A Short Human History of the Ocean Floor

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1 Introduction

It could be argued that representations are the key to understanding human actions. It is our inner picture of the sea floor that makes things happen – whatever picture that is. The more so since the ocean floor is not directly accessible to us in any way – we depend on representations. So let us start this human history of the ocean floor reminding ourselves that our object of study is not direct accessible and that our impressions of the sea floor is always mediated in one way or another: by different technologies, by science or by literature or cultural traditions.

Science came to play an important role in overtaking earlier guesswork and anecdotes about the sea floor. But even scientific views were changing. It suffices to remember the ridicule Alfred Wegener (1880–1930) was subjected to with his theory of continental drift from 1912. Not to mention the fascinating story of the cartographer Marie Tharp (1920–2003) and her detailed drawings of the ocean floor that finally contributed to the breakthrough of plate tectonics in the late 1960s and restored Wegener's ideas. The representations developed afterwards combined with all sort of technological devices have made the ocean floor a place for a great variety of claims and hunt for resources.

In this chapter, I will try to establish something that could be called a human history of the sea floor. A place so inaccessible requires other means and ways to figure out the relation between humans and the deep sea. It is important to acknowledge that the representation of the seafloor is the most important element in this history. Secondly that the resources and their regulations always have been based on these representation. As time flows these have shifted and varied. Science has come to play an important part as have real examination of the sea floor. This chapter is an overview, too short of details and modifications, but it might be an introduction to an area very few have seen, but still covers almost $\frac{5}{7}$ of the Earth's surface.¹

1 The literature in the field is particular centered on the history of oceanography. Some main references here are the classic study by Deacon, Margaret B. *Scientists and the sea 1650–1900: a study of marine science* (London: Academic Press, 1971). It was followed by a newer anthology

The chapter consists of four major parts as a parallel to four major historical phases of the cultural appropriation of the sea floor. After an introduction (Section 1), it starts with the *Carta Marina* from 1539 describing the dangers of crossing the surface of the sea and the first attempts for soundings and measuring of tidal waters (Section 2). In the second major part (Section 3), the first attempts to measure the deep sea and to use the seafloor as a place for cables are discussed. The third period (Section 4) introduces the powerful alliance between science and navies leading up to important research project as 'The Challenger' and 'Meteor' really increasing the knowledge of the seafloor. The last major section (Section 5) is devoted to the regulation of the seafloor ending with UNCLOS III and the scientific development underpinning it.

2 The Dangerous Sea

The deep ocean has always been a mystery to mankind. The idea of something bottomless, a void, is frightening. Even more frightening was the idea of what this bottomless void could hold. Rumors and ideas were circulated and also collected by intellectuals in the renaissance and later.

2.1 Representing the Unknown Deep Ocean Floor

It seems appropriate that we start this decent to the deep ocean floor with a famous map, *Carta Marina*, from 1539 (Figure 3.1). The map was made by a clergy, Olaus Magnus (1490–1557).² It covered most of the northern part of coastal Europe and the North Sea and the Atlantic. Olaus Magnus used years to gather knowledge and experiences from merchants, sailors, fishermen and whalers to be able to draw the map. To us the interesting part is not only the land masses and coasts that are drawn but also what is to be found in the deep ocean and that come to the surface of the map. Monsters, large as mountains, lived in the unfathomable depths, threatening every seaman who dared to sail across open sea. Olaus Magnus had, of cause, not seen these monsters himself,

from 2001: Deacon, Margaret, Rice, Tony and Summerhayes, C.P. *Understanding the oceans: a century of ocean exploration* (London: UCL Press, 2001). For a newer general introduction, H.M. Rozwadowsky is highly recommendable: Rozwadowski, H.M. *Fathoming the Ocean* (Harvard University Press, 2009); Helen M. Rozwadowsky, 'Focus: knowing the oceans: a role for the history of science', *ISIS: Journal of the History of Science in Society* (2014) 105(2), 335–337 (see as well her edited focus group of paper in *Isis* 2014). A good introduction to the historical development of plate tectonics can be found in Lawrence, David M., *Upheaval from the abyss: ocean floor mapping and the Earth science revolution*. (New Brunswick, NJ: Rutgers University Press, 2002).

2 Richter, Herman and Olaus, Magnus. *Olaus Magnus: Carta marina, 1539* (Vol. 11:2) (Lund: Lärdomshistoriska samfundet, 1967).

FIGURE 3.1 Carta Marina, by Olaus Magnus

[HTTP://WWW.NPM.AC.UK/RSDAS/PROJECTS/CARTA_MARINA/](http://www.npm.ac.uk/RSDAS/PROJECTS/CARTA_MARINA/) "CARTA MARINA SATELLITE IMAGES", PUBLIC DOMAIN, [HTTPS://COMMONS.WIKIMEDIA.ORG/W/INDEX.PHP?CURID=558827](https://commons.wikimedia.org/w/index.php?curid=558827)

he had to rely on reports as he relied on reports of coasts and lands, weather and winds. Hence, what we see in the map are not fantasies, but first attempts to empirically say something about what the deep ocean in fact contained as it had been witnessed by sea folks. It was a representation of what the oceans concealed.

