

THE SUNKEN LAND OF BUS (lat. 35 west, long. 53 north).—BY
HENRY S. POOLE, D. SC., A. R. S. M., F. G. S., F. R. S. C.,
Halifax.

(Read 11th April, 1904.)

In latitude 53°, longitude 35°, the "Atlantic Ocean Pilot" notes a reported shoal, styling it "The Sunken Land of Bus," but gives no further information on the matter. It does not say whence the information, so laconically entered, was obtained. It does not tell us who Bus was, whether he was a Dutch navigator or related to the monk, Cæsar de Bus, of note in the sixteenth century. All the reference books to which I have access are silent on the subject. But, in that locality, recent investigations have proved the presence of shallower waters than those about it, if not of a shoal, in the usual acceptance of the term.

Through the kindness of Capt. DeCarteret, of the cable ship "Minia," I am able to present a record of soundings taken midway between Newfoundland and Ireland in June and July, 1903. The region is near, or possibly was even crossed, by the line of soundings obtained by Capt. McClintock for the first Atlantic cable in 1857.

The present series has disclosed the existence of a mountainous district in a locality where ocean's depths were assumed, from McClintock's infrequent soundings, to be those of a fairly level plateau with its shallowest waters 1550 fathoms.

The location of the region reviewed is accurately shown on the accompanying chart on a scale of six knots to five inches. The chart was kindly prepared by Mr. J. Adams, first officer of the S. S. "Minia."

As we are a maritime people, with a large proportion of our population directly interested in all that relates to the ocean at

our doors, we are desirous of recording any new discovery regarding its currents, its depths and shallows, and its inhabitants and their haunts.

A few years ago public interest was aroused in Atlantic soundings by the discovery of submarine peaks directly north of the Azores and near where, on old charts, the doubtful Chaucer shoal is marked. To this locality was given the name of the Faraday Hills. These hills were found to be surrounded on the east and west and to the north by waters of 2000 fathoms and over, thus giving to the mountain range an elevation of nearly 8000 feet above the general bottom of the ocean in that section of the Atlantic.

The soundings by the "Minia" last summer, recalled the discovery of the Faraday Hills, and in a popular way a reference was made to them in one of the monthly periodicals, but so far as I am aware, no accurate statement regarding them has as yet been published.

Memorandum of soundings on a line northward from the Azores :

	Latitude N.	Longitude W.
A depth of 770 fms. with deep water east and west	60°	33°
A doubtful shoal—The Sunken Land of Bus, Atlantic Ocean Pilot, p. 240	53°	35°
Hill region located 1903, by S. S. "Minia," depth 630 fms. &c.	53° 22'	35° 12,
A doubtful shoal—Chaucer		
Faraday Hills, depth 714-730 fms. &c	49° 26'	28° 42
Corvo, an island of the Azores	40°	34°

In the foregoing table it will be noted that the shoaler waters between the 40th and 60th parallels of latitude lie in a due north and south course of the mean longitude of 32° west.

In addition to the accurate location of the soundings marked on the chart, information derived from other observations was also kindly supplied, and this may be thus summarized :—

Currents: An undercurrent constantly setting to the south-west at a rate of about half a mile an hour, was determined by the buoys which moved in that direction regardless of the surface flow and the wind.

Deposits: The sounding tube and the mushroom anchors brought up samples of various sorts of deposits, some that adhered to the anchor like mud, are so noted on the chart; others were of fine or coarse sand with, in some cases, small dark coloured stones. Then there was ooze and small shells.

Blue mud: This name was given to a deposit which, when freshly obtained, had a decided blue tint that it lost after exposure for some time in the air. The blue layer underlaid one of a yellowish cast and was alone obtained by the mushroom anchors. The sounding tubes did not penetrate deep enough to reach it. The tint doubtless was due to iron passing from the ferrous to the ferric oxide. In two localities the deposit was found to yield manganese, but in what form I am not able to report, as the samples were transmitted to London. The presence of the allied metals, iron and manganese, with a growing calcareous deposit, has its interest for students of the metalliferous zone of the Lower Carboniferous rocks of Nova Scotia, in which occur in irregular masses deposits of both iron and manganese.

Sand: This, so far as I am aware, was not the product of quartz, but of the breaking down of the siliceous and calcareous casings of organisms.

Pebbles: Of these a few were obtained in the sounding tube. Their composition has not been examined, but their surface is smooth to the touch and pitted by erosion. In addition to these were fragments as large as the tube would bring up, of volcanic glass showing the usual conchoidal fracture, and mixed with the ooze were small grains of volcanic ash.

Volcanoes: That the region is volcanic, the presence of obsidian leaves no doubt, and this conclusion is also suggested by the records of the grapnel work when the ship was drifting for the cable. Steep declivities were met with which required a rapid paying out or taking in the grapnel rope. So rough was the surface found to be in long. $34^{\circ} 52'$ that that neighborhood was abandoned and a fresh line of search was taken up. Notes of some of the rapid changes in depth are to be found on the chart, and the heights of the hills above the surrounding plain are stated as elevations of 100, 250, 500 and even 1200 feet.

