ON RECENT CONTRIBUTIONS TO OUR KNOWLEDGE OF THE FLOOR OF THE NORTH ATLANTIC OCEAN

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649165384

On recent contributions to our knowledge of the floor of the north Atlantic ocean by Sir John Murray & R. E. Peake

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

SIR JOHN MURRAY & R. E. PEAKE

ON RECENT CONTRIBUTIONS TO OUR KNOWLEDGE OF THE FLOOR OF THE NORTH ATLANTIC OCEAN

Trieste

ON RECENT CONTRIBUTIONS TO OUR KNOWLEDGE OF THE FLOOR OF THE NORTH ATLANTIC OCEAN.*

By Sir JOHN MURRAY, K.C.B., F.R.S., D.Sc., etc., and R. E. PEAKE, M. Inst. C.E.

Introduction.

The first attempt to show the floor of the North Atlantic Ocean by means of isobathic contour-lines is due to Lieut. M. F. Maury, of the United States Navy, who was for some years in charge of the Hydrographic Bureau at Washington. In the sixth edition of his 'Sailing Directions' published in 1854, he gives a map (Pl. xiv.) showing the depths of the North Atlantic, based principally upon soundings taken by several ships of the United States Navy between 1849 and 1853. This map is reproduced as an inset at the upper left-hand corner of the large bathymetrical map of the North Atlantic which accompanies this paper. A comparison of these two maps will show at a glance the progress of knowledge in regard to the bathymetry of the North Atlantic basin during the past half-century.

In his 'Physical Geography of the Sea,' published in 1855, Maury says, "There is at the bottom of this sea, between Cape Race, in Newfoundland, and Cape Clear, in Ireland, a remarkable steppe, which is already known as the Telegraphic Plateau. A company is now engaged with the project of a submarine telegraph across the Atlantic. It is proposed to carry the wires along this plateau from the eastern shores of Newfoundland to the western shores of Ireland. The great circle distance between these two shore-lines is 1640 miles, and the sea along the route is probably nowhere more than 10,000 or 12,000 feet deep."†

* Map. p. 36.

† Maury, 'Physical Geography of the Sea,' p. 253 (1855).

In this extract it will be observed that Maury states that the sea-bed between Cape Race in Newfoundland and Cape Clear in Ireland is "already known as the Telegraphic Plateau." This, however, is the earliest publication in which we can find the term "Telegraphic Plateau." In the latest edition of his 'Sailing Directions,'* Maury devotes considerable space to a consideration of the bed of the North Atlantic, as regards its suitability for submarine telegraph cables, and the words "'Telegraphic Plateau" are printed on his depth map (Pl. xi.), on a line running between Cape Race in the west and Cape Clear in the east. These words are not, however, printed on the earlier editions of the map.

With the view of tracing the origin of the term "Telegraphic Plateau," a letter was addressed to the U.S. Hydrographic Office on the subject, and the following reply was received, which is of much historic interest:—

Hydrographic Office, Washington, D.C., *December* 12, 1903.

Sir,

In reply to your letter of November 20, 1903, on the subject of the announcement of the discovery of a telegraphic plateau referred to in Maury's 'Sailing Directions,' 8th edition, vol. i., July, 1858, page 159, paragraph 2, the Hydrographic Office takes pleasure in furnishing you with the following information.

In Maury's 'Sailing Directions,' 5th edition, 1853, the telegraphic plateau is indicated on Plate xiv., constructed from deep-sea soundings reported prior to date of publication, but the name "Telegraphic Plateau" is not given to it.

In Maury's 'Sailing Directions,' 6th edition, 1854, the telegraphic plateau is more fully indicated on Plate xiv., which is a great improvement upon that in the preceding edition by the plotting of later deep-sea soundings; but the name "Telegraphic Plateau" has not yet been given to it (see the description of the Plate on pages 296 and 297).

In Maury's 'Sailing Directions,' 7th edition, 1855, page 155, paragraph 1, the telegraphic plateau, which is shown on Plate xiv., is described by that name, and although the description states that it "is already known as the 'telegraphic Plateau,'" it is considered by the Hydrographic Office that this is the announcement in the publications of this office referred to in paragraph 2, page 159, of Maury's 'Sailing Directions,' 8th edition, vol. i., 1858, as it is made in the same terms as the quotation from Maury's 'Physical Geography of the Sea,' given in paragraph 3, following paragraph 2, page 159, of Maury's 'Sailing Directions,' 8th edition, vol. i., 1858.