2.2 Addressing the Perils of the Open Sea by Exploring the Seafloor

The sea monsters and ocean storms were perils of the open sea. There were, however, other more concrete and always threatening ways that the sea and the sea bottom could be a menace for the seamen and the ship masters. One thing was storms and bad weather, even more dangerous was the treacherous sea bottom threatening to ground the ship and destroy it. As late as the end of 19th century the largest cause of averages and losses of ship was 'grounding' or 'stranded and abandoned'. As much as $\frac{2}{3}$ to $\frac{3}{4}$ of all ship losses was caused by this.³

3 DnV accident statistics, from Annual report. See Paulsen, Gard, Andersen, Håkon With, Collett, John Peter and Stensrud, Iver Tangen *Building Trust. The history of DNV 1864–2014* (Dinamo Forlag, 2014).

The danger of grounding and the anxiety for being stuck on the bottom lead very early to measures to sound the depth of the sea under the ship. Sounding was also used to determine if land was not too far away. However, the main reason was to ensure safe travel. Still, accident happened. One of the more famous was for instance James Cook's (1728–1779) grounding at the Great Barrier reef in the summer of 1770 when exploring the east coast of Australia.⁴

Sounding also made another thing clear: the ocean was very, very deep. Usually sounding lines would only reach some hundreds fathom deep.⁵ Below that, nobody knew and nobody cared too much. Interest turned to what was considered problems for shipping. Not only grounding was a threat, but in the same way knowledge of tides became important in the 18th century. Serious studies of tides and the behavioral of tides were undertaken, along with attempts to map coastlines with the level of tides.

Nevertheless, very few cared about the deep ocean except for superstition and rumors about what the deep ocean actually hid. It was still fathomless in the 18th century, even if Olaus Magnus' creatures had disappeared and may be substituted by whales and other large sea animals with other stories connected to them and the few that had seen them.

A small note should be made about the real observers of the ocean: the growing whaling industry towards the end of the 17th century and through the 18th and early 19th century. Whalers were the only one that really crisscrossed the oceans on their restless hunt for the large animals. Hence, they also became the most important reporters of conditions at sea and the lives of 'monsters'.⁶

3 Mapping the Seafloor as a First Answer to Its Growing Strategic Importance

Towards the end of the 18th century and start of the 19th century, the ocean took on a more strategic importance to the larger naval countries. It became important to systematize the knowledge of wind, currents and sailing conditions around the globe. Knowledge about the sea floor, where it was a danger to ships and where it could contribute to different sailing conditions became important. The French navy had done this since the middle of the 18th century

4 M.B. De Deacon, Margaret B. *Scientists and the sea 1650–1900: a study of marine science* (London: Academic Press, 1971).

5 A fathom is 6 feet or 1,83m. Older measures varies from 1,5m to 1,8m.

6 Philbrick, Nathaniel, *In the heart of the sea: the epic true story that inspired Moby Dick* (London: HarperCollins, 2001); Tønnessen, Johan Nicolay and Johnsen, Arne Odd, *The history of modern whaling* (Univ of California Press, 1982).

while the British navy established the British Admiralty's Hydrographic Office in 1795. The first hydrographer of the admiralty was Alexander Dalrymple (1737–1808), a fellow of the Royal Society. We immediately note the marriage between 'science' and the navy, a new combination that should mark the exploration of the seafloor for many decades to come.⁷

The hydrographic office should first and foremost gather intelligence about the sea and the oceans and improve maps and navigational manuals for both military and civil service. Maps had been made for commercial reasons for centuries, but particularly the use of chronometers and lunatic tables for more exact longitudinal positions had improved the quality of maps quite dramatically. The Admiralty and its hydrographic office had pioneered these resources since the last decades of the 18th century. But the task was even broader: the hydrographer should be the foremost advisor to the Board of Admiralty on all sort of intelligence about the ocean.⁸ It strengthened the link between the navy and 19th century scientific activity at the same time as it also contributed to commercial activities, first and foremost through better maps and sailing manuals. Dalrymple, for example, came to prioritize international scientific cooperation and exchange of data and maps. He had obvious a desire to put hydrography before limited military gains.⁹

Matthew Fontaine Maury (1806–1873) came to play a parallel role in the United States in the antebellum period. In 1842, he was appointed director of the Navy's Depot of Charts and Instruments and soon after the head of the Naval observatory.¹⁰ In connection with our study of the ocean floor Maury plays a prominent part as he was the first to make a crude map of the Atlantic Ocean floor and as such motivated the first use of the deep sea floor. We will come to that, but first we have to understand what was at stake for all the great powers hydrographic activities in the first part of the nineteenth century. We will use Maury as an example of this, even if more or less the same sort of work were conducted in Britain, France, Spain, Denmark and other European coastal states.

7 Webb, Adrian. 'More than just charts: hydrographic expertise within the Admiralty, 1795–1829', *Journal for Maritime Research* (2014) 16(1), 43–54; Clissold, P. *Chartering the Seas. The Admiralty Hydrographic Service 1795–1919*. Vice-Admiral Sir Archibald Day, K.B.E., C.B., D.S.O. (1968), Her Majesty's Stationery Office, London, 1967, 105s. *Journal of Navigation*, 21(03), 371–373.

8 Webb, Adrian (n7) p 45.

9 Webb, Adrian, 'Foundations for «International cooperation in the field of hydrography»: some contributions by British admiralty hydrographers, 1795–1855', *International Hydrographic review* (2010) (4) p 8.

