

REPORT

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BRITISH ASSOCIATION

FOR THE

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arranged. At first sight it seems to present equally strong affinities with four principal groups, viz.—1. the Nematoid worms; 2. the Annelida; 3. the Lernæan Crustacea; and 4. the Arachnida.

1. With the Nematoid worms it is allied by its general shape and habit, its want of distinct annulation, and remotely, by the armature of the mouth. But on the other hand, it differs widely from them in the nervous system, the sexual system, and the nature of the muscular tissue.

2. *Sagitta* has no small resemblance to certain Naiadæ, in which when young the anterior hook-like feet are directed forwards parallel to the mouth. It differs from them in the nature of its nervous system, which exhibits a concentration quite foreign to the annelid type, in the nature of the muscular tissue, and in the total absence of any water vascular system.

3. and 4. The real affinities of *Sagitta* are probably with one or other of these great divisions. The structure of the nervous and muscular system speaks strongly for this view, and the nature of the sexual system is not opposed to it, inasmuch as we have hermaphroditism among both the lowest Crustacea (Cirrihipedia) and the lowest Arachnida (Tardigrada).

The study of development can alone decide to which of these divisions *Sagitta* belongs; but until such study shall have demonstrated the contrary, Mr. Huxley stated his belief that *Sagitta* bears the same relation to the Tardigrada and Acaridæ, that *Linguatula* (as has been shown by Van Beneden) bears to the genus *Anchorella*, and that the young *Sagitta* will therefore very possibly be found to resemble one of the Tardigrada, the rudimentary feet with their hooks being subsequently thrown up to the region of the head, as they are in *Linguatula*.

An Account of Researches into the Anatomy of the Hydrostatic Acalephæ.

By THOMAS H. HUXLEY, F.R.S., Assistant Surgeon R.N.

The observations upon which this communication is based were made during the circumnavigatory voyage of H.M.S. Rattlesnake, but for the most part in the seas which border the coasts of North-eastern Australia, New Guinea, and the Louisiade archipelago.

With the exception of the mere external form, but very little has been known hitherto with regard to either the Diphydæ or the Physophoridæ, the two families of which the 'Hydrostatic Acalephæ' of Cuvier consist, although they are some of the most abundant of pelagic creatures. Indeed, hardly any one can have made a voyage to the East Indies or Australia without being struck with the immense shoals of the *Physalia* and *Velella*, through which the ship sometimes sails for days together.

The chief mass of one of the Diphydæ is formed by two transparent crystalline pieces, which look, when taken out of the water, like morsels of cut glass. One or both of these pieces contains a wide cavity, lined by a muscular membrane, by the contraction of which the animal is propelled through the water. The attachment of the posterior piece to the anterior is very slight, and when detached it will swim about independently for hours together. It was this circumstance which led Cuvier to consider the two pieces as two distinct animals.

In the Monogastric Diphydæ a single polype is developed in a special cavity of the anterior piece. In the Polygastric Diphydæ, a long chain of such polypes, each enveloped in a little transparent "bract," occupies a similar position. These polypes have no oral tentacles, but a long thread-like tentacle, bearing lateral branches, which are terminated by small sacs, is developed from the base of every polype. The small "prehensile" sac has a very peculiar form, but is, morphologically, only a dilatation of its pedicle, one wall of which is much thickened, and contains a great number of such urticating organs or "thread-cells" as are found among the Medusæ. The reproductive organs are medusiform bodies which are developed by gemmation from the pedicle of the polype.

The central sac of the medusiform body, instead of becoming a stomach, develops the spermatozoa or ova within its walls. These are generally shed forth while the organ is still attached, but in one genus they swim about independently, and might readily be mistaken for Medusæ.

In the Polygastric Diphydæ new polypes are continually being produced by gem-

mation at the attached extremity of the polype chain, and in both polygastric and monogastric forms, the same gemmation is continually going on among the prehensile and reproductive organs. The gemmæ, whether they are eventually to become polypes, prehensile organs, or reproductive organs, are invariably at first simple, double-walled processes, containing a cavity continuous with that of the common stem of the animal, which is itself a double-walled tube. The Diphydæ, whether polygastric or monogastric, are invariably diœcious.

The genus *Rosacea*, among the Polygastric Diphydæ, is remarkable in possessing only the anterior piece, which is gelatinous and hemispherical, like the umbrel of a *Medusa*. If a peculiar dilatation—the float—were formed at the extremity of the polype-chain of a Diphyes, we should have one of the Physophoridæ.

