

mantle that these spaces have the limits well marked. In *Spirula reticulata*, the reticulation is also more definite in this region as well as near the opening of the shell, where the polygons are more irregular (Fig. A in the text), whilst the projections of the reticulum vanish insensibly on the edges of these openings.¹

From without inwards the mantle presents (besides the epithelium and the layer of chromatophores): first, a layer of connective tissue, dense and glassy superficially, and looser below; second, a thin layer of longitudinal muscular fibres; third, a thick layer with circular muscular fibres, traversed by radiating muscular bundles (Pl. VI. fig. 14); fourth, another thin layer of longitudinal muscular fibres; and fifth, the subcutaneous connective tissue of the internal face.

At the aboral part the form and the aspect of the mantle are modified by the presence of the shell, elsewhere almost entirely covered; there is on both the dorsal and ventral faces only one longitudinal opening, in the form of an elongated ellipsoid, limited posteriorly by the "terminal disk." By these openings (the dorsal is the larger) the last whorl of the shell makes a slight prominence (Pl. I. fig. 1, *sh.*). The external portions of the mantle are secondarily-acquired formations, which are almost totally wanting in *Nautilus* and most Gastropods. The mantle, properly so-called, is the little convex part of the wall of the shell cavity, that is to say, the envelope of the little visceral sac lodged in the terminal chamber of the shell (Pl. III. *P'*.); it is that envelope which is the true secreting surface of the shell.

This little visceral sac corresponds to the visceral hernia of *Nautilus* and of the Gastropods, but does not include more, however, than the posterior half of the lobes of the liver (Pl. III.); it is continued backwards by the membranous siphuncle (Pl. V. fig. 1, *sphm.*) piercing all the septa of the shell, through the siphonal tubes of the shell (*sph.*) secreted by it.

The proximal portion (quite anterior) of the siphuncle is much enlarged in *Spirula reticulata* (Fig. B, iv). At the level of the septum the siphuncle does not present any sensible constriction. The portion enclosed in the last chamber but one (consequently in the last segment of the shell-siphuncle) was surrounded, in the *Spirula reticulata* studied, by a thick muff of a hard substance, recalling by its aspect and consistency the ligament of certain Lamellibranchs; this muff hermetically filled the space between the pallial siphuncle and the wall of the shell-siphuncle (fig. B, i).

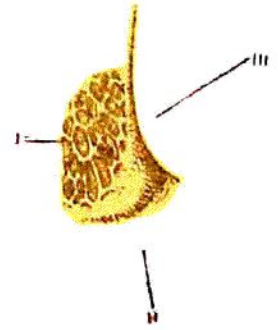


FIG. A.—Posterior part of the right side of the mantle in *Spirula reticulata*, ventral view; $\times 10$. i, reticulation of the mantle; ii, terminal disk; iii, shell.

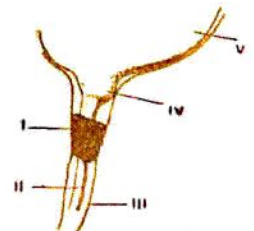


FIG. B.—Anterior part of the siphuncle of *Spirula reticulata*, left hand side view; magnified. i, muff of the last segment of the membranous siphuncle; ii, membranous siphuncle; iii, shell-siphuncle; iv, anterior widening of the siphuncle; v, mantle.

¹ The *Spirula "australis,"* examined by Owen in 1879 (*Ann. Mag. Nat. Hist.*, ser. 5, vol. iii. pl. i. fig. 2), appears also to present a reticulation of the integuments; this character will not then be special to *S. "reticulata."*