10 Rozwadowski, H.M (2009) (ni) p 44.

3.1 *Matthew Maury's Legacy*

In 2016, a whole section of the *International Journal of Maritime History* was devoted to Matthew F. Maury and his rather mixed legacy.¹¹ Mixed because he left his job to fight for the confederacy in 1861 and because he was not a real scientist according to historians of science. In the section, Maury's contribution is discussed along three dimensions: Maury, the pathfinder, the scientist and the reformer. These three roles characterize Maury quite well, as well as they characterized contemporary hydrography in general. However, Maury did it more intensely than most others hydrographers at the time. As a pathfinder, he was studying ship logs and created catalogues and maps of wind, weather and water in such a way that he could recommend the fastest way to travel.¹² He created in a way pathways for sailing ships, not only naval but also for merchant ships and whalers. This empirical and systematic work over many years did away with much of the superstition and personal preferences of the captains. As the merchant ship masters saw the benefit of their observations, they were easily persuaded to collect more data on their travels and in this way strengthen Maury's scientific work.

Maury's interests were much wider than just finding the best traveling routes in the days of sail. It included all parts of the oceans: winds, salinity, currents, weather and depths.¹³ More or less unintentionally, Maury's work came to be important for the first serious use of the ocean floor, as a bed for communication technology, the first transatlantic telegraph cable.

3.2 *The First Submarine Telegraph Cables: the Seafloor as a Medium*

In a report to the secretary of the U.S. Navy from 1853, Maury had described the ocean bed as 'a plateau, which seems to have been placed there especially for the purpose of holding the wires of the submarine telegraph, and keeping them out of harm's way'.¹⁴

It was the American entrepreneur Cyrus Field, encouraged by Maury's report that initiated the attempt to lay such a cable. Moving to Britain he succeeded in rising sufficient funding for a first attempt to lay a cable. The cost was

11 See the introductory article: Rozwadowski, Helen M., 'Introduction: Reconsidering Matthew Fontaine Maury', *International Journal of Maritime History*, (2016) 28(2), 388–393.

12 Smith, Jason W., 'Matthew Fontaine Maury: Pathfinder', *International Journal of Maritime History*, (2016) 28(2), 411–420.

13 Hardy, Penelope K. 'Matthew Fontaine Maury: Scientist', *International Journal of Maritime History* (2016) 28(2), 402–410.

14 Headrick, Daniel R., Griset, Pascal, 'Submarine Telegraph Cables: Business and Politics, 1838–1939', *The Business History Review* (2001) 3/75, 543–578.

FIGURE 3.2

Landing of the Atlantic Cable of 1866, Heart's Content, Newfoundland, by Robert Charles Dudley

[HTTPS://WWW.FLICKR.COM/PHOTOS/LAC-BAC/31367042642/IN/ALBUM-72157677492475586/](https://www.flickr.com/photos/lac-bac/31367042642/in/album-72157677492475586/), PUBLIC DOMAIN, [HTTPS://COMMONS.WIKIMEDIA.ORG/W/INDEX.PHP?CURID=55655760](https://commons.wikimedia.org/w/index.php?curid=55655760)

enormous, and the risk was high and became obvious when the first cable was lost in 1857. A second attempt was made in 1858. It succeeded temporarily so the address of the American president would reach Queen Victoria. However, a couple of weeks later it failed, never to work again. The Civil War prevented new attempts before finally the cable was laid in 1865. It broke again, but this time it was possible to repair it. In 1866, the cable finally worked and worked well: it served newspapers, business, politicians and administrations, even if it was expensive in use (see Figure 3.2 – Landing of the Atlantic Cable of 1866, Heart's Content, Newfoundland, by Robert Charles Dudley).

In the years from the 1850s onwards submarine telegraph cables were laid under many seas and oceans, all of them needed sufficient knowledge about the ocean bottom. British firms totally dominated the business, both for cable laying and for submarine telegraph. In 1892, British firms controlled $\frac{2}{3}$ of all submarine cables (more than 160 000 km) with the US as a good second with 15%.¹⁵ For cable laying, knowledge of the ocean bed's topology and the bottoms quality was of outmost importance. It was not any longer science for science sake, it was technology, it was strategy but foremost it was business.

It is difficult for us today to recognize the importance and the publicity that the submarine cables created. As communication technology, it was the first time that information and communication was separated from physical movement of persons or things. It is difficult to imagine the change that the cables brought about. Instead of using weeks and months for news, business instructions and letters, they could now be communicated within hours and minutes. The price was high, of course, but suddenly the globe became much smaller. It can be argued that the transatlantic cable across the abyss of the ocean was the real start of the global information society.

¹⁵ Ibid, p 560.

The Atlantic cable was not the first submarine cable, but it was the first to connect North America with Europe. Earlier submarine cables from the early 1850s was quickly destroyed by fishermen before they were properly protected and the insulation was destroyed by seawater. The use of gutta percha as insulation and iron reinforcements proved to be effective. Hence, the possibility for larger distances opened up.

With the idea of a submarine cable, the seafloor was immediately brought to attention. The seafloor would be the medium the cable had to use, even the very deep seafloor. In addition, this was not a territory under national control, on the contrary, this was a transnational medium paralleled only by the ocean surface as used by international shipping. For the first time, technology demanded knowledge of the deep seafloor outside the fishing grounds on the shelves and was in itself an impulse for further exploration.

