Delectus Animalium Articulatorum, by Spix and Martius; Voyage de Humboldt et Bonpland, Premier Volume; Kirby's Fauna Boreali-Americana; Coleoptères de Mexique, par Chevrolat (*Omocerus* N. G.); Dalmann's Analecta Entomologica, (*C. fornicata*); Guerin and Percheron, Genres des Insectes, col. plate 12; Sahlberg's Pereculi Entomographici Cassida; Der Naturforscher, Stuck 6 and 9, and Fuessly's Archives.

Africa—Refer to Klug's Bericht on the Coleoptera of Madagascar; Insectorum Enumeratio Eleutheratorum, by Goldfuss. The work of Palisot Beauvois also contains the figures of some species from the kingdom of Oware.

Asia—Consult Brulle's Voyage in the Morea; Hope's New Species in Gray's Zoological Miscellany; Wiedemann's Zoologisches Magazin, 1817—1823; Perty's Synopsis Coleopterorum. Falderman records only a single species, namely, *Cassida bella*, in his Fauna Entomologica Trans-Caucasica. It seems probable that *Cassida* may be greatly swayed by the vegetation on which the different species feed.

New Holland—Bois Duval's Voyage de L'Astrolabe.

REFERENCE TO PLATE IV.

1. *Mesomphalia gibbosa*. 1 *a*. The same in profile; *l* 1. Labrum; *md*. Mandible; *mx*. Maxilla; *l* 2. Labium; *a*. Antenna; *st*. Sternum; *t*. Tarsus; *u*. Unguis.

2. *Dolichotoma Chloris*. 2 *a*. The same in profile; *md*. Mandible seen in two positions; *mx*. Maxilla; *l* 2. Labium; *a*. Antenna.

3. *Selenis perforata*. 3 *a*. The same in profile; *l* 1. Labrum; *md*. Mandible; *mx*. Maxilla; *l* 2. Labium; *a*. Antenna.

4. *Tauroma Taurus*. 4 *a*. The same in profile; *l* 1. Labrum; *md*. Mandible; *mx*. Maxilla; *l* 2. Labium (with the large fleshy internal lingua); *a*. Antenna.

5. *Desmonota platynota*. 5 *a*. The same in profile; *l* 1. Labrum; *md*. Mandible; *mx*. Maxilla; *l* 2. Labium (with the internal lingua); *a*. Antenna.

6. *Batonota bidens*. 6 *a*. The same in profile; *md*. Mandible; *mx*. Maxilla. *l* 2. Labium; *a*. Antenna; *st*. Sternum.

XII.—*Some Observations on the Digestive Apparatus of Infusoria*.* By Dr. J. MEYEN, Prof. Bot. University of Berlin.

To Richard Taylor, Esq.

SIR,

EXCUSE the liberty I take of forwarding to you a short memoir on the digestive apparatus of the Infusoria, which I request you will publish in your highly valuable journal. My

* Communicated by the Author to, and translated for this Journal.

paper was sent as early as October to Prof. J. von Müller for insertion in his 'Archiv,' and since then I have seen in your journal that Prof. Rymer Jones has made some correct observations on the same subject, which have been controverted, but unsuccessfully, by Prof. Ehrenberg.

[We gladly comply with the wishes of our learned correspondent, and, in order to lay the whole subject as it at present stands before our readers, we have extracted from the elegant and valuable work of Rymer Jones the passage treating on this subject. We intend also to give in our next number an extract from a memoir which has recently been published by M. Dujardin in the 'Annales des Sciences Naturelles,' which is likewise opposed to the views taken by Dr. Ehrenberg. In the mean time we hope that some of our English naturalists (excellent microscopes being now much in use in this country) will take up this subject and help to bring this interesting question to an issue.—R. T.]

