

The form of the eyes of caterpillars, and their position at the root of the mandibles, appear to be perfectly appropriate to the mode of life of these animals. The prehension and assimilation of food constitute the essential phenomena of their life. The exercise of sight is limited to the immediate perception of nutritive materials. The distance from the point of the mandibles to the ocelli being therefore the measure of average vision, this distance must be exceptionally short. The laws of optics necessitate in this case an extremely strong curvature of the crystalline; and this curvature is realized in all caterpillars. The office of the iris is no doubt to contract under the influence of too intense a light; for this organ is endowed with an extreme contractility. Lastly, the enveloping bodies, the muscular layer, and the enveloping membranes are very strongly pigmented, so as to concentrate the light upon the nervous elements.—*Siebold und Kölliker's Zeitschrift*, Bd. xvi. p. 27; *Bibl. Univ.* Nov. 25, 1866, *Bull. Sci.* pp. 272–275.

### *Deep-Sea Life in the Ocean.*

In my Report to the British Association, at their last meeting, on dredging among the Hebrides, I quoted a paper by Professor Lovén on the results of the Swedish expedition to Spitzbergen in 1861 under Dr. Otto Thorell. A translation of that paper was sent to me by a friend from Copenhagen, and I had no opportunity of comparing it with the original. Professor Lovén has now pointed out to me a mistake in the translation, which, in justice to him, I hasten to correct. Instead of his saying that, from 60 to 80 fathoms down to the greatest depth known to be inhabited by animals, the bottom is “everywhere” covered with a soft and fine mud or clay, it should be “wherever” the bottom is so covered. This substitution of one word for another makes all the difference. The learned author was well aware of the existence of rocky ground, even at very great depths. I beg to offer my sincere apology to him for having thus misrepresented his views.

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25 Devonshire Place, Portland Place,  
1st Dec., 1866.

### *Researches on the Geryonidæ.* By Professor HÄCKEL.

Among the Craspedote Medusæ the family of the Geryonidæ is distinguished by the length of the stomachal peduncle, which causes these animals to resemble umbrellas furnished with long handles. This character certainly occurs also throughout the family Geryonopsidæ established by Agassiz, and in some Oceanidæ and Thaumantiadæ. But the Geryonidæ are distinguished from these families by the peculiar form of their generative organs, which extend like delicate leaves in the subumbrella, without projecting into the cavity of the umbrella. Gegenbaur, indeed, ascribes to the Geryonidæ another important character connected with the gastrovascular sys-



tem. Their stomachal peduncle, according to him, is destitute of gastrovascular canals, and represents a tube, hollow throughout and filled with chyme, communicating directly with the radiating canals of the umbrella. Häckel proves that this character is erroneous. The peduncle in the Geryonidæ, as in the Geryonopsidæ, is solid and hyaline, the stomach occupying only its lower or buccal extremity. From this stomach issue the gastrovascular canals, which are excavated in the peripheral layer of the hyaline peduncle, and run towards the umbrella. M. Häckel remarks that the Geryonidæ form two very natural groups, according as they are quadruply or sextuply rayed; and he therefore forms with them two subfamilies, that of the Carmarinides and that of the Liriopides. The Carmarinides, with sextuple rays, are distinguished by their large size, not only from the Liriopides, but also from nearly all the other Craspedote Medusæ; so that they may be regarded as giants among these Hydrozoa.

A very singular organ which occurs in certain Geryonidæ of both subfamilies, is a solid, gelatinous, hyaline cone, which springs from the bottom of the stomach, and, traversing its whole cavity, projects through the mouth. This organ, called by the author the "lingual cone," appears to be endowed with tactile functions; but it is also intimately connected with those of reproduction. Its existence was previously known in the four-rayed genus *Liriope*; but the author has also found it in the new six-rayed genus *Carmarina* from the Mediterranean.

Certain Carmarinides present a modification of the gastrovascular system which is unique in its kind among the Craspedote Medusæ. We find in them, besides the normal radiating canals, centripetal canals which start from the marginal canal and are directed towards the base of the stomachal peduncle, where they terminate cæcally.

The Geryonidæ appear to be furnished with a nervous system, the principal part of which presents the form of an annular cord, placed immediately beneath the marginal canal, and bearing ganglionic inflations at the positions of the marginal corpuscles. Here, therefore, we have a new champion in support of the controverted existence of a nervous system in the Medusæ. But it is as well to remark that the nervous system described by Häckel appears to be essentially different from that indicated by Agassiz; it is also distinct from the organs regarded as nervous by F. Müller in *Liriope*, and only appears to coincide with the nervous system observed by F. Müller in *Tamoya*, and by Leuckart in *Eucope*.