4 Exploring the Seafloor

4.1 *Natural Science*

In the middle of the 19th century the interest for the sea bottom took on another new perspective. This time the interest came more directly from science, from both amateurs and more professionally inclined scientists. Science as a gentleman's 'sport' was well established in Great Britain with Royal Society as a core elite institution. Around 1850 the combination of yachting and bottom scraping came in fashion by gentlemen scientists.¹⁶ Bottom scraping brought up a very new flora and fauna which could be described and discussed. In the second half of the 19th century, bottom scraping also became increasingly popular among scientists in other countries. This resulted in an increased knowledge about the sea floor at not too great depths.¹⁷ The importance of these early scrapings was to open up for more serious studies of the deep ocean, where yachts with lines and scrapes would not be sufficient. The second part of the nineteenth century represented in many ways the high tide for museums of natural history as the most prominent representation of modern science. As such, bottom scraping contributed substantially to the collections and, thus, to the representation of science.

A popular idea among scientists was the idea that there could be no life below 300 fathoms because of the loss of sunlight. The theses were put forward

¹⁶ Rozwadowski, H.M. (2009) (n).

¹⁷ Andersen, Håkon With et al, *Aemula lauri : the Royal Norwegian Society of Sciences and Letters, 1760–2010* (Sagamore Beach: Science History Publications, 2009).

by the British naturalist Edward Forbes (1815–1854) in the early 1840s and got its own name: the ‘azoic theory’, i.e. the lifeless zone. Forbes had been dragging in the Irish sea and most important the Aegean sea and found less and less diversity of living beings the further down he dragged. It encouraged others to do the same and in the 1860s the azoic hypothesis obviously had problems. All these draggings increased the knowledge of life at the seafloor, even if it was not possible to drag very deep.¹⁸

Already the laying of the transatlantic cable found evidence to contradict the azoic theory when primitive lifeforms were found on broken cables that were brought up for repair. However, it would live on for a decade before it was finally rejected through the *Challenger* expedition in the early 1870s.

The seafloor had found a use and hence become a medium that required knowledge and interest. It was no longer a void only to be discussed or to be researched. Towards the end of the 19th century, both the U.S. navy and the British navy’s Hydrological office became more and more involved in what we might call early oceanographic scientific work in a more systematic way.

The cost of doing this kind of research in the 19th century was staggering and that was one reason that only the larger navies were the ones that could contribute with ships and seamen. Hence a pragmatic alliance between the navy and scientists was formed. The ocean became in a way a new frontier, to quote Helen Rozwadowski, as there was no more land to be found.¹⁹ New species, new charts, new details of shores and peoples were to be ‘discovered’. In this the navy could be seen to continue an already old tradition from exploration and occupation of territories, but this time under the sea. For the scientist in the Royal Society or at the universities, it was inconceivable to fund large scale studies of the deep ocean without the cooperation of the navy.

The understanding of the ocean floor in the first part of the 19th century was based on the idea of a very rugged ‘landscape’. Without the forces that would slowly tear and wear on mountains on land one thought that the seascape was even more dramatic than mountains on land. This led to the belief in so called ‘vigias’ that simply was summits that raised so high in general deep seas that it was a threat for ships and lives of men. So one reason for measuring depths of even very deep oceans was that there might be some vigias. Maurey became instrumental in the early 1850s to change the view of the deep sea bottom to something much more like a plateau, perfectly shaped for a submarine cable.

18 Corfield, R., *The Silent Landscape: The Scientific Voyage of HMS Challenger* (National Academies Press, 2003).

19 Rozwadowski, H.M. (2009) (n1).

During the 1850s and 1860s several expeditions were made both with American and British navy ships sounding and measuring temperature, salinity and currents in the oceans. With the steadily expanding telegraph cables, this was also useful to commercial companies.

4.2 *The HMS Challenger Expedition (1872–1876)*

However, no initiative could compare with the three and a half yearlong scientific expedition of an old British navy vessel, the *HMS Challenger* (Figure 3.3 – H.M.S. Challenger 1874).²⁰ From 1872 until 1876 she circumvented the earth three times and crisscrossed all large oceans, sounding depths, taking samples from the bottom, measuring salinity and temperature. The navy and scientists combined resources and intellect in a very fruitful mix. *Challenger* made around 400 deep soundings in all the larger oceans in the span of the three and a half years, each sounding was difficult to execute and took a fairly long time. In addition, they took samples of the seafloor and studied both the flora and fauna of the ocean (Figure 3.4 – Examining the ‘haul’ on board the *Challenger*, W.H. Overend). The reports from the expedition filled 50 volumes and was not completed before 1895. They came to be the basis for all further investigations and new results from the findings did not stop before well into the 20th century.²¹ The *Challenger* was equipped with special equipment for sounding, including a separate steam engine to enable sounding and dragging at extreme depths. She was also equipped with laboratories and storeroom for scientific specimen brought up from the deep.

The ship itself was a 2300-ton screw corvette built in 1857. It was a full square rigger with an additional 1200hp steam engine. With most of its cannons removed and the six scientists onboard, it still had a crew of about 200 men. In the more than three years she crisscrossed the Atlantic, the Pacific, the Indian Ocean and the Antarctic she regularly stopped every 200 miles to do soundings, scrapings and all sort of measurements, particularly temperature at different depths, salinity and currents. It was the grandest and most costly scientific expedition ever to have been carried through.²²

The expedition was initiated by science, through the initiative of the vice president of The Royal Society, W.B. Carpenter (1813–1885). Charles Wyville Thomson (1830–1882) was to become the scientific leader of the *Challenger* expedition. He had led a couple of shorter expeditions to the North Atlantic in

20 Brunton, E.V., *The Challenger Expedition, 1872–1876: a visual index* (Natural History Museum, 1994). Corfield, R., *The Silent Landscape: The Scientific Voyage of HMS Challenger* (National Academies Press, 2003).

