) the Global Faculty (which developed and exploited a computer-based set of training modules in remote sensing in the marine sciences and in coastal management).



Through the Division, UNESCO also cooperated in the development, production and distribution of many varied computer-based training and reference materials.

Floating University

Between 1991 and 1996, the Division carried out, jointly with Russia and with other countries, an international multi-disciplinary ship-based programme that combined training and cutting-edge research in marine geology and geophysics. Many important discoveries related to processes of interaction between the geosphere and biosphere in the deep ocean were made, mostly at the European and North African continental margins. A few hundred students from around the world were trained. In 1995 the programme – thanks to its valuable achievements in capacity building, research and its contribution to enhancement of the culture of peace – was recognized as a UNESCO contribution to the celebration of the 50th anniversary of the United Nations. The ‘Training-through-Research’ (TTR) programme (as it is called now) is still active; UNESCO’s participation is now coordinated through the IOC. Pictured in the following illustration (next page) are the Russian R/V *Gelendzhik*, one of the main ships on which cruises were conducted in several sea areas, and several training activities. In addition to the scientific learning achieved, these were occasions for multi-cultural exchanges, as another part of UNESCO’s ‘raison d’être’.



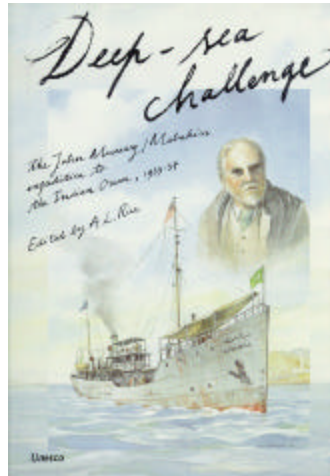
R/V Gelendzhik and images of TTR activities .

Photos courtesy of A. Suzyumov

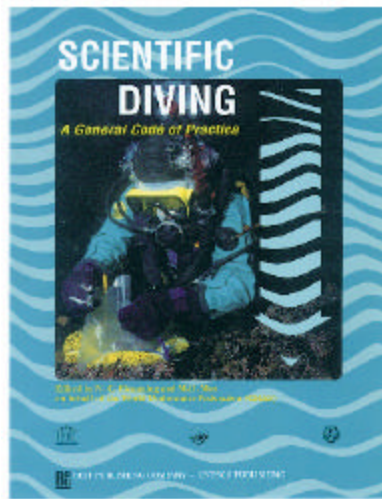
Publications and public information

In connection with its programme activities, the Division produced and widely distributed (to a great extent free of charge) a variety of publications, some of them also translated into other languages in addition to English. Included were documents, newsletters, monographs, bibliographies and other reference works.

One valuable source of information was the *International Marine Science (IMS) Newsletter*. It informed the scientific community on a broad spectrum of highlight activities of UNESCO and its partners in ocean science-related domains. A total of 76 issues were produced and distributed throughout the world to thousands of interested institutions and individual scientists. In the latter years, just prior to its discontinuation in 1996, it was available in the six UN languages. Available nowadays in the UNESCO archives, this periodical is particularly useful to historians in tracing the marine-related work of UNESCO, its sister agencies and other partners.



This 1986 book was awarded special recognition by the American Library Association.



Second edition (1996) of the scientific diving code.

The Division's publications also included a number and variety of non-serial publications, some more targeted than others as to the readership community. Certain titles (such as that on John Murray/*Mabahiss* Expedition, see above left) demonstrated the Organization's interest in preserving, where feasible and appropriate, historical information about scientific endeavours.

As well, data and information was complemented with practical advice to scientists in the conduct of their investigations. For example, scientific diving was the subject of a co-publication of a code of practice for scientific divers, produced by UNESCO in collaboration with the World Underwater Federation (CMAS) – see above right.

These publications of the Division were in significant demand by scientists, from all countries but especially in the less-developed ones. The covers of some of these are shown in this article and illustrate, to an extent, the variety of specialities and partners included in the OCE and MRI programme activities. The reader should not assume that the main purpose of the Division was the production of publications; rather that the publications were the products of the wide range activities of the Division or intended as source materials in support of the scientific community. Through the Division, UNESCO's main contribution lies in the impact it has had on the lives and work of many scientists and others the world over, particularly in the developing world.

In this article only a few of UNESCO's marine science publications have been shown. A complete historical list of all UNESCO major ocean-related publications (i.e. those which were priced titles), produced and distributed during the nearly forty years that have transpired since the first monograph and up to the date of the publication of this article, can be consulted. This list is on the IOC website (<http://ioc.unesco.org/>) in view of the fact that the IOC is now responsible for all marine science activities of UNESCO. These books were the subject of an exhibit during the recent (XXIII) IOC Assembly (June 2005, Paris).

