results (fig. 17 *h*). The pterocymba is subject to considerable modi­fications : the prows may be similar *(homoproral)* or dissimilar *(heteroproral)* ; the pteres may be lamellar or ungual ; additional lamellæ *tropidial pteres)* may be produced by a lateral outgrowth of the keel (fig. 17 *k)* ; and by growing towards the equator the opposed proral and pleural pteres may conjoin, producing a spicule of two meridional bands *(oocymba* ; fig. 17 *l).* A curious group of flesh spicules are the *trichites.* In this group silica, instead of being deposited in concentric coatings around an axial fibre, forms within the scleroblast a sheaf of immeasurably fine fibrillæ or trichites, which may be straight (fig. 17 *m)* or twisted. The trichite sheaf may be regarded as a fibrillated spicule. Trichite sheaves form in some sponges, as *Dragmastra* (*25*), a dense accumulation within the cortex. In Hexactinellid sponges the rays of the aster are limited to six, arranged as in a primitive Sexradiate spicule, but divided at the ends into an indefinite number of slender filaments, which may or may not be tylotate, *rosettes* (fig. 17 *t).*

Spongin is a horny substance, most similar to silk in chemical composition, from which it differs in being in­soluble in an ammoniacal solution of copper sulphate (cuproso-ammonium sulphate). In *Darwinella aurea,* F. Müller, it occurs in forms somewhat resembling tri-, quadri-, and sex-radiate spicules. But usually the spongin skeleton takes the form of fibres, consisting of a central core of soft granular substance around which the spongin is disposed in concentric layers, forming a hollow cylinder (fig. 23 *b*). The relative diameters of the soft core and of the spongin cylinder differ greatly in different sponges. The fibres branch so as to form antler-like twigs or bushy tree-like growths, or anastomose to form a continuous net­work, as in the bath sponge *(Euspongia officinalis).* The detailed characters of the network differ with the species, and are useful in classification. In *Ianthella* certain cells (sponginblasts) become included between the successive layers of the spongin cylinder, and their deep violet colour, contrasting with the amber tint of the spongin, renders them very conspicuous.

In some sponges the scleres are simply scattered through the mesoderm and do not give rise to a continuous skeleton,—*Corticium, Chondrillα, Thrombus.* In the *Cαlcαreα* and many silicious sponges they are dispersed through the mesoderm, but so numerously that by the overlapping of their rays a loosely felted skeleton is pro­duced. In the calcareous sponges the spicules are frequently regu­larly disposed ; and in the Sycons in particular a definite arrange­ment, on two plans, the *articulate* and *inarticulate,* can be traced in the skeleton of the radial tubes. On the latter plan the triradi­ate or quadriradiate spicules, the apical rays of which are of con­siderable length, are arranged in two sets, one having the basal rays lying in the mesoderm of the paragastral wall and the other with the corresponding rays in the dermal mesoderm. The apical rays of each set lie in the mesoderm of the radial tubes parallel to their length, but pointing in opposite directions (fig. 18 *b).* In the articulate division numerous spicules, small in comparison with the size of the radial tubes, form a series of rows round the tubes, their basal rays lying parallel to the paragastric surface and the apical pointing towards the ends of the radial tubes (fig. 18 *a).*

In the *Silicispongia* sheaves of long oxeate spicules radiate from the base of the sponge if of a plate-like form, or from the centre if globular, and extend to the surface. If triænes are present their arms usually extend within the mesoderm immediately below the

dermal surface (fig. 19). Single spicules reach from centre to sur­face only in small sponges. As the sponge increases in size the spicules must either correspondingly lengthen, or fresh spicules must be added, if a

continuous skeleton is

to be formed. The

latter is the plan fol­

lowed in fact : the ad­

ditional spicules over­

lap the ends of those

first formed like the

fusiform cells in a

woody fibre. With the

formation of a fibre,

often strengthened by

spongin or bound to­

gether with connective

tissue, there appears to

be a tendency for the

constituent spicules to

diminish in size, and

the length of each in

the most markedly fibrous sponges is insignificant when com­pared with the length of the fibre. The spicular fibre thus formed may be simple or echinated by spicules either similar to those which form its mass or different. More usually they are different, and generally styles, often spinose about their origin. The spongin which sometimes cements together the spicules of a fibre may progressively increase in quantity and the spicules di­minish in number, till a horny fibre containing one or more rows of small oxeas results. In an echinated fibre the axial spicules may disappear and the echinating spicules persist. Finally all spicules may be suppressed and the horny fibre of the Ceratose sponges results. The horny fibres may next acquire the habit of embedding foreign bodies in their substance, though foreign en­closures are not confined to the Ceratosa but occur in some Silici- spongiæ as well. The included foreign bodies may increase in quantity out of all proportion to the horny fibres ; and finally the skeleton may consist of them alone, all spongin matter having disappeared.

In the Lithistid sponges a skeleton is produced by the articula­tion of desmas into a network. The rays of the desmas (figs. 12 *f*, 13 *s,* 14 *e)* terminate in apophyses, which apply themselves to some part of adjacent desmas, either to the centrum, shaft, arms, or similar apophyses, and then, growing round them like a saddle on a horse’s back, clasp them firmly without anchylosis. Thus they give rise to a rigid network, in conjunction with which fibres com­posed of rhabdus spicules may exist. In the *Hexactinellida* both spicular felts and fibres occur, and in one division *(Dictyonina)* a rigid network is produced, not, however, by a mere clasping of apophyses, but by a true fusion. The rays of adjacent spicules overlap and a common investment of silica grows over them.

*Histology.*

The ectoderm usually consists of simple pavement epithelial cells *(pinnacocytes),* the margins of which can be readily rendered visible by treatment with silver nitrate, best by Harmer’s method.@@1 The nucleus and nucleolus are usually visible in preparations made from spirit speci­mens, the nucleus being often readily recognizable by its characteristic bulging beyond the general surface. In some sponges *(Thecaphora)* the epithelium may be replaced locally by columnar epithelium, and the cells of both pave­ment and columnar epithelium may bear flagella *(Aplysilla viοlaceα, Oscarella lobularis).* The endoderm presents the same characters as the ectoderm, except in the Ascons and the flagellated chambers of all other sponges, where it is formed of collared flagellated cells or *choanocytes,—*cells with a nearly spherical body in which a nucleus and nucleo­lus can be distinguished and one or more contractile vacu­oles. The endoderm extends distally in a cylindrical neck or *collum,* which terminates in a long flagellum surrounded by a delicate protoplasmic frill or collar (fig. 21 *g).* In *Tetractinellida,* and probably in many other sponges—cer­tainly in some—the collars of contiguous choanocytes coalesce at their margins so as to produce a fenestrated membrane, which forms a second inner lining to the flagel­

@@@1 S. F. Harmer, “ On a Method for the Silver Staining of Marine Objects,” *Mitth. Zoolog. Station zu Neapel,* 1884, p. 445.