21 M. Deacon et al., 2001 (n1) p 31.

22 Ibid and Lawrence, David M. (2002) (n1).

FIGURE 3.3
H.M.S. Challenger 1874.
FROM NOAA ARCHIVE, PUBLIC
DOMAIN, [HTTPS://COMMONS.
WIKIMEDIA.ORG/W/INDEX.
PHP?CURID=7028789](https://commons.wikimedia.org/w/index.php?curid=7028789)
[HTTPS://EN.WIKIPEDIA.
ORG/WIKI/CHALLENGER_
EXPEDITION#/MEDIA/
FILE:CHALLENGER.JPG](https://en.wikipedia.org/wiki/Challenger_expedition#/media/File:Challenger.jpg)
REPORT ON THE SCIENTIFIC
RESULTS OF THE VOYAGE OF
H.M.S. CHALLENGER DURING
THE YEARS 1873–76 UNDER THE
COMMAND OF CAPTAIN GEORGE
S. NARES, R.N., F.R.S. AND THE
LATE CAPTAIN FRANK TOURLE
THOMSON, R.N./PREPARED
UNDER THE SUPERINTENDENCE
OF THE LATE SIR C. WYVILLE
THOMPSON, AND NOW OF JOHN
MURRAY; PUBLISHED BY ORDER
OF HER MAJESTY'S GOVERNMENT
LIBRARY CALL NUMBER Q115.
C4 NOAA SOURCE INFORMATION
[HTTP://WWW.PHOTOLIB.NOAA.
GOV/SHIPS/SHIP3137.HTM](http://www.photolib.noaa.gov/ships/ship3137.htm)

FIGURE 3.4 Examining the 'haul' on board the
'Challenger'.
W.H. OVEREND [PUBLIC DOMAIN],
VIA WIKIMEDIA COMMONS, [HTTPS://
COMMONS.WIKIMEDIA.ORG/WIKI/
FILE:EXAMINING_A_HAUL_ON_BOARD_
THE_CHALLENGER.JPG](https://commons.wikimedia.org/wiki/File:Examining_a_haul_on_board_the_Challenger.jpg)

the smaller naval vessels, *HMS Lightning* and *HMS Porcupine* in the late 1860s. Both the navy and the Hydrographer of the Admiralty was positive to the project, and so was the Treasury. There were several reasons for this most unusual strong support for a very expensive and long expedition. One of them was the newly advance of subsea telegraph cables. Another was the treat of American deep sea explorations, following up on Maury's earlier work. A third reason was the way the government's financial structure was newly restructured.²³ Finally, it should be noted that Britain, as the total dominating sea power of

23 M. Deacon et al., 2001 (n1) p 28.

the world at that time, had to take on the responsibility of figuring out more about the seafloor than the other and much smaller maritime nations.

The leader of the expedition, Charles Wyville Thomson, died in 1882 and had to leave the completion of the reports to his younger colleague who also had participated in the whole expedition, John Murray (1841–1914). It was mainly due to his work that the result of the *Challenger* expedition came to put its mark on the next half hundred years of research and exploration of the sea floor.

The discoveries of *Challenger* were many and had profound consequences. First of all, one got to know how deep the ocean actually was and how the topography of the bottom varied with seamounts, ridges and large flat territories and also with extreme depths in deep trenches. Secondly, one got an idea of what the ocean floor consisted of, with the light oozes picked up all round the globe. With 200 miles between each sounding, the maps were not very good, but it sufficed to get an idea of the bottom. The extremely detailed reports that came from John Murray's hand were to be used for many decades into the future. The *Challenger* really shifted, or maybe better, created our view of the sea floor that to some extent still is valid today even as impressionistic as it was.

However, the number of soundings were rather small, compared with the enormous area of the oceans. To make profiles of the sea bottom for the laying of telegraph cables the soundings were not only suspicious few, the problems of correct soundings were also great. Already Maury in 1858 had shown how different soundings of the same route gave quite different profiles of the seafloor, mainly because the number of soundings were so few. Scientifically one could live with this uncertainty, but for telegraph cables it was another question. Here, the ocean floor as a medium for the cable was very important.

4.3 *Follow-up Expeditions: Meteor*

The *Challenger* expedition was also the breakthrough for oceanographic research internationally. However, no one had the resources or the patience to repeat such grandiose expedition as that of *Challenger*. Around the turn of the century, much interest turned away from the ocean floor and instead concentrated on the resources at sea: fish and fishing. With telegraph cables on the ocean floor now as quite ordinary business – even if it was very expensive and needed bottom surveying and fathoming, migrant fish schools and fish reproduction in the ocean became the new focus.²⁴

24 Hamblin, Jacob Darwin, 'Seeing the Oceans in the Shadow of Bergen Values', *History of Science Society, Inc* (2014) Vol. 105, pp. 352–363. Rozwadowski, Helen M., *The sea knows no boundaries : a century of marine science under ICES*, International Council for the Exploration of the Sea (Seattle, Wash: ICES in association with University of Washington Press, 2002). Schwach, Vera, *Havet, fisken og vitenskapen : fra fiskeriundersøkelser til havforskningsinstitutt 1860–2000* (Havforskningsinstituttet, Bergen, 2000).

