

M. Vicat is preparing a memoir, in which he will attempt to explain the nature of the chemical constitution of those silicates which are durable, compared with those which are not; and which will show the preponderating influence of silica in such phenomena. He will also point out a simple and certain method of classifying all such compounds, as to their fitness or not for submarine constructions, and thus will assist in very much shortening the time necessary at present for testing them by exposure to the action of sea-water. From the great practical importance of the subject, and the attention at present directed to it, this memoir will be looked forward to with considerable interest.—*Comptes Rendus de l'Academie*, No. 4, January, 1854.

#### Gulf Stream Exploration.\*

This great and singular peculiarity, embracing in its mighty sweep our entire Atlantic offshore vicinage, is so important to navigation and so essential a feature of our coast hydrography, both in its practical and scientific character, that its thorough exploration ought certainly to form an integral part of the Coast Survey, whence our offshore charts are all to be derived. A specific and complete delineation and theory of this unique oceanic movement can only be reached as a result of elaborate and continued observations on all its physical and phenomenal elements. This giant problem is thrown down as a gage at our national door, and the honour code of philosophic chivalry bids us accept the challenge. With a clear perception of the requirements of this great research, Prof. Bache in 1845 organized and began the execution of a plan of operations, which provided for running a system of perpendicular sections across the axis of the stream from selected points of the coast and observing at frequent stations along these sections, the several elements required. Between 1845 and 1848, sections were run from Montauk Point, Sandy Hook, Cape Henlopen, Cape Henry, and Cape Hatteras; when from accidents and other hindrances, the work was intermitted until in 1853, when sections were run from Cape Hatteras, Cape Fear, Charleston, St. Simons, St. Augustine, and Cape Canaveral. The results for 1853 are given in a sketch of detailed sections, and a general delineation of the Gulf Stream in its several component bands or threads, as thus far determined, will be found among the sketches. Over six pages of the Report are devoted to a full exposition of the results already reached.

The element of temperature, superficial and at various depths, has been chiefly observed up to this time; the instruments used being Six's registering thermometer for moderate depths and Saxton's metallic deep-sea thermometer, for the greater depths, a temperature sounding of 2160 fathoms having been made. One general result of the investigation is that "there are alternations of temperature across the Gulf Stream, cold water intruding and dividing the warm, making thus alternate streaks or streams of warm and cold water. In fact, the Gulf Stream is merely one of a number of bands of warm water separated by cold water." A "cold wall" limiting the Gulf Stream on the shore side, is clearly made out, as also its slight shoreward slope from the warm water overlying the cold. A distinct current of underlying cold water from the northern regions is found alike in the northern and southern sections. "It can hardly be doubted that this cold water off our southern coast may be rendered practically useful by the ingenuity of our countrymen. The bottom of the sea fourteen miles E. N. E. from Cape Florida, 450 fathoms in depth, was in June, 1853, at the temperature of 49° Fahrenheit, while the air was 81° Fahrenheit. A temperature of 38° (only six degrees above the freezing point of fresh water) was found at 1050 fathoms in depth about 80 miles east of Cape Canaveral. The mean temperature of the air at St. Augustine is 69°·9 Fahrenheit, and for the three 57°·5. The importance of the facts above stated in reference to the natural history of the ocean in these regions, is very great, but, of course, requires to be studied in connection with other physical data. It has also a bearing upon the important problems of the tides of the coast. This exploration of the Gulf Stream will be steadily prosecuted to its close, the different problems being taken up in turn or in connexion as may be found practicable."

