

round, but usually irregular, and sometimes entirely closed up by the inspissated gelatinous sarcode, so as to be invisible" (Rec. For. Gt. Br., p. 2). His figure of the species, which corresponds accurately with that in d'Orbigny's work, is copied in Pl. LXXXI. fig. 25.

The conspicuous characters, so far as they can be gathered from the majority of bottom specimens, are fairly indicated by these descriptions; but it will be presently shown that it is more than doubtful whether, in the typical condition, the shell ever possesses an aperture, in the ordinary sense of the term; and that the more or less regular openings which have been occasionally mistaken for the general orifice are probably in all cases the result of the accidental enlargement of ordinary pores.

That the test does not always consist of a simple undivided chamber was first demonstrated by Pourtales, who in a brief note on the genera *Orbulina* and *Globigerina* announced that during the examination of "large numbers of well-preserved specimens obtained from the bottom beneath the Gulf Stream," he had "found in nearly one half of the *Orbulinæ* examined, young *Globigerinæ* more or less developed and attached to the inside of the *Orbulina* by numerous very slender spiculæ."¹ Similar observations were made a few years later by Alcock upon shells found in littoral sands from the west coast of Ireland.² The same fact had been observed in living pelagic specimens by Krohn, as early as 1860,³ some time prior to the publication of Major Owen's well-known memoir on Surface Foraminifera.⁴ Carpenter, in his review of the observations made by Pourtales, states that "after having carefully laid open, by the application of weak acid, the spheres of a considerable number of *Orbulinæ*," he had "not met with a *Globigerina* in a single one."⁵ For myself, though I have never encountered the *Globigerina*-like internal shells in *Orbulinæ* from bottom-dredgings, to anything like the extent indicated by the American author, I have not unfrequently found them in a certain proportion of the specimens so obtained.⁶

¹ *Amer. Journ. Sci. and Arts*, 1858, vol. xxvi. p. 96.

² *Mem. Lit. and Phil. Soc. Manchester*, 1865, ser. 3, vol. iii. p. 180.

³ *Fide* Schultze, *Wiegmann's Archiv*, 1860.—Transl., *Ann. and Mag. Nat. Hist.*, ser. 3, vol. vii. p. 312.

⁴ *Journ. Linn. Soc. Lond.*, 1867, vol. ix., Zool., p. 149.

⁵ *Introd. Foram.*, p. 178.

⁶ Since these sheets have been in the hands of the printer, I have received from the author, Herr G. Schacko of Berlin, an interesting and elaborate paper entitled "Globigerinen Einschluss bei *Orbulina*" (*Wiegmann's Archiv*, Jahrg. xlix. p. 428), which offers a reasonable explanation of these apparent discrepancies. Schacko's investigations, which refer to bottom-specimens, both recent and fossil, tend to show that the Globigerine shell is most conspicuous in comparatively small *Orbulinæ*. He states that in a sphere of 0.3 mm. diameter, the Globigerine chambers occupied two-thirds of the cavity of the test; that one of 0.7 mm. diameter contained a *Globigerina* of 0.5 mm. diameter; that in one of 0.8 mm. diameter the Globigerine shell measured only 0.2 mm.; whilst a specimen of still larger size, between 0.8 mm. and 0.9 mm., contained scarcely a recognisable trace of a Globigerine shell. Hence it would appear that in ordinary thick-walled bottom-specimens, the Globigerine shell has its maximum development in *Orbulinæ* of about 0.7 mm. diameter; and that in spheres of more than 0.8 mm. it is either of insignificant size or entirely absent, in the latter case probably resorbed during the thickening of the outer wall.

Broadly speaking, this accords with my own observations. I have never found a Globigerine shell in the interior of a very large bottom-*Orbulina*, and very rarely in one that could be called full-sized; but they are not uncommon in middle-sized and small specimens.