FIGURE 3.5 The Meteor expedition, original plan (1925–1927)

A. MERZ, [HTTPS://COMMONS.WIKIMEDIA.ORG/WIKI/FILE:DAE_REISEPLAN_ORIG.JPG](https://commons.wikimedia.org/wiki/File:DAE_REISEPLAN_ORIG.JPG)
PUBLIC DOMAIN VIA WIKIMEDIA COMMONS

Scientific expeditions did not stop even if interest turned to other problems. Of particular interest is the German *Meteor* expeditions in 1925–1927 (Figure 3.5 – The Meteor expedition, by A. Merz). For the first time sounding was carried out without line and heavy weights. The Meteor expedition pioneered acoustic waves as sounding method. Suddenly it was possible to do many more soundings and at the same time reduce the uncertainty connected to the real

depth. While *Challenger* made 400 soundings, *Meteor* was able to do more than 6000 soundings in a much shorter time. From the 1920s we could say that it was possible to realistically profile the ocean floor.²⁵ *Meteor* was using an echo sounder based on a design by the Canadian inventor and professor Reginald A. Fessenden (1866–1932). Fessenden was originally known for his inventions in radio communication but had turned to echo sounding and ‘ice-berg warning’ later in life. The *Meteor* expedition set the state for a much better knowledge of the subsea floor.²⁶

5 Governing Deep Sea Resources

The 1930s saw in embryonic form another approach to the ocean and deep sea: the attempt to control resources in the sea much further away from land than until then had been customary law. Some South American nations were particularly eager to control what they considered their resources. Let us, however, take a small step back and consider the historical development of international law with respect to the ocean.

5.1 *The Shortcomings of the First International Law Response*

As many authors have pointed out, there was actually no law of the oceans aside for customary rules and, of course, private law regulating much of the shipping business. The reason was quite obvious, since no one needed such laws apart for the common conception of the free ocean and the limitation of the territorial sea to a cannon shot, usually interpreted as three nautical miles.

With expanding fisheries and the introduction of large steamer fishing vessels, conflicts escalated, particularly after the turn of the century. The contours of the frontlines that marked most of the 20th century became clearer: the large shipping nations (flag states) against the coastal states. The first ones fighting claims to increased national control over the coastal seas, the other ones wanted to protect what they considered their resources, also outside the rather narrow territorial waters.

Already in the early 1920s, the League of Nations started working finding out where there was a need for new international public law. In 1924, the Council of the League of Nations established a Committee of Experts for the Progressive Codification of International Law. The law of the sea was one topic considered

25 Hühler, Sabine, ‘Depth records and ocean volumes: ocean profiling by sounding technology, 1850–1930’, *History and technology* (2002) 18(2), 119–154.

26 Lawrence (2002) (n1) p 102–108. Hühler (2002) (n25).

for codification by the Committee of Experts. Through a series of debates, the Committee narrowed the questions concerning the seas down to the question of territorial waters.²⁷

In 1930, the preparatory work of the Expert Committee was the basis for an international diplomatic conference: The Hague Codification Conference. It turned out that the second Committee that was charged with questions related to territorial waters was unable to conclude.²⁸ The conference was a failure and is often seen as irrelevant since it did not give any results on the territorial seas. Others might see it a bit differently. The conference was premature but the different view between the flag states and the coastal states became apparent and led several of the last to threaten to increase their own territorial waters unilaterally.²⁹

To complicate the situation even further just after World War II, one of the most powerful shipping nations made two unilateral proclamations increasing both their fishing rights and, what interests us most here, their claim on the seafloor and the recourses in the subsoil of the continental shelf. This has later been known as the Truman declarations from September 28, 1945.³⁰

The background was the search for oil that already before the war had lead oil companies into the Gulf of Mexico to search for oil in increasingly deeper water. Actually, this was not the first claim on the sea floor. In 1942, Britain signed an agreement with Venezuela on the Gulf of Paria (between Trinidad and Venezuela) on the rights to the seafloor and the water above.³¹ In both cases, the agreement stated that the arrangement would not interfere with the right of shipping and would thus preserve the freedom of the seas, even if the resources in the water column and the continental shelf were claimed.

Until the mid-20th century, the ocean floor was interesting and experienced as a medium and as a scientific object of study. The question of resources or to whom it belonged was far away and outside anyone's actual claim. We should also note a particularity concerning the use of the ocean as a medium. It was largely dominated and regulated by private companies, not by states. We have already mentioned that shipping was mainly regulated by private laws and agreements, but so was also the telegraph cables. They were both laid,

27 Harrison, James, *Making the law of the sea: a study in the development of international law*, Cambridge studies in international and comparative law (New York: Cambridge University Press, 2011), p 29.

28 Ibid, p 30.

29 Gold, Edgar, *Maritime transport: the evolution of international marine policy and shipping law* (Lexington, Mass: Lexington Books, 1981).

30 Ibid, p 252.

31 Ibid, p 252.

controlled and operated by large, mainly private, companies, even if they of course were of strategic importance for states.

5.2 *New Attempts to Regulate the Seafloor through International Law in Changing Global Power Balance (1950s)*

In the 20th century, both fish and oil became important as it was possible to move further out from the shores. Hence, the quest for appropriation of both the water column and the ocean floor and its subsoil became an issue. Even if the League of Nation's conference failed in 1930, the United Nation tried again, both in 1958 and 1960 with the first and the second Law of the Sea Conferences, both a rather mixed success and partly failure.

