

cate, beyond the possibility of a doubt, that the zona, of which they are the constituents, is not a part of the yolk, but an envelope of the egg.¹

In the next stage, in an egg about one sixteenth of an inch in diameter, we find the cells of the zona so pressed against each other that their outlines are not recognizable, (Pl. 9a, fig. 16, 16a, c,) and only a clear, thick band represents the presence of this membrane. Again: in an egg about one tenth of an inch in diameter, this layer is found much thickened and more conspicuous, by reason of the transverse striæ which extend from its outer to its inner contour (Pl. 9a, fig. 18, 18a, e). The nature of these striæ is readily demonstrable, by breaking up the zona; when it becomes evident that they are the outlines of columnar cells,² (Pl. 9a, fig. 19,) flattened in a direction opposite to that in which we found them in the beginning (Pl. 9a, fig. 17, b'). At this age the zona is a very elastic and flexible yet tender layer, exhibiting a considerable degree of tenacity between the cells of which it is composed. This structure remains unchangeable for the rest of the interovarian life of the egg, (Pl. 9d, fig. 2, c,) as may be demonstrated by resorting to a full-grown ovum.³

Subsequently to the entrance of the egg into the oviduct, the zona would seem to be gradually resorbed, as the "investing membrane," developing close upon the surface and from the substance of the yolk, becomes more and more defined as a membrane, and takes the place of the former. At what period the zona disappears altogether it is not possible now to say; but, in some instances certainly, not till after the embryo has commenced to form its amnios, when it appears to be very thin, and, in addition to other characteristics, is remarkable for turning suddenly to a nacreous white upon the application of water. This latter peculiarity we have not noticed previously. At a later period it has not been possible to find the least trace of the zona, excepting perhaps a mere film lining the shell, as late as during the middle period of incubation.

The Vitelline Sac. In a previous section⁴ we have already discussed the origin

¹ See, below, note 1, p. 486.

² Thompson, loc. cit., page 83, says he is inclined to believe that these striæ, as seen by Remak (Müller's Archiv, vol. 4, p. 252) in the ovum of the rabbit, do not depend on any structure of the zona itself, but rather on the markings produced by the adhesion of the pediculated cells of the tunica granulosa, which, under pressure, leave a radiated appearance on the zona; but we would ask, how are the cells of the tunica granulosa enabled to produce transverse striæ in the considerable thickness of such a membrane as

this? We can hardly believe that these cells have such a far-reaching power.

³ Dr. Martin Barry (Researches in Embryology, Phil. Trans., 1838, p. 316) says, "In the ovary of Birds, Amphibia, and Fishes, it is, I believe, allowed that there is no membrane formed external to the membrana vitelli," and denies that the zona pellucida ("Chorion," as he calls it, but in Phil. Trans., 1839, p. 310, he says "Zona,") has its parallel in other Vertebrata than the Mammalia.

⁴ See Sect. 1 of this Chapter, p. 454-456. What