

ON THE FOSSIL FORAMINIFERA OF MALTA AND GOZO.

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In a former volume of the 'Geologist' there are notices of the geology of Malta and Gozo (vol. for 1860, pp. 198, 275, 421), from which it appears that the stratal groups forming these islands are, in downward succession,—

1. Upper Limestone; fossiliferous.
2. Soft sandy rock, consisting of yellow, green, and black sand in variable proportions, and containing many shells and echinoderms, chiefly as casts, and sharks' teeth.
3. Bluish marl, with sharks' teeth and other fossils, especially *Pecten Burdigalensis*.
4. Light-yellow calcareous freestone; the common building-stone of the islands, rich with echinoderms, and containing also nautilus, fish-remains, and other fossils: this comprises also a band of chocolate-coloured pebbles, with sharks' teeth.
5. Lower Limestone, white and hard; with *Scutella subrotunda*, fish-teeth, and a few other fossils.

These strata have been described by Captain Spratt, in the Geol. Soc. Proc., vol. iv. p. 225, etc., and their fossils determined and enumerated by Professor E. Forbes, *ib.*, p. 230, etc. Dr. Wright also gave a notice of the beds, and descriptions of several of their fossils, in a paper published by the Cotteswold Nat. Field-club, and in the Annals Nat. Hist., 2nd ser., vol. xv.; lastly, Dr. A. L. Adams and Dr. Wright communicated a paper on the Maltese Strata and Echinoderms to the Geological Society, in 1863.

Having lately received, from Captain F. W. Hutton and Dr. A. Leith Adams, some fine specimens of foraminifera from the Maltese beds, carefully labelled as to their respective strata, as well as some notes on the strata from the same friends, I am enabled to add something as to the distribution of the foraminifera.

Stratum No. 1, which, being largely composed of corallines (Nulporæ, E. Forbes's List, *loc. cit.*), and destitute of corals, seems to have no title to its old name of "Coral-limestone," contains *Heterostegina depressa*, according to Dr. Adams and Captain Hutton; the latter informs me that this limestone is sometimes 230 feet thick, *Pecten Pandora* being one of its most abundant fossils.

Stratum No. 2, varying from 1 to 30 feet in thickness, is in many parts composed almost entirely of the little flat foraminifer that was formerly mistaken for a nummulite and a lenticulite, but is really *Heterostegina depressa*. The specimens of this bed (from Dingli, Malta, where it is 30 feet thick), with which I have been favoured by Captain Hutton, are dark-yellow friable shell-rock or limestone, consisting of *Heterostegina* massed together in every position, mixed with a few valves of *Pecten*, in a scanty granular calcareous

matrix, with calcareous cement. Many of the grains are obscure foraminifera and débris of shells, etc. Mr. Parker has detected the following foraminifera in this matrix:—*Globigerina bulloides*, *Truncatulina lobatula*, *Planorbulina ammonoides* (Quart. Journ. Geol. Soc., vol. xvi. p. 300), and *Calcarina rarispina*.

Dr. Carpenter's allusion to this *Heterostegina*-rock as being found in fissures in Malta, appears to be incorrect (Introd. Foraminif. Ray Soc., 1862, p. 288).

In some places this bed contains a large quantity of green grains. These may prove, on examination by the microscope, to be casts of the cells of foraminifera, bryozoa, etc., as Bailey and Ehrenberg have shown other sands of silicate of iron really to be. Captain Spratt and Professor E. Forbes (*loc. cit.*) notice the occurrence of cetacean bones in this bed, and of oysters with the *Heterostegina*.

The bed No. 3, blue marl, about 100 feet thick, is not yet known to contain foraminifera; but should be examined with careful multiplication, as described in the 'Geologist,' vol. ii. p. 244.