NEWS AND EVENTS

CHANGES IN THE COMMISSION OF OCEANOGRAPHY. During the XXIInd International Congress on the History of Science, held in Beijing from 24-30 July this year, the General Assembly of the Division of the History of Science approved two changes recommended by the executive of the Commission of Oceanography. The first was the change of name of the Commission to *Commission of the History of Oceanography*. This brings the name of the Commission into line with its purpose. In addition, Professor Keith Benson, the Principal of Green College of the University of British Columbia in Vancouver, was approved as the new President of the Commission. Keith Benson is a distinguished and well known historian of the marine sciences, specializing particularly in marine stations and American science. After a career at the University of Washington, he was most recently in charge of the Science and Technology Studies Program of the U.S. National Science Foundation in the Washington, D.C. area.

50 YEARS OF SCOR AND IOC – A RESEARCH OPPORTUNITY. The history of oceanography is often centered on personalities and on the scientific advances they have made.

Another focus has been on the agencies or organizations that have affected their work. Since the ocean is so vast, the organizations that foster international cooperation in its study are of particular interest, as exemplified by recent histories of ICES (Rozwadowski 2002) and PICES (Tjossem in press). While these organizations are intergovernmental, their remit is regional rather than global.

Global cooperation in marine science is particularly the province of the Intergovernmental Oceanographic Commission, IOC, of UNESCO. This organization was established in 1960, a few years after another global, but non-governmental, organization, the Scientific Committee on Oceanic Research, SCOR, was set up. IOC and SCOR have different personalities and capabilities and have interacted vigorously and often productively, for most of the past half-century, SCOR in an advisory capacity and IOC in carrying out its mandate for governments to coordinate their actions in support of ocean research.

Since it took over, at SCOR's request, coordination of the International Indian Ocean Expedition in the 1960s, IOC has coordinated other major global oceanographic programs involving, for example, multi-national expeditions, ocean monitoring, and data exchange, as well as capacity building and public dissemination of scientific findings. Many of these actions have involved interaction with SCOR and other non-governmental organizations.

The story of these two organizations would make an interesting study for a historian of science. Some of the early players are still around, and reasonably coherent, and archives of the two organizations presumably exist. SCOR Proceedings have been published regularly since 1964, and G. Böhnecke's reports as SCOR Secretary are available for the preceding years. A complete set of IOC documents is available in the IOC Documentary Centre in Paris and IOC Depositary Centres in Member States. There are also brief histories of the early years of SCOR (Wolff, 1990) and IOC (Roll 1979) that could provide a starting point for such a study.

As Rozwadowski (2002) and Tjossem (in press) have shown, the unofficial nature of their studies has allowed them to look at both the successes and failures of the organizations in achieving their goals. We feel strongly that the proposed study should be blessed but not controlled by the organizations concerned and that their interactions are an important part of the story. Rather than an official story this could be one written by professional historians who could analyse developments and report events as they see them, without censorship by the organizations.

Persons interested in this project are invited to contact one of us. We propose that an ad hoc committee be established to assist in negotiations with SCOR and IOC and with potential funding agencies. (Warren S. Wooster, wooster@u.washington.edu) and Selim Morcos (selimmorx@aol.com).

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BOOKS IN MEMORY OF DAVID VAN KEUREN Many historians of oceanography have contributed to create a library in the history of oceanography in memory of our colleague, David van Keuren, who was killed in a bicycle accident a little over one year ago. The intent is to donate the library to the Museum of the World Ocean in Kaliningrad. Svetlana Sivkova has agreed to establish a reading room in David's honor. To date, we have received more than twenty-five books, but we are still in the need of more volumes. We have gathered most of the recent works in the history of oceanography, but we are still in the need of many of the standard works, including the early proceedings from the ICHO conferences (we have the work from the La Jolla meeting through to the present), standard reference works in oceanography (a version of Sverdrup, Johnson and Fleming's *The Oceans*, for example, would be wonderful), and some of the early contributions to the history of oceanography. To avoid duplication, please contact Keith R. Benson (krbenson@interchange.ubc.ca) if you care to contribute to the library. We also will accept monetary gifts that will be used to purchase books we cannot locate by donation. Many of us consider the library to be the one outstanding contribution we can make to the memory of David. He gave so much to all of us, through his work in organizing "smokers" to develop an interest in the history of oceanography, in his efforts in creating the Maury Workshops, and in his unstinting support for younger scholars who have pursued work in the history of oceanography. David was especially attached to Russia, in particular to the work being done in Kaliningrad. It will be wonderful when the reading room in his honor is opened. (Keith Benson, Green College, University of British Columbia, 6201 Cecil Green Park Road, Vancouver, B.C. V6T 1Z1, Canada. krbenson@interchange.ubc.ca).

