is a freshwater form, anomalies in its development (which remind us of those in the development of the freshwater *Hydra)* might almost be expected.

Probably in no other single group is the doctrine of homoplasy enunciated by Lankester more tellingly illus­trated than in the sponges. The independent develop­ment of similar types of canal system in different groups, sometimes within the limits of a single family, is a remark­able fact. In the following table the sign × shows inde­pendent evolution of similar types of canal system in different groups :—

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Ascon. | Sycon. | Rhagon. | | |
| Eury­  pylous. | Aphodal. | Diplodal. |
| Class *Calcarea* | × | × | × |  |  |
| Order *Halisarcina* |  | × | × |  |  |
| Order *Monaxona* |  |  | × | × |  |
| Order *Ceratosa* |  | × | × | × | × |
| Sub-order *Microsclerophora* |  |  |  |  |  |
|  |  |  | × | × | × |
| Order *Choristida* |  |  | × | × |  |
| Family *Tetillidæ* |  |  | × | × |  |

In the gross anatomy of the canal system similar homoplasy obtains ; thus, to cite one case amongst many, a peculiar type of canal system characteristic of *Siphonia* (Lithistid) occurs also in *Emploca*(Hexactinellid), *Schmidtia* (Monaxonid), and other apparently unrelated genera. The development of a cortex has likewise taken place inde­pendently, but on parallel lines, in the *Syconidæ, Leu- conidæ, Monaxona, Tetillidæ,* and *Stellettidæ.* Calcareous and silicious spicules have evidently an independent his­tory, and yet all the chief forms of the former are repeated in the latter. Quite as remarkable is the similarity of the independently evolved horny spicules of *Darwinella aurea* to the quadri- and sex-radiate silicious spicules. We have now sufficient knowledge of the morphology and evolu­tion of the sponge to furnish the physicist with data for an explanation of the skeleton, at least in its main outlines. The obvious conclusion from this is that variation does not depend upon accident, but on the operation of physical laws as mechanical in their action here as in the mineral world. Another important consequence follows : if homoplasy—*i.e.,* the independent evolution of similar structures —is of such certain and quite common occurrence in the case of the sponges, it is also to be looked for in other groups, and polyphylitic origin, so far from being improb­able, is as likely an occurrence as monophylitic origin.

*Physiology and Ætiology.*

Under the head of “physiology” we have almost a blank. At present we do not even know what cells of the sponge are primarily concerned in the ingestion of food. If a living sponge, such as *Spongilla,* be fed with carmine for a few minutes, then immersed in dilute osmic acid, and examined in thin sections, its flagellated chambers are found to be all marked out as red circular patches, and a closer investigation shows that the choanocytes, and they alone, have ingested the carmine. In this way we con­firm the earlier observations of Carter made by teasing carmine-fed sponges. This might be thought to decide the question ; but, though it effectually disposes of Pole­jaeff's argument that the choanocytes do not ingest nutri­ment because mechanical disadvantages (conceived *a priori)* make it impossible, it has not proved a final solution. Von Lendenfeld, by feeding sponges such as *Aplysilla* with carmine for a longer interval—a quarter of an hour—finds that amoeboid cells crowd about the sides and particularly the floor of the subdermal cavities, and are soon loaded with carmine granules ; after a time they wander away to the flagellated chambers and there cast out into the excurrent canals the carmine they have absorbed, apparently

in an altered state. On the other hand, the choanocytes, though they at first absorb the carmine, soon thrust it out, apparently in an unaltered state. Hence Von Lendenfeld concludes that it is the epithelium of the subdermal cavities which is charged with the function of ingestion, and that the amoeboid cells subsequently digest and distribute it, and finally cast out the worthless residues. There may be much truth in this view, but it requires to be supported by further evidence. (1) Sufficient proof is not adduced to show that the carmine granules expelled from the amoe­boid cells are really more decomposed than those rejected by the choanocytes. (2) There is at present no proof that carmine is a food, or that if it is sponges will readily feed upon it. In either case one would expect the amoeboid cells to play the part which they perform in other organisms and to remove as soon as possible useless or irritant matter from the surface which it encumbers ; at the same time the choanocytes, not having found the food to their liking, would naturally eject it. (3) If the choanocytes do not ingest food, how does the Ascon feed, since in this sponge all the pinnacocytes are external ? It is, however, a very noticeable fact that, as the organization of a sponge increases in complexity, the choanocytal layers become reduced in volume relative to the whole bulk of the individual ; and it is quite possible that as histological differentiation proceeds it may be accompanied by physio­logical differentiation which relieves the choanocytes to some extent of the ingestive part of their labours.

The origin of the sponges is to be sought for among the choanoflagellate *Infusoria*; and Savile Kent has de­scribed a colonial form of this group which is suggestively similar to a sponge. Its differences, however, are as marked as its resemblances, and have been sufficiently pointed out by Schulze (*23*). Kent has called this form *Protospongia,* a name already made use of, and fortunately, as the organism is not in any sense a true sponge ; the present writer proposes, therefore, to call it *Savillia,* in honour of its discoverer. It consists of choanoflagellate *Infusoria* (see Protozoa, vol. xix. p. 858, fig. XXI., 15), half projecting from and half embedded in a structureless jelly or blastema, within which other cells of an amoeboid character and reproductive function are immersed. Pro­fessor Haddon arrives at the generalization that conjuga­tion amongst the *Protozoa* always takes place between individuals of the same order : flagellate cells conjugate with flagellate, amoeboid with amoeboid, but never with flagellate ; while in true sexual reproduction the conjuga­tion occurs between two individual cells in different stages of their life cycle: a flagellate cell conjugates with a resting amoeboid cell. Now *Savillia* would appear to be extremely near such a true sexual process, since the simultaneous coexistence of cells in two different stages of life and within easy reach of each other—a necessary preliminary, one would think, to the union—has already been brought about. That coalescence between two different histological elements should result in products similarly histologically differentiated (compare amphiblastula stage of *Calcarea)* has in it a certain fitness, which, however, has still to be explained. The mode by which an organism like *Savillia* might become transformed into an Ascon cannot be sug­gestively outlined with any satisfactory results till our knowledge of the embryology of sponges is more advanced. The minute characters of the flagellate cells of the amphi­blastula and other sponge larvæ are still a subject for research. They often possess a neck or collum ; but the existence of a frill or collar is disputed. Kent asserts that it is present in several embryos which he figures ; and Barrois makes the same assertion in respect to the larva of *Oscarella,* and illustrates his description with a figure. On the other hand, Schulze and Marshall both