No. 4, the freestone, consists of four or five divisions that run one into the other, lying in no regular order. The building-stone is that in which most of the Echinodermata are found. Captain Hutton and Dr. Adams state that the *Heterostegina* occurs in the freestone; the latter points out that it is much rarer than in No. 2, "and only in a drab or light-blue portion towards the upper parts of the bed." In Professor E. Forbes's list (*op. cit.* p. 230), *Cristellaria* and *Nodosaria* are said to occur in the upper division of this freestone; and within the last few days Captain Spratt has obligingly shown me the specimens referred to. They comprise *Nodosaria Raphanus*, *N. Raphanistrum*, *N. Radicula*, *Dentalina acicula*, *D. pauperata*, *Lingulina costata*, *Fronicularia annularis*, *Cristellaria calcar*, and *C. cassis*. No doubt numerous smaller forms will also be found; for these are the larger specimens of such a group of foraminifera as D'Orbigny has figured and described in his *Foram. Foss. Bassin. Tert. de Vienne*. Some of the specimens are yellowish, some are greyish, indicating at least two beds or seams that are rich with them.

No. 5 is the hard whitish limestone, also used for building; it is very variable in lithological character, Captain Hutton says, and more than 400 feet thick; he adds, that "it is at the top of this bed only that *Scutella subrotunda* is found." I find, by specimens that have been shown to me, that it also contains, in large abundance, *Operculina complanata* and *Orbitoides dispansus*.

The *Operculinæ* (which appear to be two subvarieties) occur gregariously in the upper part of the limestone, are associated with *Scutella subrotunda* and *Echinolampas scutiformis*, and "are very common at the fault at Migiar Selimi in Gozo, and at various points along the northern coast of Malta." (Dr. A. L. Adams.) A large hand-specimen that Captain Hutton has kindly given me, comes from Marsa Scala, Malta.

[We must remember that the so-called "*Lenticulites complanatus*"

(an old name of *Operculina complanata*), of Professor Forbes in the Proc. Geol. Soc., *loc. cit.*, and of Dr. Wright in the Annals Nat. Hist., 2nd ser., vol. xv. p. 101, etc., is really the *Heterostegina depressa*, as the Maltese specimens in the Museum of the Geological Society show. See also Quart. Journ. Geol. Soc., vol. xvi. p. 300, *note*.]

Of the Orbitoides, Dr. Adams writes,—“They are characteristic of the point of transition between the Lower Limestone and the Calcareous Sandstone; indeed, I have seen them nowhere else. They are so abundant that whole masses of limestone seem to be entirely composed of them; properly speaking, they are fossils of the Lower Limestone, and are frequently associated with what you name *Operculina complanata*, which seems, as far as I can find out, also peculiar to the same situations.” The only locality that Captain Hutton knows for the Orbitoides-rock “is just south of Fort Ricasoli.”

Captain Hutton believes that he has detected foraminifera in thin slices of some of the hard white limestone (made up of more or less rolled calcareous débris) from St. George's Bay, Malta.

Obituary Notice.

THE REV. DR. ANDERSON,
OF NEWBURGH.

There is a solemn pleasure in paying a last tribute to those who have been our friends, and those we have respected. Death draws the dark veil between the living and the past away, and when one worker is taken away from the grand field in which we are labouring, the last act of kindness to the departed those who are left can contribute is the record of the worth of the departed. Amongst the fossils of Dura Den, the Minister of Newburgh was a great and successful worker, as the fine slabs of fish in our museums, and some of the best plates in Agassiz's memorable ‘Poissons Fossiles,’ and in his ‘Grès rouge d'Écosse,’ substantially testify. As a writer on geological subjects, Dr. Anderson will not take rank in highest eminence, but for the work he has done in his locality, he will stand in position with the best of our local-workers. The Edinburgh ‘Evening Courant’ of the 18th ult. gives a very nice notice of one that all who knew respected for his fine personal qualities.

The geological works published by Dr. Anderson were,—‘On the Remains of Man in the Superficial Drift,’ ‘The Course of Creation,’ ‘The Geology of Fifeshire,’ ‘The Geology of Scotland,’ in the Rev. Dr. Taylor's ‘History of Scotland,’ and ‘Dura Den,’ a monograph of that remarkable fossiliferous locality. Dr. Anderson, too, took a lively interest in the local affairs of his district, and in the antiquities of his parish. He was also the promoter of a motion in the General Assembly of 1860, for making the study of natural science compulsory on students of the Established Church. The testimony paid to his individual worth by the writer in the Edinburgh paper referred to, will find a ready response in the hearts of all who knew him.