HISTORICAL PHOTOGRAPHS OF CANADIAN OCEANOGRAPHY The Canadian National Committee for SCOR www.cncscor.ca is working with the Canadian Meteorological and Oceanographic Society (CMOS) to establish an archive of Canadian oceanographic photographs. The intent is to create an on-line library of historical photos that would parallel that of the Canadian meteorological community. Hopefully submissions will be scanned photos sent by email, but some providers may not have such capabilities. In this case we would have to make arrangements for submission to a third party for scanning and guarantee of return of the originals. A site has been established to post photos; see <http://www.cmos.ca/Oceanphotos/photoindex.html>. Photos should be reasonably clear so as to be able to identify individuals in the photo, and have a caption that would explain the event (a cruise, conference, university faculty, etc.), a date (year) of the event, and an organized list of (many) of those in the photo. The names associated with the photo should be in a standard format if at all possible, along the lines of "Richard (Dick) BL Stoddart". Obviously we are looking for Canadian content, but international events held in Canada would also be useful if there were several notable Canadian oceanographers in attendance. Realizing the significance of "ships" to oceanographic effort we would also like to get photos of all the Canadian oceanographic vessels as well as photos of people. General guidelines for input photos are that they should be between 500K and 1MB. The original photo size (e.g. 8x10 or 4x6) is not important; whatever the size of the original is fine. However, a good clear input photo is needed to produce a nice online version. JPEG is the preferred format. If you are able to help out, it would be appreciated if you could send a few (up to 5) scanned photos to me at your convenience. Additional photos would also be very much welcomed, but you should await confirmation that the first batch has been successfully received – just in case there are multiple emails from others that collectively, with their attachments, end up being too many to handle. You may wish to use the CMOS ftp service if large numbers of photos need to be transferred.

Anyone who wishes to use this service should contact the CMOS webmaster, Bob Jones, at jonesb@igs.net. (Dick Stoddart, Secretary for CNC/SCOR. dick.stoddart@sympatico.ca)

CONFERENCE REPORTS

FIRST SCAR WORKSHOP ON THE HISTORY OF ANTARCTIC RESEARCH At the 23rd SCAR (Scientific Committee on Antarctic Research) delegates meeting in 2004 at Bremerhaven, Germany a SCAR Action Group on the History of Antarctic Research was established. This Action Group, under Cornelia Lüdecke (president) from Hamburg University and Aant Elsinga from Goteborg University, convened a first workshop together with the Commission of Glaciology of the Bavarian Academy of Sciences and Humanities in München, Germany. From 2-3 June 2005 this well-prepared workshop took place at the Bavarian Academy. Not every Antarctic research project is relevant to oceanography, but the programs of many countries include studies of various aspects of the Southern Ocean, in the past and today. The number of people present during the workshop sessions varied from 13 to 17, 2 from the USA, 2 from the Netherlands, 1 from Chile, 1 from Sweden, 1 from the UK working in the USA and Argentina, 1 from Switzerland, working in Australia and the rest from Germany. This shows the internationalisation of Antarctic research, but also that quite a number of countries with a rich history in Antarctic research had not sent representatives. e.g. France, Norway, Belgium and the UK. Unfortunately Russian colleagues could not participate due to another meeting. Nevertheless there was a good mixture of veterans and young scientists, of historians and natural scientists. After a welcome by Ludwig Braun representing the Commission of Glaciology and an introduction by the members of the Action Group, there were 10 lectures and 3 posters. Personally I found the discussions, for which the organizers had provided ample time, very enlightening, especially because of the contributions by the "real" veterans, Jorge Berguño from Chile and John Behrendt from the USA. They had been present at many meetings of the Antarctic Treaty. The organizers had asked beforehand to concentrate on the motivation to start and to continue Antarctic research and on obstacles encountered, also to discuss international cooperation and mention people with leading roles. Abstracts with overviews were sent about the activities of the Soviet Union and Australia. Lectures about the early involvement of Sweden and of Argentina were given by Aant Elsinga and Adrian Howkins respectively, while Johan van Bennekom talked about the Dutch involvement. International cooperation long before the Antarctic Treaty was highlighted by Jorge Berguño and by Cornelia Lüdecke. John Behrendt took us along on dangerous early traverses to measure ice thickness while Reinhardt Krause gave a biography of Georg von Neumayer, after whom the German antarctic station was named. Peter Abbink discussed the changes in the Antarctic Treaty in the 1980's, when the number of consulting parties nearly doubled. Cornelia Lüdecke explained why a privately organized German expedition in the 1950's failed: it was too much prestige oriented and had opposition from scientific bodies. The last lecture was by Balthasar Indermuehle on the history of astrophysics in Antarctica, from the first meteorite find in 1960 until the use of the ice as gigantic particle detector. It is intended to publish the papers in a special issue of *Berichte für Polarforschung*, published by the Alfred Wegener Institute in Bremerhaven, while two more workshops are planned. For further information contact Cornelia Lüdecke via e-mail: C.Luedecke@lrz.uni-muenchen.de (Johan van Bennekom, NIOZ, P.O. Box 59, 1990AB Den

Burg/Texel, Netherlands. bennekom@nioz.nl).

MARINE ENVIRONMENTAL HISTORY WORKSHOP HELD Woods Hole, Massachusetts, was the setting from May 20-22, 2005 for an exploratory workshop on the subject of environmental history of the oceans. Almost forty participants met on the campus of the Sea Education Association (SEA) to discuss the history of the ocean and its interrelationship with human society. Scholars with backgrounds in maritime history and literature, environmental history, history of science and technology, historical ecology, and fisheries science came together to explore traditions within the humanities that contribute to the understanding of our historical relationship with the ocean environment.

