The Test (Testa, Tunica Externa, Cellulose Mantle, Outer Mantle, Cartilaginous Sac).

The test or outer tunic (sometimes incorrectly called the mantle), from which the class derives its name, is one of the most characteristic features of the group. It undergoes many and various modifications, but it is present, and is recognisable as a "test," or "investing mass," in almost every member of the class. It possesses the additional interest of being the organ in which Karl Schmidt, in 1845, made his well-known discovery of cellulose in the animal kingdom. Since that date the principal works on the structure of the test in the Tunicata have been those of Löwig and Kölliker (1846), Schacht (1851), F. E. Schulze (1863), Oscar Hertwig (1872), and Semper (1875).

In a Simple Ascidian the test is a more or less thickened coat forming the outer layer of the body wall. It varies greatly in shape according to the species, and even to a considerable extent according to the individual, being greatly affected by surrounding circumstances. In the so-called Social Ascidians (the family Clavelinidæ) it forms in addition the stolons or creeping roots, which connect the different individuals of the "Society," and contain the connecting blood-vessels. In the Ascidiæ Compositæ it is represented by the "investing mass," the tests of the different Ascidiozooids of the colony having fused together into a common ground mass or matrix. In *Pyrosoma* also there is a colonial mass representing the united tests of the different Ascidiozooids; while in *Salpa* the test forms the outer layer of the body of each individual, as in the Ascidiæ Simplices. In the Appendiculariidæ the test is represented by the structure usually known under the name "Haus," given by its discoverer Mertens. This is only formed at certain times, so that in these Tunicates there is sometimes no test. In certain species of *Doliolum*, also, there appears to be no test.

The external surface is always more or less irregular and prone to develope knobs, hairs, spines, and other processes. This is especially the case at the posterior end of the fixed forms, where the test frequently pushes out long branched processes to serve as roots for the attachment of the Ascidian to foreign bodies.

In the adult condition it is histologically an abnormal form of connective tissue, consisting of protoplasts of various forms imbedded in a matrix which also varies greatly in its characters. The test is in all cases lined by a layer of epithelial cells, the true ectoderm, and it has its origin from these cells alone. It commences as a cuticular secretion on the surface of the ectoderm, and afterwards attains its cellular condition by the migration into it of protoplasts formed by proliferation from the ectoderm. These immigrated cells then increase the thickness of the test greatly by forming deposits of cuticular matter around themselves, thus building up the matrix of the adult test. The protoplasts may also develop large vacuoles in their interior, which sometimes increase to such an extent as to form what may be called a bladder-cell—a large oval or globular space in the matrix lined