The tentacles of the adult Geryonidæ are at least as numerous as the radiating canals, and are then placed at the extremities of the latter. There are consequently at least four of them in the Liriopides, and six in the Carmarinides. But many species also possess interradial tentacles, which appear, likewise, to exist in all the species when young. Moreover, during a certain period of larval life, all the Geryonidæ appear to possess supplementary or accessory tentacles, inserted upon the dorsal part of the umbrella, a little above the radial tentacles and upon the same meridians as these. During this period



of development, therefore, the *Liriopides* possess twelve tentacles, and the *Carmarinides* eighteen. Whilst the radial tentacles are hollow, supple, and endowed with great mobility, the interr radial tentacles are short and rigid, and scarcely possess any but a pendulum-like movement, like the tentacles of the *Trachynemidæ*.

The development of all the *Geryonidæ* presents a series of very interesting metamorphoses. The young individuals, on escaping from the egg, are very different from their parents, and, before attaining their definitive form, have to pass through various phases, some of which have occasioned the formation of separate genera. The metamorphoses of one species only (*Liriope catharinensis*) had hitherto been studied by F. Müller; but M. Häckel now makes known those of another *Liriope* and of a *Carmarina*. In all the species, whether their fundamental typical number be four or six, the tentacles are at first equal in number to the typical number, then double, and afterwards triple in number; then in the course of development the number falls to double the typical number, or even, in many species, to this number itself. The first radial tentacles, which are only rudimentary, generally disappear as soon as the second have attained a certain length. On the other hand, the solid and rigid interr radial tentacles persist, in some species, until the commencement of sexual maturity, and in others even through the whole life.

Besides this mode of reproduction, M. Häckel has observed another, very strange one in the Mediterranean *Carmarina hastata*. Certain individuals of this species, both males and females, contain in their stomachs a sort of spike, formed by an agglomeration of medusiform buds. The number of *Medusæ* on one of these spikes may be as many as eighty-five. A more careful examination showed M. Häckel that the axis of the spike is formed by the lingual cone, to the surface of which the medusiform buds are attached by the middle of the dorsal surface of the umbrella. This cone, therefore, acts the part sometimes of a tactile tongue, sometimes of a gemmiparous organ.

It is still more remarkable that all these buds are octuply radiated, whilst all the adult *Carmarinæ* and all the larvæ which issue from them are sextuply radiated. It is therefore impossible that these buds should ever become *Carmarinæ*. Moreover the whole organization of these buds removes them from *Geryonidæ*, to give them place among the *Æginidæ*; and in fact these young buds become developed into an *Æginide* abundant in the Bay of Nice, and described by Häckel under the name of *Cunina rhododactyla*. This *Cunina*, which is destitute of the long stomachal peduncle, is a sexual individual as well as the *Carmarina* from which it is produced.

The two families *Geryonidæ* and *Æginidæ* must therefore henceforward be united into one (*Phyllorchidæ*, Häckel). Häckel, moreover, shows that the differences which separate them are not so great as has been supposed. The *Æginidæ* alone, among the *Craspedota*, have passed as being destitute of a marginal canal; but this exception disappears, the author showing that this canal also exists in them.



The so-called blind lateral diverticula of the stomach, upon which so much stress has been laid as a character peculiar to the Æginidæ, are in reality only radiating gastrovascular canals, exceptionally widened and flattened, opening at one end into the stomach and at the other into the marginal canal. Lastly, those peculiarities of the tentacles which have been indicated in the Æginidæ are met with in the provisional tentacles of the Geryonidæ.

This remarkable discovery might, to a certain extent, have been foreseen, by taking into consideration some isolated facts already known. In 1853 Kölliker described, under the name of *Stenogaster complanatus*, a small Æginide with sixteen rays, which he discovered in the stomach of an Æginide with ten rays, *Eurystoma rubiginosum*. In 1861 Fritz Müller was led to suppose, from analogy, that the *Stenogastres* were engendered by the *Eurystomata*. In fact, he observed in an Æginide of the Brazilian coast, to which he gives the name of *Cunina Köllikeri*, that individuals octuply rayed produced by gemmation in their stomach individuals covered with vibratile cilia and duodecimally radiated. These facts, brought together with that investigated by Hæckel, show that in the Æginidæ there is a dimorphism of two sexual generations, one of which is produced from the other by gemmation.