Most experts agree that the world's oceans are facing an environmental crisis. As highlighted by the 2003 Pew Oceans Commission and reiterated by the 2004 US Ocean Commission, human pressures on the marine environment have forced scholars and governments to seriously examine new directions in marine environmental policy and education. These reports call for new directions—ones that demand sophisticated historical understandings. Maritime history, traditionally focused upon national expansion, economic development, labor, and seafaring culture, has seen the ocean environment only as a stage for human action. The marine environment, however, has shaped human history as much as it has been affected by human use.

Participants concluded that the time has come for scholars to consider the marine environment as a worthy subject of historians' attention. This undertaking will encompass the methods, questions, and literature of many disciplines, including the natural sciences. The workshop highlighted recent work contributing to the emerging subfield of marine environmental history and articulated new research directions. Participants are planning to propose sessions examining aspects of environmental history of the ocean at upcoming scholarly conferences and to create a web presence for this new field. Plans are underway for a follow up meeting in spring 2007. For more information, contact Matthew McKenzie, Sea Education Association (mmckenzie@sea.edu), or Helen Rozwadowski, University of Connecticut, Avery Point (helen.rozwadowski@uconn.edu). (Helen Rozwadowski, Maritime Studies Program, University of Connecticut at Avery Point, 1084 Shennecossett Road, Groton, CT 06340-6070, USA)

HMS CHALLENGER VIRTUAL FIELD TRIP The College of Exploration, located in Virginia, USA, has created an animated 'virtual field trip' of the famous oceanographic research vessel HMS *Challenger*. The field trip is part of a project funded by National Oceanic and Atmospheric Administration's Office of Ocean Exploration and it was created by experts at the Ocean Technology Foundation. The animation can be viewed at:

<http://www.coexploration.org/hmschallenger/vft/index.html> If you need a flash player to view this, you can get one free from: <http://www.macromedia.com/software/flashplayer/>. (Helen Rozwadowski, Maritime Studies Program, University of Connecticut at Avery Point, 1084 Shennecossett Road, Groton, CT 06340-6070, USA. helen.rozwadowski@uconn.edu).

ANNUAL REPORT 2005 – ROMANIAN HISTORY OF MARINE SCIENCES The annual symposium of the Constanta Subcommittee of the Romanian Committee of History and Philosophy of Science and Technology (CRIFST), under the auspices of the Romanian Academy, took place at Constanta, on May 28, 2005. The following contributions were relevant to the history of oceanology and the Romanian Navy:

- Development of marine biological institutions around the Black Sea, by A.S. Bologa (cf. *Ocean Sciences bridging the millennia: A spectrum of historical accounts*, S. Marcos *et al.* (Eds.), UNESCO / IOC, China Ocean Press, China, 209-222)
- Forgotten histories: two ships and a family of sailors, by N.C. Papadopol (cf. *Yacht Magazin*, Romanian Royal Yacht Club, 25, octombrie – noiembrie 2004, 36-39)
- Romanian sailors with scientific and technical contributions abroad: George Chirovici, Stefan Christescu and Pavel Popovat, by George Petre.
- Sailors claim appeal to history of aviation: Commander Pavel Popovat inventor of propulsion by reaction, by Carmen I. Atanasiu.

The following Romanian publications, with relevant integral / partial contributions to history of science and technology have been printed:

- *Portul Constanta – portul lui Anghel Saligny (Port Constanta – the port of Anghel Saligny)*, by Petre Covacef, Ed. CNAPM, Constanta, 2004, 346 pp,
- *Anuarul Muzeului Marinei Romane (Romanian Naval Museum Yearbook)*, VI, 2003 (M. Mosneagu, editor in chief),
- *1st International Congress of Naval History. The Danube in the history of Europe*, Constanta, Romania, October 6-8, 2004 (cf. *Romanian Naval Museum Yearbook*, VII, 2004, M. Mosneagu, coordinator),
- *Cercetari marine – Recherches marines*, NIMRD, 35, 2004 (A.S. Bologa, editor in chief),
- *Marea Noastra (Our Sea)*, Romanian Naval League, Constanta, quarterly, 2004 / 2005,
- *Romania maritima si fluviala. Magazin (Maritime and fluvial Romania. Magazine)*, RNL / Bucharest branch, 1(13), 2004
- Printul Rainier al III-lea de Monaco – continuator al traditiilor Comisiei Mediteraneie timp de jumatate de secol (Prince Rainier III of Monaco – continuer of Mediterranean Commission's traditions for half a century), *Marea Noastra*, XIV, 2 (55), 2005