The genera *Rhizophysa*, *Physalia*, *Athorybia*, *Physophora*, *Stephanomia*, *Agalma*, *Porpita*, and *Velella*, were described and their structure illustrated by diagrams, without which the details would be unintelligible. Suffice it to say, that their forms, however varied, are shown to be simple modifications of a common type, in the main identical with that of the Diphydæ. Thus, such a polype-chain as that of *Rosacea*, if it developed a float, would be a *Rhizophysa*. The *Physalia* is a *Rhizophysa* with its float disproportionately enlarged; the *Physophora*, a *Rhizophysa* which has developed lateral natatorial organs like those of a Diphyes. Again, the *Velella* may be considered as a *Physalia* flattened out and having its air-sac divided and subdivided by partitions, until it becomes a firm, resisting, internal shell.

The same continual multiplication of parts by gemmation goes on among the Physophoridæ as among the Diphydæ; and the structure and mode of development of the young organs is essentially the same. Great variety is presented by the reproductive organs, from the form of mere sacs to that of free swimming bodies, precisely resembling *Medusæ*, and developing the generative elements only subsequently to their liberation. In *Physalia*, the female organs are free-swimming medusiform bodies, while the male organs are simple pyriform sacs, which remain attached and develop their spermatozoa *in situ*. In the language of the "alternation theory," the *Physalia* itself and the medusiform body would be two generations, and we should be presented with the unexampled peculiarity of a male giving birth to a female.

As a general conclusion, it may be stated that the Diphydæ and Physophoridæ are essentially composed of two membranes, an outer and an inner, which the author calls "foundation-membranes," since every organ is formed by the modelling into shape of one or other, or both of these, commencing as a simple process or diverticulum, and assuming its perfect form by a gradual differentiation. The stomach has no walls distinct from those of the general parietes. The reproductive organs are always developed externally, and the thread-cell is found in all in the greatest abundance. The author lays particular stress on the bearing of the latter fact upon classification, and shows that the same organ is met with in equal abundance only in the Hydroid and Sertularian Polypes, the Medusidæ, Beroidæ, and Anthozoic Polypes. A similar organ has indeed been also found in an Echinoderm, in certain Trematoda, and perhaps, although the author is inclined to think that its presence in this case is accidental, in Eolis; but in none does it assume such a prominent place as in the families mentioned.

The author endeavours to show that this fact, combined with the radiate polype form, and the composition of the body of two distinct membranes, forms a very good positive character for a group embracing the Hydroid and Anthozoic Polypes, and the Acalephæ; a group equal in importance to any one of the primary subdivisions of the animal kingdom. The name of *Nematophora*, "thread-bearers," is proposed for this group, in allusion to the characteristic diffusion of the "thread-cell." But this group must be subdivided into two equivalent sub-classes. In the Hydroid Polypes, the Diphydæ, Physophoridæ, and Medusidæ, the stomach is *not distinct* from the common parietes, and the reproductive organs are *external*. In the Anthozoic Polypes and Beroidæ, the stomach is *distinct* from the common parietes, and the reproductive organs are *internal*. Some years ago Mr. W. S. MacLeay, when consulted by the author, suggested the name of *Cœcioa* (those which have their eggs under cover, "housed") for the latter division, and that of *Anœcioa* for the former. Now a mutual representation runs through these two groups. For instance, the Actinidæ represent the Hydra and its allies; the Zoanthidæ represent the Corynidæ; the Physophoridæ seem to represent the Pennatulidæ; and the Medusidæ, the Beroidæ.

Furthermore, each group returns into itself; the free floating Actiniæ nearly approximate Berœe, and *Lucernaria* is but a fixed *Medusa*.

Should these considerations eventually prove to be well-founded, the author considers that it will be necessary to break up the class Radiata of Cuvier into four groups, severally capable of being defined by positive characters. Supposing the Nematophora to form a sort of central group, we have on the one hand the Ascidians and the Bryozoa, leading to the Mollusca; on the other the Echinoderms and Entozoa (in the widest sense), leading to the Annulosa; whilst the Polygastria, Sponges, and Gregarinidæ (if indeed they are not rather to be considered only as the lowest forms of the other three groups) conduct us towards the lowest plants. These relations may be thus represented:—

MOLLUSCA.

ANNULOSA.



Description of a New Form of Sponge-like Animal. By T. H. HUXLEY, F.R.S.

The author described a gelatinous substance found in almost all seas, in masses varying in size from that of a pea to that of a walnut. This mass is an animal of extreme simplicity, analogous to the Palmellæ in the vegetable kingdom, and consisting of a number of simple cells united by a gelatinous connecting matter, containing siliceous spicula.

The author pointed out the importance of this creature as connecting the *Spongiæ Gregarinidæ* and *Polythalamata*.

On the Land and Freshwater Mollusca found within seven miles of Nottingham.

By E. J. LOWE, F.R.A.S.

1st. LAND SHELLS (*Univalves*).

Azeca tridens, rare at Highfield House.

Arion ater and *A. hortensis*, common.

Achatina acicula, rare at Ratcliffe.