which are, so far as we know, totally unrepresented at the present day.

*Phylogeny.*

The most recent views as to the evolution and inter-relation ships of the principal groups of sponges above enumerated may be conveni­ently expressed by the accompanying phylogenetic tree (fig. 42). Starting with the hypothetical Protolynthus as the ancestral form of the entire group, we sec how two divergent lines of descent are very early estab­lished according to whether or not a calcareous skeleton is developed. The Calcarea are at first simple Olynthus forms, Homocoela, differ­ing only from the Protolynthus in the presence of the calcareous spicules. From these are derived, by the pro­cess of budding, on the one hand reticulate forms *(Clathrina)* and on the other radiate forms (*e.g*. *Leuco- solenia tripodifera),* and some of the latter (now probably extinct) form the starting point for the evolution of the Calcarea Heterocoela, begin­ning with simple Syconoid forms and ending with complex Leuconoids, in which the original process of simple budding has been followed up by elaborate modifications of both skeleton and canal system.

Turning to the other main line of descent we find at once a conspicuous gap between the Protolynthus and the simplest known non-calcareous sponge; though the analogy of the Calcarea makes it easy to understand how the almost Syconoid canal system of the simplest Hexactinellids, or the primitive Rhagon type of other groups, may have been derived from the Protolynthus ancestor in the first instance by simple budding. This line of descent may be regarded as continued straight on into the existing Myxospongida, with increase in the complexity of the canal system, due to folding of the chamber-bearing layer and the accompanying development of inhalent and exhalent canal systems, but without the development of any skeleton. The Triaxonida and Euceratosa would seem to have branched off independently at a very early stage from the Myxo- sponge line, before the flagellated chambers had suffered that reduc­tion in size which occurs in some existing Myxospongida and in all Tetraxonida. In the Triaxonid line of descent the evolution of the siliceous skeleton of primitively hexactinellid spicules is the leading feature, the canal system preserving remarkable uniformity through­out the group. In the Tetraxonida also the skeleton has played the principal part in the evolution of existing species, but the canal system too has undergone great modifications. The primitive tetrax- onid, tetractinellid siliceous spicules must have arisen quite indepen­dently, their fundamental form being totally different from that of the triaxonid hexactinellid type. The appearance of differentiated microscleres in this group introduced new possibilities of variation, of which full advantage has been taken, and we are confronted with most interesting evolutionary series, terminating in many very remarkable and at present inexplicable spicule forms (fig. 29). In many of the more advanced Tetraxonida, especially in the Chalininae, the development of spongin cement also appears as a new factor in the process of evolution. At first serving merely to glue the mega­scleres together into a continuous framework, it ultimately, in some extreme cases, completely replaces the siliceous skeleton and gives rise to a purely “ horny" skeleton in which all traces of spicules have been lost by degeneration. Thus we arrive at a “ Pseudo- ceratose ” condition (fig. 32, *D)* which must be carefully distinguished from the condition of the Euceratosa, which have apparently branched off quite independently from Myxosponge ancestors. Here we have another typical example of that phenomenon of “ convergence ” which has rendered the classification of sponges so very difficult. In the Euceratose line of descent we start with forms *(Aplysilla)* with large sac-shaped chambers and altogether primitive canal system, accompanied by an arborescent horny skeleton (fig. 33) of an. entirely different type from that of the pseudoceratose Tetraxonida. From this we can trace the evolution gradually through the Spongeliidae to the Spongiidae, the skeleton becoming reticulate and the canal system gradually more complex with accompanying reduction in size of the chambers. The bath sponge perhaps represents the culminating point in this direction. Thus it appears that both the horny type of skeleton and the siliceous spicular type have been twice independently produced in the evolu­tion of the Non-calcarea. An analogous case of convergence is seen in the union of originally separate spicules into a coherent skeleton by means of cement of the same chemical composition as themselves. This has taken place independently in the Calcarea *(Petrostoma),* the Dictyonine Hexactinellida and the Lithistid Tetraxonida.

*Affinities of the Porifera.*

Three main views have been put forward with regard to the position of the Sponges in the animal kingdom: (1) that they are colonies of Protozoa; (2) that they form a subdivision of the Coelenterata; (3) that they are not Protozoa but have originated from Protozoon ancestors quite independently from other Metazoa (Enterozoa). The first of these views, associated especially with the names of James Clark and Saville Kent, is supported by the relative independence of the constituent cells in the sponge-body and by the extraordinary resemblance of the collared cells to the choanoflagellate or collared Monads. It is also supported by the existence of a remarkable colonial form of Choanollagellata *(Proterospongia)* in which the collared Monads are partially embedded in the surface of a gelatinous matrix, in the interior of which amoeboid cells are found. E. A. Minchin has shown that even in the adult *Leucosolenia (Clathrina)* the collared cells and porocytes have the power of changing their relative positions, while migration of dermal and gastral cells and consequent inversion of the layers appears to be a common feature of the sponge larva at the time of metamorphosis. These facts are certainly suggestive of Protozoon colonics rather than of Metazoa. On the other hand it must not be forgotten that migratory amoebocytes *(leucocytes)* occur in probably all groups of Metazoa, while the degree of integration and the amount of histological differentiation in Sponges are far greater than in any other Protozoon colonies known to us. It has been argued that the process of sexual reproduction by means of ova and spermatozoa is fatal to the Protozoon-colony theory, but this argument is completely disposed of by the discovery of spermatozoa and ova in the unicellular Sporozoa. On the other hand the occurrence of collared cells has been held to distinguish the Sponges from all other Metazoa, and this argument has also been answered by the discovery of collared cells in the larva of *Echinocyamus* (an Echinoderm) by H. Theel. It would, in short, be difficult to frame a definition of the Protozoa which should absolutely exclude the Sponges, while at the same time our con­ception of the nature of Protozoa will have tσ be profoundly modified if we are to admit the Sponges within the limits of that group.

The second view, that the Sponges constitute a subdivision of the Coelenterata, is maintained by some very eminent con­tinental authors such as Ernst Haeckel and F. E. Schulze. This view is supported by the structure of the Olynthus type, which, as we have seen, forms the starting-point of Sponge evolution. The dermal layer of the Olynthus is regarded as ectoderm, the gastral layer as endoderm and the mesogloea with its contained cells as mesoderm, more highly developed