IT WILL be well known to naturalists that Von Gleichen even as early as the year 1781 fed the infusorial animalcules with carmine, and observed on the following day that several red globules were apparent in the interior of their body, whence he drew the inference that the animalcules had swallowed the colouring substance; Gleichen also observed that the coloured globules were expelled by a distinct aperture. Gleichen figures these received red globules very correctly, and indeed each globule in the interior of a distinct circle, without stating anything respecting their design. Subsequently Prof. Ehrenberg repeated these observations, and thence concluded that the true Infusoria possess a larger or smaller number of stomachs, which in one group are destitute of intestinal canal, but in the other are connected with one another by peculiar extremities of the canal, nay sometimes exhibit laterally appended canals *en cul-de-sac*. In consequence of these discoveries the animalcules received the name of Polygastrica. M. Ehrenberg thought he observed that these stomachs are filled in regular succession, and he has even figured, more or less completely, in a number of animalcules of this kind, the intestinal canals

which are said to lie between the globular stomachs and to connect them one with the other.

These views of Dr. Ehrenberg on the digestive apparatus of the Infusoria have already been doubted in various quarters. I have never participated in them; in the first place, because I could never perceive these intestinal canals which are said to connect the various stomachs one with the other; and secondly, because many years ago I had observed in Infusoria of various genera that the supposed stomachs circulated with more or less rapidity in their interior, resembling exactly the rotatory currents of the globules in the cellules of the *Charæ*. Subsequently I frequently saw in *Vorticellæ*, when they had nine to fifteen large balls of indigo in their body, that these revolved constantly round a fixed central point, and thus evidently showed that in this case an intestinal canal connecting the stomachs and in connexion at one extremity with the oral and at the other extremity with the anal aperture could not exist.

What then, however, are those equally sized vesicles and globules which occur in the interior of animalcules and have been regarded as their stomachs? This question will be generally asked of me, and I have also put this question to myself, until by continued observation of this subject I have ascertained the origin of these globules and vesicles. The true Infusoria are vesicular animals, whose cavity is filled with a gelatinous, somewhat slimy substance; the consistence of the membrane forming the vesicle is in some of these creatures distinctly visible, and in several genera I have been able to observe in this membrane a spiral structure plainly recognisable, so that the structure of these Infusoria, in the main, appeared to me to resemble that of the cells of plants. In the larger Infusoria there proceeds from the mouth a cylindrical canal (alimentary canal) obliquely through the membrane which forms the animal; the lower end of this canal expands when it has taken up nutriment in a greater or less degree, generally, however, to the size of the globules which occur in the interior of these Infusoria. The inner surface of this portion of the alimentary canal is beset with cilia, by the motion of which the absorbed substances, both the nutritive sub-

stances and foreign ingredients, are forced round with an exceedingly great velocity, until they are compressed together into the form of a perfect sphere. During this formation of the globules, the stomach (for this organ can only be considered as such) is in free connexion with the alimentary canal, and by the outer ciliary apparatus new substances are continually driven into this canal and into the stomach; but whether the alimentary canal between the oral aperture and the stomach is also clothed with cilia I have not been able to ascertain with certainty. As soon as the globule of the absorbed substances has attained the size of the stomach, it is expelled at the other extremity, and forced into the cavity of the animalcule, immediately on which a new globule is formed within the stomach, if solid substances are present in the surrounding fluid; this second globule is also thrown into the cavity of the animalcule, and now pushes the first globule with the intervening slime further forwards, and thus the formation of similar globules from the absorbed substances is constantly going on. These are the globules from the number of which Dr. Ehrenberg inferred the great quantity of stomachs of these animals. If the surrounding fluid does not contain much solid matter, these globules are also less compact, and they then have the same appearance as we find them in Infusoria in common uncoloured infusions, where such a globule at times only exhibits a few small particles, and consists for the greater part of a slimy substance, with which these are mixed. At times two such globules are pressed in the interior of the body so forcibly together that they remain in this connexion.