Mr. Adams further informs us that while lowering the grapnel in one locality the tool struck an obstruction, hung for a moment, and then fell over 300 feet more. He concluded this was on the edge of a precipice and in consequence the assumed contours at this point are set very close together.

The following report by John S. Flett, D. Sc., F. R. S. E., on the rock specimens and some of the oozes collected by the S. S. "Minia" from the bed of the North Atlantic in 1903, is extracted from an article by Sir John Murray, and is inserted by the editor of the *Transactions*, although it appeared subsequently to the reading of the foregoing paper.

Specimen a.—S. S. "Minia," sounding 122, lat. $53^{\circ} 12' 15''$ N., long. $53^{\circ} 44' W.$, 872 fathoms. Fine, buff-coloured, crystalline limestone, without traces of organic structures. It effervesces readily with cold dilute hydrochloric acid, and under the microscope consists of small crystals of calcite, forming a mosaic in which there are brown patches stained with limonite.

Specimen b.—S. S. "Minia," sounding 120, lat. $53^{\circ} 8' 45''$ N., long. $35^{\circ} 42' W.$, 844 fathoms. Olivine basalt, fine grained, not distinctly porphyritic. It contains olivine, brownish augite, and lath-shaped plagioclase, with iron oxides, and the structure is of the "subophitic" type. Not vesicular. The olivine has weath-

ered to serpentine and limonite. There are a few small phenocrysts of felspar.

Specimen c.—S. S. "Minia," sounding 4, lat. $53^{\circ} 20' N.$, long. $34^{\circ} 40' W.$, 1397 fathoms. Porphyritic andesite or andesitic basalt. In this rock there are a few small phenocrysts of plagioclase felspar and brownish augite and magnetite. It contains no olivine, and is not vesicular. All the minerals are well preserved.

Specimen d.—S. S. "Minia," sounding 63, lat. $53^{\circ} 14' 30'' N.$, long. $35^{\circ} 15' W.$, 1440 fathoms. Perlitic tachylite, perfectly fresh, with a few skeleton crystals of olivine, and phenocrysts of plagioclase and greenish augite. The dark brown ground-mass is very abundant, and is very free from microliths and spherulites; here and there it shows small rounded steam cavities.

Specimen 1.—S. S. "Faraday," station 62, lat. $50^{\circ} 3' N.$, long. $30^{\circ} 46' 45'' W.$, 1460 fathoms. Biotite gneiss, fine grained and somewhat granulitic in texture. It is very rich in microcline, but contains practically no muscovite; quartz appears in fine veins or strings, which are parallel to the foliation, as indicated by the biotite. Orthoclase is common, but soda-lime felspars are scarce. The biotite is brown, and is not abundant.

Specimen 2.—Same locality. Fine-grained granular basalt, very similar to specimen *b*, but without olivine. It contains many small phenocrysts of brownish augite.

Specimen 3.—Same locality. A sheared biotite granite or granite-gneiss, showing cataclastic structures throughout, and much decomposed. It evidently originally contained biotite, but this has been entirely replaced by epidote and chlorite.

Sounding 50.—Brown or buff-colored gritty, containing one pebble (a quarter of an inch in diameter) of black volcanic glass. Insoluble residue, 43.77 per cent. Minerals: quartz, (granitic, often brown stained, up to one millimetre in diameter,

mostly well-rounded, but the smaller fragments were often angular or subangular); orthoclase decomposed and rounded; microcline (rare); weathered oligoclase; also perfectly fresh sanidine, oligoclase, andesine and labradorite (in angular splinters and cleavage flakes). These last contained augite microliths and glass cavities. Brown volcanic glass, occasionally fluidal or finely vesicular, frequently perlitic, but not spherulitic, colourless, transparent pumice in fine shreds and splinters with concave outlines. Less common were magnetite in grains and small octahedra; pyroxene of two varieties, pale green and clear brown; chlorite; glauconite in rounded cryptocrystalline aggregates; olivine, perfectly fresh, in angular fragments; one small grain of pink garnet. Among the doubtful minerals were hypersthene, zircon, and epidote.

Sounding 58.—A tough, pale brown deposit, with many Foraminifera. Insoluble residue 54.14 per cent. Minerals: small rounded quartzes up to 0.3 millimetre in diameter, weathered orthoclase, sanidine, oligoclase, microcline, brown glass, shreds of pumice, hornblende, green and brown augite, magnetite.

Sounding 98.—Pale brown Globigerina ooze. Insoluble residue, 31.12 per cent. Minerals: quartz, mostly rounded up to 0.3 millimetre in diameter; orthoclase, microcline, sanidine, oligoclase, andesine, labradorite, fragments of colourless pumice and of brown glass, green hornblende, augite (brown and green), magnetite, olivine, epidote, glauconite; also a doubtful isotropic mineral.

Sounding 124.—Pale, creamy-white, coherent Globigerina ooze. Insoluble residue, 20.62 per cent. Recognizable mineral particles in this were very few, and formed not more than 2 or 3 per cent. of the sample. They were mostly brown and colourless volcanic glass, angular pieces of felspar, green augite. Quartz was either absent or very scarce.