There is, however, an earlier document, a letter dated February 23, 1854, from Lieut. M. F. Maury, U.S.N. (Superintendent of the U.S. Naval Observatory and Hydrographical Office), to Prof. S. F. B. Morse, describing the bottom of the sea between Newfoundland and Ireland as "a plateau which seems to have been placed there especially for the purpose of holding the wires of a submarine telegraph, etc.," and speaking of it also as "the telegraphic plateau;" and this is doubtless the authority for the statement in the description in the 7th edition, and in the

* Maury, 'Explanations and Sailing Directions to accompany the Wind and Current Charts,' 8th edit., 2 vols. Washington: 1858 and 1859.

quotation in the 8th edition, that the plateau "is already known as the Telegraphic Plateau."

It must be borne in mind that this was not an announcement of a definite discovery made at a particular time, but was the conclusion gradually arrived at by the cumulative evidence obtained by soundings covering a number of years; so that the indication of the plateau on successively constructed and published plates, in editions five and six of the 'Sailing Directions,' the description of it in the letter of February 23, 1854, from Lieut. Maury to Prof. Morse, as "the telegraphic plateau," and finally its description in the 7th edition of the 'Sailing Directions' under the name of the Telegraphic Plateau, may well be considered as sufficient authority for the statement in the 8th edition of the 'Sailing Directions' that the discovery of a telegraphic plateau had been "duly announced in the publications of this office."

It is believed that copies of all the editions of the 'Sailing Directions' referred to were forwarded to the British Museum; but there is no record as to whether a copy of the letter of February 23, 1854, from Lieut. Maury to Prof. Morse, was also forwarded, and a copy of it is therefore herewith enclosed, trusting that it may be of interest to you.

Very respectfully,
(*Signed*) W. H. H. SOUTHERLAND,
Commander U.S. Navy, Hydrographer.

R. E. Peake, M. INST. C.E.,
Clark, Forde and Taylor,
4, Great Winchester Street, London, E.C., England.

The letter from Lieut. Maury to Prof. Morse, enclosed with the foregoing, being of considerable interest, is here printed by permission of the U.S. Hydrographer—

COPY.

National Observatory, February 23, 1854.

SIR,

Lieut. Minor informs me that you called at the Observatory the other day to make certain inquiries about the depth of the ocean between America and England, with a view to its bearings upon the subject of a submarine telegraph across the Atlantic.

I happened to be absent on a tour of duty at the north, and regret I did not have an opportunity of conversing with you upon this interesting subject.

You recollect that Congress has authorized the Secretary of the Navy to employ a small vessel or two of the navy to assist me in my researches touching the winds and currents of the sea, and to apply the *experimentum crucis* to certain discoveries connected therewith.

The last vessel employed on this service was the U.S. brig *Dolphin*, Lieut. Commanding C. H. Berryman. She is now laid up, but I hope she will be fitted out again in the spring, for there are still many highly interesting questions and useful problems that have arisen during these investigations into the laws of the great deep upon which she may throw light and enlarge the circle of their practical utility.

The examinations made by the *Dolphin* last year relate chiefly to that part of the ocean through which lies the great thoroughfare for ships engaged in commerce between this country and Europe. While thus employed, she carried a line of deep-sea soundings entirely across the Atlantic, and obtained all the information

concerning the bottom of the deep sea between this and the British Islands that a submarine telegraphic company could desire.

From Newfoundland to Ireland the distance is about 1600 miles, and the bottom of the sea between the two places is a plateau which seems to have been placed there especially for the purpose of holding the wires of a submarine telegraph, and of keeping them out of harm's way. It is neither too deep nor too shallow. Yet it is so deep that the wires, being once landed, will remain for ever beyond the reach of vessels, anchors, icebergs, and drifts of any kind; and so shallow that the wires may be readily lodged upon the bottom. The depth of this plateau is quite regular, gradually increasing from the shores of Newfoundland to the depth of from 1500 to 2000 fathoms as you approach the other side. The distance between Ireland and Cape Charles in Labrador is somewhat less than the distance from any part of Ireland to the nearest point in Newfoundland. But whether it be better to lead the wires from Newfoundland or Labrador is not now the question; nor do I pretend to consider the question as to the possibility of finding a time calm enough, the sea smooth enough, a wire long enough, and a ship big enough to carry and lay a coil of wire 1600 miles in length. I simply address myself to the question in so far as the bottom of the sea is concerned; and as for that, the greatest practical difficulty will, I apprehend, be found after reaching soundings at either end of the line, and not in the deep sea.

A wire laid across from either of the above-named places on this side would pass to the north of the Grand Banks and rest on that beautiful plateau to which I have alluded, and where the water of the sea appears to be as quiet and as completely at rest as it is at the bottom of a mill-pond.