Even the existence of spikes of Medusæ, produced by the formation of numerous buds on the surface of the lingual cone of the Geryonidæ, is not so completely new as it might be thought at the first glance. As early as 1843, Krohn indicated an analogous spike in the stomach of a *Geryonia* from the Mediterranean; and in 1860 F. Müller made a similar observation on a Brazilian *Liriope*; but he believed the spike to be of foreign origin, and to have been merely swallowed by the *Liriope*.

This singular mode of reproduction of the Æginidæ evidently differs considerably from that prevailing in the other Hydroids. We have nothing to do here with an alternation of one or several asexual hydriform generations with a generation of sexual Medusæ, but we have a genetic union of two forms of sexual Medusæ very different from each other. In it M. Hæckel sees a mode of generation essentially different from the alternation of generations, and for it he proposes the name of *Allæogenesis*. Nevertheless this difference is perhaps not so profound as it seems at the first glance. We must indeed reject as forced the interpretation by which Mr. Allman seeks to refer the exceptional facts observed by M. Hæckel to the normal form of the alternation of generations. Mr. Allman, in fact, endeavours to make of the Geryonidæ an asexual generation by theoretically raising their generative organs to the rank of independent zooids or rudimentary individuals of a sexual generation. Such an interpretation seems to us to give an exaggerated importance to the generative organs, each of which is really only a modification of a radiating gastrovascular canal. In any case the existence of two sexual forms in one and the same species is not now so surprising as at the moment when M. Hæckel wrote. The development of *Ascaris nigrovenosa*, as revealed to us by the beautiful researches of MM.



Leuckart and Mecznirow, presents us, among the Nematode worms, with a very similar example of dimorphism of sexual forms.—*Bibl. Univ.* 1865, *Bull. Sci.* pp. 154–160; abstract of ‘*Beiträge zur Naturgeschichte der Hydromedusen*, Heft 1. *Die Familie der Rüsselquallen.* Leipzig, 1865.

*On some Crustacea of the French Coasts.*

By M. HESSE.

In a ninth memoir on new and rare French Copepod Crustacea, M. Hesse describes numerous species of this class, most of which are found living in the interior of various Ascidians. The species belong to the genera *Doropygus* and *Dispontius* of Thorell and to four new genera proposed by the author.

Of the genus *Doropygus* the author describes twenty-one species, four of which had previously been observed by Thorell. He gives the following general table of their characters:—

Abdominal extremity	terminating in a rounded point; appendages straight, unarmed, with or without hairs; posterior thoracic process .....	{ large: <i>D. curculio</i> , <i>pulex</i> (Thor.), <i>propinquus</i> , <i>conicus</i> , <i>callipygus</i> , <i>deflexus</i> , <i>oblongus</i> , <i>rotundus</i> . wanting: <i>D. verrucosus</i> , <i>albidus</i> , <i>viridis</i> , <i>gibbosus</i> , <i>tumefactus</i> .
	terminated by a small cavity; appendages recurved and hooked, armed with points; posterior thoracic process .....	{ large: <i>D. gibber</i> (Thor.), <i>psyllus</i> (Thor.), <i>auritus</i> (Thor.). small: <i>D. acutus</i> , <i>reflexus</i> . wanting: <i>D. macroone</i> , <i>rufescens</i> , <i>coccineus</i> .

Most of these species occur in simple Ascidians; but the habitat of *D. oblongus* is said to be *Polyclinium stellatum*; *D. tumefactus* occurs in “an incrusting pustular Ascidian of a brown colour,” found on a *Maia squinado*; *D. rufescens* inhabits a reddish, pustular, incrusting *Eucelinus*; and *D. deflexus* was found under the cortical envelope of a zoophyte attached to the feet of a *Maia squinado*.

Of the genus *Dispontius* the author describes Thorell’s species *D. striatus*, and two new ones, *D. marginatus* and *D. conspicuus*.

Those which form the types of new genera are:—

1. GASTRODES, Hesse.

Closely allied to *Botachus*. *Female*. Body elongate, narrow in front, enlarging gradually to base of thorax; thorax of six segments; abdomen narrow, cylindrical, of five segments, the last terminated by four very strong opposed claws, which may be prehensile. Antennæ moderate, basal joint large and long; stem cylindrical, eight-jointed. First footjaw long and slender, terminated by a hooked claw; second and third stouter and shorter. Natatory thoracic feet biramose, furnished with points and hairs. Eye single, in the middle





Haeckel, Ernst. 1867. "Researches on the Geryonidæ." *The Annals and magazine of natural history; zoology, botany, and geology* 19, 63–67.

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