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HARNESSING THE OCEANS: THE ENVIRONMENTAL HISTORY OF THE SEA, 1600-1850 At Greenwich, England, on 19 February 2005, as part of the National Maritime Museum's 'Open Museum' adult learning programme, there was a one-day seminar entitled "Harnessing the oceans: the environmental history of the sea, 1600-1850". Four papers were presented. The first was by Margaret Small (National Maritime Museum), her subject "North Atlantic exploration and understanding of the environment". She set the scene by reviewing the history of voyages on the North Atlantic Ocean from ancient times to the 16th century. She mentioned that Himilco was becalmed and hindered by seaweed on the North Atlantic in the 6th century BC, that Pytheas possibly reached Iceland in the 4th century BC, that St Brendan may have reached North America in the 6th century AD and Norsemen certainly did four centuries later. Himilco possibly discovered the Sargasso Sea but more likely encountered seaweed off southern Portugal. Pytheas reported 24-hour sunlight and Brendan encountered icebergs. These intrepid seafarers ventured into the unknown with very little idea of the weather and sea

conditions they would encounter. By the 15th century, knowledge of the marine environment had accumulated to such an extent that Spanish and Portuguese navigators were able to exploit the prevailing winds and currents of the Atlantic. In the 16th century, attempts to find the North West and North East Passages were unsuccessful but served to increase knowledge of Arctic sea ice. Next to speak was Malcolm Walker (Royal Meteorological Society), his topic "Majid to Maury: the contributions of seafarers to weather knowledge and insight". He pointed out that the Arabs had accumulated a wealth of atmospheric and oceanic knowledge by the late Middle Ages. By 1500, they had correctly explained land and sea breezes and classified in detail virtually every aspect of the weather that had any navigational significance. Majid was probably the pilot who helped Vasco da Gama reach India. Halley recognized that thermal contrasts between land and sea were fundamental in the shaping of monsoons and Dampier advanced understanding of tropical cyclones. Captain Cook advanced knowledge and understanding of the meteorology of the Southern Ocean and correctly deduced the origins of the icebergs found on that ocean. Beaufort built upon the classifications of wind strength used by seafarers before him and formulated his own now-famous scale of wind force. Franklin, Capper, Horsburgh and James Clark Ross made their own contributions to marine meteorology; and Redfield, Reid and Piddington produced models of tropical cyclones. FitzRoy understood the importance of the barometer to seafarers and developed a model of extra-tropical depressions. Maury produced charts of prevailing winds and currents which helped seafarers travel faster and more safely than hitherto.

Dennis Wheeler (University of Sunderland) spoke on "Ships' logbooks: the first global monitoring system", focusing upon analyses of meteorological data recorded in the logbooks of mariners of a number of European countries. He said that Beaufort's scale of wind force was actually Dalrymple's and some (but not all) of the wind-strength terms listed by Defoe in his account of the 1703 storm were in fact rarely used by seafarers. Before Beaufort, Wheeler added, everything was a gale! There were "indifferent gales", "brave gales", "soft gales" and "pleasant gales". Even the meaning of the term "breeze" evolved over the years, being originally the name given to land and sea breezes. Wheeler outlined the CLIWOC Project (<http://www.ucm.es/info/cliwoc>), an EU-funded venture which has made freely available for the scientific community the world's first daily oceanic climatological database for the period 1750 to 1850. During this period, more than 100 different wind-force terms were used by seafarers. They can be found in an important product of the project, the *CLIWOC Multilingual Meteorological Dictionary*, an English-Spanish-Dutch-French dictionary of wind-force terms used by mariners from 1750 to 1850. The last speaker was Clive Wilkinson (University of East Anglia), his subject "Captain's Log: the impact of the environment on navigation, trade and warfare in the age of sail". He showed how seafarers exploited contemporary knowledge of winds, weather, currents and geography of the world's oceans for exploration, commerce and warfare. The ships of the East India Company, for example, set out from the British Isles and from India and China in the period December to February and thus made good use of the seasonal wind and current patterns of the Indian Ocean. An important finding of his research was that winter was the best time for sailing vessels to cross the equator and 18-24°W the best longitude band to cross it. (Malcolm Walker, 64 West Chiltern, Woodcote, Reading RG8 0SG, United Kingdom. walkerjm@btinternet.com)

ARCHIBALD MENZIES' OBSERVATIONS OF AIR AND SEA PROPERTIES At the Annual Meeting of the American Meteorological Society in San Diego in January 2005, Malcolm Walker presented a paper entitled "The weather observations of Surgeon Menzies". Walker is the

Education Resources Manager of the Royal Meteorological Society and his paper was given in the Third Presidential History Symposium (which was just one of 25 parallel conferences and symposia during the Annual Meeting!).

Archibald Menzies served as surgeon and naturalist on Vancouver's historic voyage around the world from 1791 to 1795. During the voyage, he kept a weather log, including in it daily observations of air temperature, sea-surface temperature, barometric pressure, wind direction and wind force (using terminology similar to that used by Admiral Beaufort a decade later in the first published version of his famous scale of wind force). The log is important historically, for it includes the first weather observations ever made systematically along the west coast of North America (from Mexico to Alaska), among them observations made whilst at anchor at San Francisco and Monterey.