Now, you may wish to know the reasons for my inference that there are no perceptible currents and no abrading agents at work at the bottom of the sea upon the telegraphic plateau. I derive this inference from the study of a physical fact which I little dreamed, when I sought it, had any such bearings.

It is unnecessary to remind you of the germs which physical facts, even apparently the most trifling, are sometimes found to contain; for your own great achievements with the lightning has its root in the little physical fact that was first observed by a philosopher with regard to the legs of a dead frog. So, too, with regard to these deep-sea soundings, and the carefully labelled specimens from the bottom:—When asked, as I have often been, for the *cui bono?* touching these last, I have found myself under the necessity of answering the question by asking with Franklin, "What is the use of the new-born babe?"

Berryman brought up with Brooke's deep-sea sounding apparatus specimens of the bottom from this plateau. I sent them to Prof. Bailey, of West Point, for examination under his microscope. This he kindly gave them, and was quite as much surprised to find, as I was to learn, that *all* those specimens of deep-sea soundings are filled with microscopic shells—"*not a particle of sand or gravel exists in them.*"

These little shells, therefore, suggest the fact that there are no currents at the bottom of the sea whence they came; that Brooke's lead found them where they were deposited in their burial-place after having lived and died on the surface, and by gradually sinking were lodged on the bottom. Had there been currents at the bottom, they would have swept and abraded and mingled up with these microscopic remains the *débris* of the bottom of the sea, such as ooze, sand, gravel, and other matter. But not a particle of sand or gravel was found among them. Hence the inference that those depths of the sea were not disturbed either by waves or currents.

Consequently, a telegraphic wire once lodged there, it would remain as

completely beyond the reach of accident as it would if buried in air-tight cases. Therefore, so far as the bottom of the deep-sea between Newfoundland or the mouth of the St. Lawrence and Ireland is concerned, the practicability of a submarine telegraph across the Atlantic is proved.

Respectfully, etc.,
(*Signed*) M. F. Maury, Lieut. U.S.N.

Prof. S. F. B. Morse,
Washington, D.C.

Lieut. Maury, in the last edition of his work, gives tables showing the soundings obtained up to the year 1857, on which his bathymetrical map was constructed, viz. those of the *Albany* (1850–51), the *Dolphin* (1851–52, Lieut. Lee), the *Dolphin* (1852–53, Lieut. Berryman), the *Jamestown* (1851), the *Plymouth* (1851), the *Portsmouth* (1851), the *Taney* (1849), the *Saratoga* (1850), the *Congress* (1851), the *John Adams* (1851), the *Susquehanna* (1851), the *St. Louis* (1852), and the *Saranac* (1853).

In Maury's map (which, as already stated, is reproduced as an inset to the bathymetrical map accompanying this paper) the depths are indicated by four shades of stippling, the darkest shade being used for depths less than 1000 fathoms, and the lightest shade for depths between 3000 and 4000 fathoms, those parts of the map where the depth was supposed to exceed 4000 fathoms being left blank.

In the year 1856, Lieut. Berryman, in the U.S.S. *Arctic*, sounded across the North Atlantic, the principal object being to verify the discovery of the so-called submarine ridge between Newfoundland and the British Isles, to which Maury had called attention, to which he had given the name of Telegraphic Plateau, and along which a company was preparing to lay a submarine cable. Berryman obtained samples of the deposit on the sea-floor from thirty-four points along this line, which were submitted to Prof. J. W. Bailey for examination and report.

In the following year (1857), Captain Dayman, in H.M.S. *Cyclops*, sounded along the great circle between Valentia in Ireland and Trinity bay in Newfoundland, to the north of Berryman's line. He used a modified form of Brooke's sounding-machine, and brought back many samples of deep-sea ooze, which were sent to Prof. Huxley for examination.

Again, in 1860 the British Government sent out H.M.S. *Bulldog* to make a comparative survey of the route for the Trans-Atlantic telegraph cable, accompanied by Dr. Wallich, who published an interesting account of the results in his 'North Atlantic Sea-bed.'* A great controversy arose as to whether some ophiurids, which came up clinging to the sounding-line, came from the bottom, and really lived at the great depth of 1260 fathoms in the ocean.

The deep-sea deposits collected by these last three and some of the

* Wallich, 'North Atlantic Sea-bed.' London: 1862.

immediately preceding expeditions, and their examination by scientific experts, created a very wide-spread interest. Bailey pointed out that some deposits obtained by Brooke in the Northern Pacific were chiefly composed of siliceous organisms, while those obtained in the North Atlantic were largely composed of the shells of calcareous organisms. Pourtalès announced the discovery of *glauconite* associated with *Globigerinæ* in deep water off the eastern coasts of the United States, and Bailey believed that this "well-defined greensand" was formed in the position from which it had been procured by the sounding-tube.