If it is desired to observe the formation of these globules very distinctly, the observation should be commenced immediately on the Infusoria coming in contact with the coloured fluid. The reception of the coloured matter takes place very rapidly, frequently even in half a minute, and then it may easily be perceived how one coloured globule after the other passes from the stomach *perfectly formed*, and how in the *Paramæciæ*, *Keroniæ*, and *Vorticellæ* they are propelled downwards at the border of the cavity of the animal, and how then the new globule pushes the preceding one with the intervening slime forwards, so that the first soon ascends on the

inner border of the opposite side, turns round at the opposite end of the cavity, and is then again forced down on the other side; and thus the mass of the globules goes on continually increasing, until again some are expelled at the anus. The quantity of these globules is sometimes so great that the entire cavity of the animalcule is filled with them, and they lie so near to one another that all of them together form as it were a great ball, which frequently, especially in the *Vorticellæ*, revolves slowly round its centre. This rotatory motion is caused, however, as I have perfectly assured myself, by the force with which the globule newly formed in the stomach is propelled into the cavity, and hits against the under border of the existing ball. In other cases on the contrary, when so many globules are not yet present, this circular rotation is also seen, of which I have already made mention at the commencement; but it has not become clear to me by what external causes this motion is here produced.

In the true Infusoria, therefore, the substances which they take up are brought in form of globules into the cavity of the body, and here the nutritive substance is extracted from them; the useless passes off generally in the same globular form in which it entered, but sometimes the intervening slime is reabsorbed, and the particles of the globule already separate in the interior of the body, which, however, does not frequently happen.

But what then are those vesicular cavities which occur frequently in such great number, and also of very different sizes, in the interior of Infusoria? Stomachs they certainly are not; they have nothing to do with the absorbed globules just mentioned, although sometimes those globules penetrate singly into these cavities, which, however, must be regarded only as an accidental occurrence. The origin of these cavities, as also their *sudden and total disappearance* in the slimy substance in the interior of the Infusoria, may be observed with the same ease as the formation of the globules; nay, it is sometimes even possible to observe the formation of such a cavity around one of the absorbed globules, which then after some time again disappears. The microscope shows that these cavities have no distinct membranous sides, but consist in mere excavations of the slimy substance; they also occur

generally near the inner surface of the membrane which forms the coating of the animalcule, and at times some of them increase to a very considerable circumference, so that the cavity of such a bladder constitutes one-third and one-half of the cavity of the entire animalcule. That these cavities contain a thin and aqueous fluid and are not filled with air is shown by the remarkably small refraction of rays at their borders, and in the larger Infusoria it may be quite distinctly seen that they do *not open exteriorly*. Similar cavities are also formed in the mucus of the cells of plants, especially frequent in *Hypomycetes* growing in water.

My botanical researches prevent my working out this subject more fully; these brief notices may, however, suffice to induce a greater number of naturalists to follow up the observations, which it is true require great patience; for the above-mentioned facts are not to be seen immediately in every animalcule; but they are sufficiently important, for already have the Polygastrica passed into all recent works on zoology.

Prof. RYMER JONES on the *Digestive Apparatus of Infusoria**.

However imposing, from their completeness, the views of Ehrenberg concerning the digestive system of the Polygastrica may be, and sanctioned as they are by almost general consent, we cannot pass over a subject of so much importance without expressing ourselves as being far from admitting their accuracy in all respects, and we must say that our own observations upon the structure of the Polygastrica have led us to very different conclusions.

The positions of the mouth and anal aperture we are well assured, by frequent examination, to be such as are indicated by the illustrious Professor of Berlin; but with regard to the tube named by him intestine, and the stomachs appended thereto, our most patient and long-continued efforts have failed to detect the arrangement depicted in his drawings. In the first place, as regards the function of the sacculi, which he looks upon as the organs in which digestion is accomplished;

* Extracted from Prof. Rymer Jones's work entitled 'A General Outline of the Animal Kingdom.'

1839. "XII.—Some Observations on the Digestive Apparatus of Infusoria."

Annals of natural history 3, 100–105.

<https://doi.org/10.1080/03745483909443204>.

View This Item Online: <https://www.biodiversitylibrary.org/item/72071>

DOI: <https://doi.org/10.1080/03745483909443204>

Permalink: <https://www.biodiversitylibrary.org/partpdf/60723>

Holding Institution

University of Toronto - Gerstein Science Information Centre

Sponsored by

University of Toronto

Copyright & Reuse

Copyright Status: NOT_IN_COPYRIGHT

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.