The sheets on which Menzies recorded his observations were lost when the Royal Meteorological Society moved from London to Bracknell in 1972, but they subsequently turned up in the University of Texas at Austin, USA. Thanks to the generosity of the university's Harry Ransom Humanities Research Center, the material was recovered in 1993 and is now in Reading, in the archive of the Royal Meteorological Society. The story of how the observations came to be in the possession of the Society in the first place was told in Walker's presentation. It is a long story. Suffice it to say for now that Menzies used the sheets for pressing flowers and the sheets were given to Hugh Robert Mill in 1907 by a member of staff of London's Natural History Museum. At the time, Mill was President of the Royal Meteorological Society.

During Vancouver's voyage, Menzies became the first to climb Mauna Loa, and he also climbed Wha-ra-rai, another Hawaiian peak. He used a barometer to ascertain the heights of these mountains, and the values he calculated were close to heights accepted today.

Walker's paper focused on the activities of Surgeon Menzies during Vancouver's historic voyage, particularly his meteorological activities. Relations between Menzies and Vancouver became so bad towards the end of the voyage that Vancouver ordered Menzies to hand over all of his journals, charts and drawings. Happily, Menzies did not comply. Had he done so, Walker's paper might never have been possible! (Malcolm Walker, 64 West Chiltern, Woodcote, Reading RG8 0SG, United Kingdom. walkerjm@btinternet.com).

THE LIFE CYCLE OF A PORT PIANC seminar on "life cycle approach in port infrastructure, reducing financial risks and achieving cost savings", held at PIANC headquarters in the Conscience auditorium of the Flemish Ministry of Public Works, Brussels, Belgium (February 2, 2005).

Is the history of a port's development only human geography, and/or economic geography? If the answer you give is yes, read no further, for a port's "life cycle" is no history of oceanography. That is however not the position taken by PIANC, the venerable organization vested in Belgium, which was until recently the Permanent International Association of Navigation Congresses, now streamlined into the International Association of Navigation.

The concept of life-cycle for ports was introduced just short of twenty years ago and has both historical and dynamic facets. Many ports have had their hour of glory which is at best a nearly faded memory today; as many have physically disappeared, some engulfed by the rising sea, others by silting. Thus some predictions see Charleston SC under five feet of water in the coming decade, unless protected by major engineering works, just as some Pacific Islands states are supposedly doomed. Some ports are now only linked to the sea by a trickle of water, like Brouage—near La Rochelle, France—once the finest harbour of France and the starting point of an important Hansa route and of perilous voyages to Canada.

Some ports have a life-cycle curve showing several peaks corresponding to modifications in operations and/or dominant product handled or product handling method or means. Ro-Ro, containers, have modified the aspects, extensions, and centers of harbours. Summarizing, the history of ports presents in general a period of development, growth, bloom and obsolescence, occasionally followed by renaissance accompanied by adaptation to altered conditions.

The ports with a new lease of life, for example, Rotterdam, Antwerp, and London, witness commonly a phenomenon of separation, even divorce, of town and port, with the contemporary facilities at some distance from the historical center. The reciprocal dependence is no longer in evidence, and may have faded *in toto* or *in partim*. This reaches such extent occasionally that one may wonder whether it is appropriate to speak of geographical relocation or if a new port has been born. The question may also be raised if one should speak of “cycle”, which implies, usually, a circular concept, cyclical with more or less regular nodes, or if these modifications are other than harmonic. Thus, although there has been talk of the life-cycle of harbours for two decades, the concept is still not “anchored”, yet historically challenging. In some cases a new life has started as is the case for the Atlantic ports of Bayonne, France and Bruges, Belgium.

The topic was the subject of a symposium, in Brussels, in February 2005.

The Port Life-Cycle Symposium

The papers were strongly environmentally geared and applicability aimed. They generally also drew on “the historical record”. Realism, field experience and future-pointed lessons from the past and present as well as forecast and long term planning were spotlighted. Life cycle approach management has found its place in port administration, methods and approach, and in long term planning. Benchmark changes in the shipping industry but also in port handling, or better *manutention*, stevedoring, labor and space requirements were detailed and examined in the light of British experience. The findings would have fit any major port on any continent. The presentation was aptly placed in the context of the port itself by a paper highlighting the changes in the world of ports but also of port operators. More on the fringe of the topic of the day was a bird’s eye view from the oil and gas industry experience. The examples furnished could be, at least *in partim*, extrapolated for use in shipping and ports.

An abundance of examples of the life cycle approach in existing and new ports was presented. Factors causing relocation, expansion and adaptation of harbours were analyzed, keeping environmental constraints in mind. Though smaller ports such as Bordeaux, Ghent, or even disappeared ones such as Brouage were included, major attention was directed at the giants such as Antwerp and Rotterdam. Papers provided an adequate introduction to a description of the economic aspects of the ports’ life cycle approach, using the case of Rotterdam as the example. Ingenious use of space in locations where it is at a premium, got its moment with a presentation dealing with Monaco’s new “hollow” breakwater. It is to bring some relief to both the parking and mooring problems.

As literature on the subject is still rather scarce, the seminar perhaps heralds better and more information on the topic.