Some observers, like Maury and Bailey, held that the minute shells which made up the greater part of the Atlantic mud lived at the surface of the ocean and fell to the bottom after death. Ehrenberg, on the other hand, held that their true habitat was in the great depths from which they had been taken by the sounding-lead. Huxley discussed this question without coming to any definite conclusion, but on the whole he favoured Ehrenberg's view. This controversy was definitely settled during the *Challenger* expedition. The fifteen or twenty species of Foraminifera which make up the larger part of the Atlantic ooze were all found living in the surface waters of the ocean, and the distribution of the dead shells on the sea-floor corresponded exactly to the distribution of the living animals in the surface waters.*

Huxley found in the bottles containing the deep-sea oozes collected by Dayman a gelatinous substance with small round corpuscles, soluble in acid, which he called *coccoliths*. These last he regarded as the skeletal parts of a gigantic Moneron (*Bathybius*), which lived in the deep-sea ooze, and was probably wide-spread over the whole floor of the ocean in deep water.† This intimation caused something like a sensation among biologists. In concluding an interesting paper on the subject, Haeckel asked, What kind of organism is this *Bathybius?* "Have we not here the case of protoplasm coming continuously into being by creation? We stand here face to face with a series of dark enigmas, the answer to which we must hope to receive from future investigations."‡ The *Challenger* Expedition found that the *coccoliths* were parts of a small calcareous Alga living, like the pelagic Foraminifera, in the surface waters of the ocean, and also that the viscous substance found in the bottles with the deep-sea oozes consisted of a gelatinous sulphate of lime thrown down from the sea-water associated with the oozes by the abundant addition of alcohol, which was poured into the bottles with the view of preserving the samples.

The examination of these early procured samples of Atlantic ooze

---

* See Murray, "On the Distribution of the Pelagic Foraminifera at the Surface and on the Floor of the Ocean," *Natural Science*, vol. xi. p. 17 (1897).

† *Proc. Roy. Geogr. Soc.*, vol. xiii. p. 110 (1869).

‡ Haeckel, "Bathybius und das freie Protoplasma der Meerestiefen," *Jenaische Zeitschr.*, Bd. v. p. 499 (1870).

also led to much controversy as to the origin of the volcanic and other mineral particles, which Bailey and others had observed in the samples. The *Challenger* Expedition also cleared up most of the difficulties connected with this subject by observing that large and small fragments of pumice—containing many of these minerals—were continually floating about on the surface of the ocean, and that they gradually became water-logged and sank to the bottom, where they disintegrated.

The observations of these early expeditions, and the controversies to which they gave rise, had a most important influence in directing the attention of scientific men to deep-sea problems, and ultimately led to the despatch of expeditions specially fitted for the exploration of the great ocean basins. The observations of Ross in the Arctic and Antarctic as to the depth at which marine organisms could live on the floor of the ocean had been overlooked or neglected, and it was very generally assumed that, as a result of Forbes's researches in the Mediterranean, a zero of life was soon reached in the abyss of the ocean.

The British Government fitted out the *Lightning* (1868), the *Porcupine* (1869), the *Shearwater* (1870), and finally the great *Challenger* Expedition, which explored all the great ocean basins from 1872 to 1876. In the years 1880 and 1882 the British ships *Knight Errant* and *Triton* explored the Faroe channel, with the view of testing some special questions raised during the *Porcupine* and *Challenger* expeditions.

Louis Agassiz and Pourtalès commenced the exploration of the deep water off the Atlantic coasts of America in 1867; and this work was continued with great vigour by his son, Dr. Alexander Agassiz, in the U.S. ships *Blake*, *Albatross*, and other ships from the year 1877 down to the present time. The *Gettysburg*, in 1876, and vessels of the U.S. Coast Survey, have at various times been engaged in the exploration of the North Atlantic in recent years.

In the years 1876 to 1878 the Norwegian Government sent out the *Vöringen* to investigate that part of the North Atlantic lying between Norway and Greenland.

In the years 1880 to 1883 the French Government ships, the *Travailleur* and *Talisman*, carried out deep-sea investigations in the eastern portion of the North Atlantic.

Since the year 1885 the Prince of Monaco has carried on oceanographical work nearly every summer in the North Atlantic, and is at present engaged in founding a large oceanographical institute at Monaco, on the shores of the Mediterranean.

The majority of the above-named expeditions engaged in the study of marine organisms by dredging, trawling, and tow-netting on the floor of the ocean and in the intermediate and surface waters, as well as in the examination of the temperature, specific gravity, composition of sea-salts, dissolved gases, and other physical and chemical investigations, sounding the ocean forming only a small part of the