The most remarkable fact brought to light in relation to the Gulf Stream is probably that of the existence of two submarine ranges of hills near its origin, which produced most marked effects on the distribution of its parts. The form of the Charleston and Canaveral sections," as shown in the diagram, shoals gradually from the shore to

53 and 36 miles respectively, then suddenly falling off to below the depth of 600 fathoms. On the Charleston section, 96 miles from the coast is a range of hills steep on the land side and having a height of 1800 feet and a base of about eleven miles on the seaward side; a second range 136 miles from the coast, 1500 feet high, with a base of about seventeen miles, on the outer side. Beyond this there is a more gradual rise. On the Canaveral section the inner range is 68 miles from the coast. The effect of this form of the bottom in forcing up the deep cold water stratum is very marked, so that the deep isothermals of section, exhibited a general conformity to the bottom curve. It is undoubtedly due in a considerable degree to these submarine hill-ranges, and to their uplifting of the cold water, that the Gulf Stream is divided into several superficial bands, though to what exact extent and how far subject to variations remain to be studied. Horizontally, the conformity of the Gulf Stream to the coast line configuration is verified even in detail, and its modification by the variation of steepness in the off-shore bottom slope, are strongly marked. With these results the names of Lieuts. Davis, George M. Bache, Richard Bache, S. P. Lee, Maffitt and Craven are conspicuously associated; George M. Bache being distinguished as a martyr to his zeal, in the very glow of talent, hope and success.

The results of the microscopic examinations of seventeen Gulf Stream bottoms made by Assist. L. F. Pourtales (Appendix No. 80), are of great interest. From these and many other investigations of bottoms, he has derived the generalization that the per-centage of shells, chiefly Foraminifera, progressively increases with the depth, and he remarks of a bottom from the depth of 1050 fathoms that it "is no longer sand containing Foraminifera, but Foraminifera containing little or no sand. The grains of sand have to be searched for carefully under the microscope to be noticed at all." It will be seen that this result coincides with Prof. Bailey's recent announcement, thus closely linking the Gulf Stream bottoms with those of the remoter parts of the Atlantic. Mr. Pourtales also somewhat examines the question whether these minute animals lived where they were found, or have been gradually washed down from the reefs. Though not decisive the evidence inclines him to the opinion that they lived where found. This is indicated by the fact that most of the individuals are found perfect, notwithstanding the extreme delicacy of the shells, and again by the delicate pink colour of the Globigerina, which could scarcely survive transportation. The fact of the occurrence of the same species off the New Jersey coast and off Cuba and other West India islands under very dissimilar circumstances of light and temperature is also indicative that they are actually drawn from their true habitat in these Gulf Stream soundings. Mr. Pourtales well remarks on the importance of "a knowledge of the habitation and distribution of the Foraminifera" to geologists, "since of all classes of the animal kingdom, none has contributed so large a share to the formation of rocks, at least in the cretaceous and tertiary formations."

#### Railroad Traffic in Great Britain and Ireland.

From the semi-annual returns of the British Board of Trade it appears that the number of passengers conveyed on railways in England and Wales, Scotland, and Ireland, during the half-year ended 31st Dec., 1853, was 57,206,344, of which 29,529,696, were parliamentary and third class; 20,634,682 second class; and 7,028,966 first class passengers. The total receipts for passengers amounted to £4,821,686, of which the sum of £62,061 was for periodical tickets, £1,634,863 parliamentary and third class, £1,46,646 for second class, and £1,468,196 for the first class passengers. As compared with the corresponding period of 1852, the total increase in the number of passengers was 7,820,221, or 14.6 per cent., and in the receipts of £461,519, or 10.6 per cent.; of which increase the sum of £7,449 was the periodical tickets, £173,962 for parliamentary and third-class, £115,297 for second class, and £159,224 for first-class passengers.

The total receipts from general merchandise, cattle, minerals, horses, carriages, luggage, parcels and mails, amounted for the half-year ending 31st December, 1853, to £5,023,904, and for the corresponding period of 1852, to £4,154,836, showing an increase of £869,068, or 20.9 per cent.

The total receipts from all sources of traffic, amounted on 7,641 miles of railway in the United Kingdom to £9,844,600, and for the corresponding period of the year previous, on 7,336 miles of railway, to £8,

\*Extracts from a review of the Coast Survey Report for 1853 in Silliman's Journal for September.