For the seafloor, however, the conferences resulted in some constructive conclusions, even if they were rather temporary and incomplete. The 1958 conference was able to conclude with a regulation of the continental shelf. The shelf and its resources belonged to the coastal state until the depth of 200 meters or as deep as it was possible to extract resources. This was a rather unclear and technology dependent limit, but was probably the best that could be achieved at that time. As for the water column and its resources, none of the conferences were able to reach an agreement. Even if the ambition was reduced compared to the 1930 conference, the different views were still too antagonistic. The flag states opposed the claims of the coastal states. It should also be noted that with regard to the surface, the larger shipping nations blocked the establishment of a UN organization for regulating shipping businesses. The International Maritime Consultative Organization (IMCO, later IMO), which was established in 1949, did not get sufficient ratifications before 1959, mostly due to the opposition of the major flag states. In the light of this, one could say that the agreement on the continental shelf was an exception to be explained.³²

Resources have to be controlled, one way or another. What we have seen through the first three quarters of the 20th century was a fight over the control of resources in the sea column, that is mainly fish. Large maritime nations wanted not only to have free access to oceans and straits, but also to be able to fish everywhere. Hence it was important to keep the limit of territorial waters to a minimum. Coastal states on the contrary wanted to lay their hands on larger areas of the sea that they argued was their rightful resources. As for the seafloor, it was not that much of a threat since, in most cases, it was not seen

32 Cafruny, Alan W. *Ruling the waves : the political economy of international shipping* (Vol. 17) (Berkeley: University of California Press, 1987).

as relevant for either fishing or shipping and only on very shallow waters was considered relevant for oil.

The cold war was another factor in this game. The US and Britons were opposed to larger territorial waters in light of the submarine warfare possibilities and threats even if this was not clearly stated. However, military and strategic concerns played a central role in the further development of the law of the sea, even if it was not clearly articulated.

It is important in this discussion to bear in mind a couple of important facts as for international law of the sea. The first fact of importance is to recognize Britain's immense dominating position as maritime power around 1900. Half of the world fleet was British. They also dominated both shipbuilding and subsea telegraph cable companies. Add to this the British empire and their domination is complete. As for shipping, another growing power became second only to the British: the US fleet or rather the fleet controlled by US owners. Rules set by the British Board of Trade was the closest one could come to international law of the sea.³³ Other large shipping nations, as the Scandinavians and Greece, followed closely the British policy and the rules of the Board of Trade, simply by necessity.

This situation could not last. The cod wars between Iceland and Britain towards the end of the 1950s was only a sign that times were changing. As the Empire shrank and countries got their independence one after the other, the demand of the coastal states grew stronger by the day. At the end of the 1960s, it was only a question of time before large exclusive economic zones (EEZ) would be a reality. At the same time the prospect of technological change had made the old limitation of the continental shelf irrelevant (200m).

5.3 *Changing Scientific and Political Parameters: the 1960s*

For the history of the seafloor, the 1960s was fascinating in two very different ways, scientific and political. It was a time of great upheaval in both dimensions. Let us start with the scientific one. Almost one hundred years after the *Challenger* expedition, a totally new perspective on the ocean floor would be found, a paradigmatic change almost without parallel. It started in a discredited place, with the geophysicist Alfred Wegener's (1880–1930) theses of continental drift from 1912/1915. Wegener argued that all the continents once had been one, the Pangea, and then drifted apart, colliding and turning.³⁴ One reason for the rejection was that Wegener was not able to give any mechanism

33 This might clearly be seen in the case of an international loadline for merchant ships, finally established in 1930.

34 Lawrence (2002) (n1), p 33 ff.

for the continental drift and his theory was regarded as rather odd. It was a common consensus that both the continents and the seafloor was of the same constitution and of the same age.

The 1960s marked the return of Wegener's ideas, but now in a totally different form, i.e. as a theory of plate tectonics and this time with explanations on mechanisms for plate drifts. The closer knowledge of oceanic ridges and the creation of new ocean floor at the same time as the oldest part moved slowly into the magma under the continents proved surprisingly to give a radical new understanding of the ocean floor's creation, young age and volcanic activity. The ocean floor was dramatically different from the continents: in age, structure, thickness and durability.

However, nobody had ever seen this part of the world, even if there were enormous amounts of soundings. An important contribution to the solution came to be a painstaking detailed drawing of the ocean floor that still today is quite amazing. Marie Tharp's (1920–2006) drawings are today considered to be major works in international cartography.³⁵ The seafloor's relatively young age, its thin structure and the volcanic activity gave rise to speculations of what was to be found on the seafloor. Already *Challenger* had noted the manganese nodules on the seafloor in the Pacific, but this new view from the late 1960s on the seafloor re-opened the question.

Hand in hand with the new scientific findings, a new political reality was also dawning. As the number of member states to the United Nations steadily increased during the de-colonialization process in the 1960s, the political balance and competition in the organization changed. The share of new states increased and the balance of power shifted from the old flag states to the new really international organization. The context at the end of the 1960s was quite different than before: a new scientific view on the ocean floor and a new political situation pushed for new ways of doing things.