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BOOK REVIEWS

Goodman, Jordan, 2005. *The Rattlesnake: A Voyage of Discovery in the Coral Sea*. London: Faber and Faber, 357 pages, illustrated, £ 18.99, ISBN 0-571-21073-2.

“My dearest Lizzy - Henceforward, like another Jonah, my dwelling place will be the “inwards” of the *Rattlesnake*, and upon the whole I really doubt whether Jonah was much worse accommodated, so far as room goes, than myself.” This wrote the 21-year old T.H. Huxley to his sister on the 6th of October 1846 when he got the appointment as assistant surgeon to join the *Rattlesnake*’s journey to Australia (1846 – 1850). It is Huxley who gave the ship its long-lasting fame, comparable to the fame Darwin gave to the *Beagle*. The studies Huxley made aboard the *Rattlesnake* on the anatomy of animals collected with their self-made tow-net formed the base of his fame as a scientist after his return. Much has been written already on the *Rattlesnake*’s journey in the Narrative of the voyage by its naturalist John MacGillivray (1852), in Huxley’s diary (1935) edited by his grandson Julian, and in Adrian Desmond’s *Huxley, the Devil’s Disciple* (1994). However, Goodman’s book is a welcome addition. It deals in particular with the main purpose of the *Rattlesnake* voyage: to chart the dangerous coastlines of Australia’s Coral Sea, indicate safe shipping routes in the area of the Great Barrier Reef and the Torres Strait, and map the coast off southern New Guinea.

Goodman relates the complete story of the voyage including the boring daily life aboard a surveying ship of endless sounding, measuring and map-making, and the serious leakage problems of this refitted 44-year old, 114 foot long navy frigate, directly after leaving Portsmouth. The *Rattlesnake* was one of several ships sent in succession to Australia by the Hydrographer of the Admiralty, Francis Beaufort. As its captain Beaufort selected the 35-year old Owen Stanley, with long naval experience and scientific interests, like Beaufort himself. Tragically Owen Stanley died in 1850 in Sydney shortly after the end of the survey, although he had hoped to succeed Beaufort as hydrographer. Probably the arduous task and responsibility as captain for such a long survey in these difficult and dangerous waters had been too much.

This is a well-written, excellently produced book, nicely illustrated by watercolours made mostly by captain Owen Stanley himself. Recommended to everyone interested in the history of oceanography!

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***Insula Serpilor (The Serpent Island)*, D. Padurean, Ed.Muntenia,Constantza, 2004, 557 pp and 21 annexes)**

Insula Serpilor, the first national and international scientific monograph by Dominut I. Padurean, a professor at “Mircea cel Batrân” Naval Academy in Constantza, Ph.D. in history, is the fruit of four years of documentary research.

The complex monograph is structured in seven chapters which contain extremely valuable data and information about the island: they cover respectively (1) geographical co-ordinates, geologic aspects, climate, waves, flora and fauna, (2) the island names between 777 BC and 2004, (3) cartographic presence between the 2nd and 20th centuries, (4) Achile’s island between mythology and reality, (5) the lighthouse, (6) the island’s political status until 1812, under Tsarist occupation between 1813 and 1856, under Ottoman domination between 1857 and 1878, Romanian land (1879-1947), 1948 unilateral annexation by the USSR, (7) island under Soviet control (1944/1948-1991) and Ukrainian (1991-2003) military base, issues concerning the territorial sea, the contiguous zone, the continental shelf and the Economic Exclusive Zone

(EEZ), the Romanian-Soviet (1967-1987) and Romanian-Ukrainian negotiations regarding the continental shelf and EEZ of USSR, Ukraine and Romania, the Romanian parliamentary debates on Serpent Island, the treaty with Ukraine of June 2nd, 1999 regarding Serpent Island with related implications on this island, and the consequences of the treaty on Romanian geostrategic interests in the Black Sea.

The dynamic and fascinating style, rigorously and permanently trying to objectively *audiantur et altera pars*, defends the position that Serpent Island continuously belonged *de jure* to Romania and its territorial rape - besides that of Bessarabia in 1812 and 1940, north of Bucovina and Hertza in 1940. The island has obvious geostrategic value and more recently acquired a growing economic importance. After 70 years of Romanian administration, its loss caused Romania a severe amputation, losing almost half of the 454 km of sea coastline it had owned from 1940 and 1948.

The book includes numerous interesting and original notes, such as the etymology of the northern branch of the Danube river, Chilia (of Chilia, Achillei) which comes from one of the ancient names of the island, viz. Achillea, Achilleis, Achilles, Achilleus, Achillis, and the ones containing the adjective “white” (Léuke etc.), the noun serpent (snake) *Natrix tessellata* Laur., or others rare or uncertain.