If we add to this an increased technological and industrial pressure on the resources in the water column (fishing) and on the seabed (oil and all sorts of valuable minerals) there were every reason to reconsider the situation of the oceans. In particular, John Mero's book from 1965 on the *Mineral Resources of the Sea* came to play an important role for the understanding of the potential richness of the deep sea floor. The ocean as an open common needed some sort of regulation and control of access, at least to the resources that was limited.

35 Ibid. For a view of the refined map see 'Manuscript painting of Heezen-Tharp "World ocean floor" map by Berann (1977), available at <<https://www.loc.gov/resource/gg9096c.ct003148/>>.

5.4 *Arvid Pardo's Legacy*

In 1967, the Maltese ambassador to the United Nation, Arvid Pardo (1914–1999), made a speech at the UN General Assembly that later has been hailed as exceptional and most important.³⁶ The title of the item submitted by the Maltese delegation and presented by Pardo was: 'Examination of the question of the reservation exclusively for peaceful purposes of the sea-bed and the ocean floor, and the subsoil thereof, underlying the high seas beyond the limits of present national jurisdiction, and the use of their resources in the interest of mankind'. Pardo's idea was basically that the ocean bottom and the subsoil with all its resources should belong to all mankind, regardless of their nation, land-locked or coastal, large or small. The seafloor should be declared the heritage of mankind and administrated by some new agency under the United Nations. It was a grand idea, since 70 percent of the Earth was ocean floor. Pardo's speech struck a note. The Maltese delegation left it to the Secretariat to further work on a resolution or to choose other means to forward the proposition.³⁷

Pardo's argumentation and conclusion brought the full question of all the possible uses of the sea floor into the UN. In addition to the importance of the topic, the timing was perfect. The ocean and seabed was under attack in so many different ways: nuclear pollution, military appropriation and use of the deep seabed, the quest for the enormous amount of riches in the deep seafloor including mineral extraction, the unclear limit of the continental shelves as for oil and gas extraction. Two international features made the period even more crucial: first, all the new developing states that from the end of the 1950s had been gaining power in UN; and, second, the contemporary technological optimism. It was an optimism not without reason. The space adventures had its high days, nuclear power promised low cost energy, nuclear bombs and missiles with several war heads, electronic computers, microelectronics, discoveries in biology (DNA) and medicine and so on, all made deep sea floor extraction seem realistic.

A policy to avoid a new run for the rich countries to carve up the seafloor like they did some decades earlier in Africa was welcomed in many quarters. Pardo was very explicit on the point that the developing countries should have a preference when the wealth of the seafloor was to be distributed.

Pardo's speech triggered a process that ended with calling a new conference on the law of the sea, the third in line. It might be debatable if there would

36 Arvid Pardo's speech, UNGA 22nd session, 1 November 1967, Agenda Item 92, full text available at <http://www.un.org/depts/los/convention_agreements/texts/pardo_ga1967.pdf>.

37 Ibid.

FIGURE 3.6 Arvid Pardo monument at the University of Malta
CONTINENTALEUROPE AT ENGLISH WIKIPEDIA, CC BY-SA 3.0,
[HTTPS://COMMONS.WIKIMEDIA.ORG/W/INDEX.PHP?CURID=47519850](https://commons.wikimedia.org/w/index.php?curid=47519850)

have been a third conference anyway since more mundane problems like the extension of the continental shelves and the still unsolved question of territorial sea and control over fish resources remained unsolved. However, no one can deny the visionary talk of Pardo as concerns the use of the deep sea floor, even if he was far ahead of his time and all too optimistic both on behalf of the volume of resources and of the appropriate technology.

Pardo's suggestion had a parallel that might have inspired the proposal. It was linked to the rather fresh agreement on de-militarization of outer space. An agreement had already been made and was open for signatures from January 1967. Here, the peaceful use of outer space to the benefit of all mankind was a central value.³⁸

In 1973 started the United Nation Law of the Sea Conference number III, the UNCLOS III. It was the fourth attempt to make 'a constitution for the oceans', and this time, after several years of work, they succeeded. Meanwhile, it was not until 1994 that Pardo's international 'heritage of mankind' had been given an administration that would answer to its name. By then, it had shrunk substantially as the coastal states had expanded their legitimate continental shelves well beyond anything that was thought as realistic in the 1950s. The old maritime powers had lost out on most issues, including on EEZs of 200 miles and territorial waters of 12 miles.

6 Conclusion

The old maritime powers, the old flag states, had the tendency to stretch the idea of control over the resources to control over the waters and the seafloor. Control over resources turns out to be similar to control over territory, as it might be argued it is at the seafloor.

Then, maybe Philip Steinberg is right: today we have very conflicting views of the ocean. As for the surface and for shipping, the ocean is a freeway, a medium owned by nobody, used by all. For the large continental shelves and the water column, the national ownership of the resources seems to drift in the direction of a nationally controlled territory. Lastly, the environmental aspects have become of central importance, with a stronger focus on the consequences of the common heritage regime, the responsibility for the ocean's ecology and on

38 Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies, opened for signature on 27 January 1967 and entered into force on 10 October 1967. Available at <http://disarmament.un.org/treaties/t/outer_space>.

the stewardship of the environment.³⁹ The environmental question might now have taken the place that a just distribution of wealth had in the 1970s. It raises the question of how well UNCLOS is designed to handle these kinds of questions or if amendments or new treaty approaches are needed.

39 Steinberg, Philip E., 'Of other seas: metaphors and materialities in maritime regions', *Atlantic Studies* (2013) 10(2), 156–169.