The whole argumentation based on numerous documents and quoted statements proves the legitimacy of considering the Serpent Island being Romanian land and claiming it accordingly (without forgetting incidentally, *Transylvania Romanian land : The Transylvanian issue according to an American*, by M.G. Lehrer, Bucharest, 1944, republished 1989). Another essential idea of the book refers to the notorious illegalities that brought about the separation of the island from the motherland. Regrettably not only the present “owner” of the island, Ukraine, but also some contemporary Romanian ranking officials, sustained the alienation of the island, notwithstanding legality and evidence. The patriotic sober, robust and tonic attitude of the author, which I share, leads to a major conclusion: the necessity to continue negotiations to retrieve Serpent Island. The example of Japan’s Kurile Islands may be cited here.

In spite of financial difficulties, translation of this outstanding monograph is recommended, eventually in a shorter version, at least in English, though it is also desirable in French and Russian. Also to be considered is appropriate distribution, e.g. to foreign embassies in Romania, Romanian embassies abroad, major libraries world wide, up to prestigious international juridical organizations.

Fiat justitia, ...

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Schwartz, M.L., editor. 2005. *Encyclopedia of coastal science*. Dordrecht, The Netherlands: Springer, xxxvi + 1126pp, illustrated. \$499 (€280) ISBN 1-4020-1903-3.

Some thirty years ago Rhodes W. Fairbridge launched the *Encyclopedia of Earth Sciences* Series, and its volumes, no longer sequentially numbered, have appeared under the imprint of various publishers. Each book turned out to be an outstanding tool of the library of the professional earth scientist and a valuable reference for peripheral readers. Twenty years ago M.L. Schwartz put out his *Encyclopedia of Beaches and Coastal Environments*, which was highly appreciated. The present effort updates and completes that work.

No less than 245 contributors address the multitude of topics in entries, some brief, but some covering several pages. New terms are introduced, for instance *tor*, and so are new visions

of standard concepts. Yet, such topics as kharkar, polders (though reclamation is listed), tangle, zwin, have been deleted or left out. Among the authors one finds the stalwarts of ocean science, but particularly of coastal science, and younger researchers who have established themselves. If the topics cover a broad spectrum, so does the geographic range of the contributors. Geomorphology captures a lion's share of the articles, but the editor has insured that the human and economic impacts are duly represented, for instance human impact on coasts and tourism. The contents and approach are interdisciplinary and under a single cover one finds subjects normally scattered throughout scientific literature.

Indeed, in addition to geomorphologists biologists, ecologists, engineers, geographers, geologists, and oceanographers, technologists will find information related to their respective fields, but so also will economists and social scientists. One may regret that the index does not include more geographical references. Inclusion of appendices that provide information on learned journals and a listing of organizations and institutes involved with numerous aspects of coastal science. The illustrated glossary of geomorphology will prove very useful for many of us, though entries representing coastal sedimentology would have still enhanced the value of that appendix.

The historian of oceanography will find several entries dealing with the history of coastal ecology, also of coastal geomorphology, coastal protection and the Holocene period. But a large number of articles encompass a historical review, and some have a definite historical slant.

Though the price tag is not excessive for such a monumental book, several individual researchers will have to rely on their libraries to provide a copy, unless they have taken advantage of the pre-June 30, 2005 reduced price of \$292.00, a hefty 40% discount.

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BOOK ANNOUNCEMENT

SECOND VOLUME FROM MAURY WORKSHOPS ON HISTORY OF OCEANOGRAPHY The second volume associated with the Maury Workshops on the History of Oceanography will appear sometime early this fall. It is based on papers given during the last workshop, Maury IV, held in Barrow, Alaska, 1-4 September 2004. Science History Publications will release the book, tentatively titled *Extremes: Oceanography's Polar Adventures*, edited by Keith R. Benson and Helen M. Rozwadowski. It will feature the following contributions:

Dedication to David van Keuren

Michael Reidy, Helen M. Rozwadowski, and Keith R. Benson, "Introduction"

Michael F. Robinson, "Reconsidering the theory of the open polar sea"

Vera Schwach, "Significant, but faded in oblivion: the Norwegian Vøringen-expedition, 1876-1878"

Cornelia Luedecke, "Diverging currents: depicting Southern Ocean currents in the early 20th century"

Eric Mills, "Creating a global ocean conveyor: George Deacon and the 'Hydrology of the Southern Ocean'"

Ronald Rainger, TBA

Fae L. Korsmo, "The early Cold War and U.S. Arctic research"

Jacob Darwin Hamblin, "Mastery of landscapes and seascapes: science at the strategic poles during the International Geophysical Year"

Peter Neuschul, "Antarctica beneath the ice: marine botany in the polar region"

Walter Lenz, "Multi-national, but not international - the Marginal Ice Zone Experiments (MIZEX), 1983-87"

Zuoyue Wang, "China goes to the Poles: nationalism and internationalism in Chinese polar oceanography"

Mott T. Greene, "Arctic sea ice, oceanography, and climate models"

Deborah Day, "Bibliography of the history of Arctic marine science of the 20th Century"

For information about the book, you may contact Neale Watson at Science History Publications, PO Box 1248, Sagamore Beach, MA 02562-1248

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Prepared by Deborah Day, Scripps Institution of Oceanography Archives

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