

169322

THE
JOURNAL
OF
THE LINNEAN SOCIETY.

ZOOLOGY.

VOL. VIII.



LONDON:
SOLD AT THE SOCIETY'S APARTMENTS, BURLINGTON HOUSE;
AND BY
LONGMAN, GREEN, LONGMAN, ROBERTS & GREEN,
AND
WILLIAMS AND NORGATE.
1865.

PRINTED BY TAYLOR AND FRANCIS,
RED LION COURT, FLEET STREET.

JOURNAL

THE EASTERN UNIVERSITY

ADDRESS

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WILLIAMS AND BROTHERS



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JOURNAL OF THE PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON

On *Cygnus Passmori*, a supposed new American Swan.

By the Rev. W. HINCKS, F.L.S., Prof. Nat. Hist. Univ. of Toronto.

[Read January 21, 1864.]

MR. PASSMORE, taxidermist, of Toronto, who is an experienced and intelligent observer of the objects which his occupation brings under his notice, obtained a Swan during the last winter, which appeared to him so remarkable that he called my attention to it, and requested my opinion as to the species to which it belongs. On examining it with care, I came to the conclusion that it has not yet been described; and although the comparison of further specimens would be very desirable, I venture to lay the observations I have made before the Linnean Society, and to name the new species, from its discoverer, *Cygnus Passmori*.

I regret that I did not see the bird until after it had been prepared, when it was no longer possible to obtain all the measurements which I should wish to give; but as the sternum, with the trachea, was placed in my hands, and I had also two specimens of the same parts taken from the *Cygnus buccinator*, I find myself able to give abundantly sufficient characters, accompanied by an interesting correction of the labours of my predecessors.

The Swan which I now introduce to the notice of naturalists resembles in its general aspect *Cygnus buccinator* of Richardson,

having, like it, the beak, legs, and feet black, and a little colour on the plumage of the head and upper parts of the neck; but the new species, though our specimen is apparently a mature bird, is considerably lighter and smaller in size, and the colour is a light dirty grey, slightly tinged with ferruginous about the crown. The same grey tinge is also seen on the tips and inner webs of the quill-feathers of the wings. The prominence of the forehead between the eyes is subangular; and there is a difference, best expressed by a figure, in the course of the line bounding the beak from the eye to the opening of the mouth. In these remarks, I assume that the name *Cygnus buccinator* must continue to be given to the Great Northern Swan, our commonest species, which, from its peculiar cry, is popularly called the *Trumpeter*, notwithstanding that two species have been for a time included under the one name, and that it happens that the sternum and trachea communicated by Sir John Richardson to Mr. Yarrell, and by him described and figured in the 17th volume of the Society's 'Transactions' (pp. 1-4, tab. 1), appear to have belonged to a specimen of the new species, and the very remarkable corresponding parts of the true *Cygnus buccinator* remain, so far as I can ascertain, as yet undescribed. If I am right in conjecturing that the peculiarities to be pointed out in the trachea are immediately connected with the distinguishing cry of the bird which has given cause for the specific name, and in supposing that Sir J. Richardson's description was probably made from a true Trumpeter, though the trachea procured was obtained from one of a species then confounded with it—that at least the preserved specimen referred to by Mr. Yarrell in his description must have been a Trumpeter—I think I shall be justified in applying the received name to the bird to which it is most appropriate, and bestowing a new one on the smaller species now first distinguished. When, having carefully noted the wide difference between the sternum and trachea in the two species under comparison, I turned to Mr. Yarrell's figure already referred to, it was with no small surprise that I found it corresponded very nearly with what I took to be the trachea of the new species, instead of that of the true Trumpeter. My first impression was that wrong marks might have been affixed to the specimens, or that I might have confused them, although the comparative size made this improbable; but on consulting Mr. Passmore, he was able to remove all doubt by producing the sternum of a second Trumpeter, procured at the same time with that in my hands; and, being a female, its agreement with that previously

examined proved that the specimens were from the first rightly referred, and that, in fact, Mr. Yarrell's figure belongs to our new species, not to the true *C. buccinator* as we understand it. Comparing my sternum of *Cygnus Passmori* with Mr. Yarrell's figure and description, it appears that the bony protrusion at the anterior extremity of the inner face of the sternum is somewhat less solid and less compressed laterally in mine, and that the fold of the trachea within the hollow carina does not advance so far in mine as in Mr. Yarrell's, both which circumstances are explained by his bird being the older; but the resemblance is too close to admit a doubt of specific identity. I proceed, then, to describe the sternum and trachea of what I regard as the true *C. buccinator*. In this, as in the preceding case, the trachea descends without changing its course, passing between the branches of the furcula until it reaches the level of the carina, when it bends backwards and enters between the bony plates of the carina. Proceeding backwards and inwards, it rises above the level of the inner face of the sternum, making a wide bow, which is covered by the bone of the inner surface of the posterior portion of the sternum, as represented in Mr. Yarrell's figure of the sternum of *Cygnus Bewickii* (Transactions, vol. xvi. tab. 25. fig. 3) and in the accompanying drawings. But in *C. buccinator* the rise of the trachea from the carina is more sudden, so that there are very slight traces of a rising over its course until the commencement of the bow, which is also larger than it is represented in *C. Bewickii*: and the returning fold of the trachea, instead of immediately passing out as in *C. Bewickii*, rises into a protuberance at the anterior extremity of the sternum, of the same kind with that of *C. Passmori*; but, instead of rising only, as in that species, *to the level of* the vertical bone of the sternum, it rises *an inch above it*, with a decided inclination to the right side, looking forward. Within this extraordinary protuberance the trachea bends round, and, as it descends, comes out under the arch of the furcula, the exterior portion being manifestly enlarged, and having much broader rings, contracting again laterally as it approaches the bone of divarication (see fig. 8). The bronchiæ had been destroyed in both specimens of the sternum and trachea of *C. buccinator* before they came into my hands; but they are described as abruptly much swollen close to the bone of divarication, with the tubes shorter than in *Cygnus Passmori*. The figure of the sternum itself also seems to differ in the two species, the angular enlargements at each side of the anterior arch on the interior surface being much more dis-

tinct in *C. Passmori*, and the sinuses at each side of the posterior extremity, which are deep and well defined in *C. Passmori*, being very obscure in *C. buccinator*, as if the large swelling over the trachea interfered with them.

I add a few comparative measurements, and have endeavoured faithfully, though rudely, to represent by figures some points of comparison amongst the North American species of *Cygnus*.

The weight of *C. Passmori* was 18 lbs., whilst that of a medium specimen of *C. buccinator* which was compared with it was 30 lbs.

		inches.
The length, from the tip of the beak to the end of the tail, of	<i>C. Passmori</i>	51
	<i>C. buccinator</i>	60
Length of the head in the line of the meeting of the mandibles	<i>C. Passmori</i>	7 $\frac{1}{4}$
	<i>C. buccinator</i>	9 $\frac{1}{2}$
Back of the eye to tip of the beak	<i>C. Passmori</i>	5
	<i>C. buccinator</i>	5 $\frac{3}{4}$
Hind point of the nostril to tip of the beak	<i>C. Passmori</i>	2
	<i>C. buccinator</i>	3
Length of sternum	<i>C. Passmori</i>	8
	<i>C. buccinator</i>	8 $\frac{1}{2}$
Width near the posterior end	<i>C. Passmori</i>	4
	<i>C. buccinator</i>	4 $\frac{1}{2}$
Greatest width of the heart-shaped elevation on the posterior portion of the sternum in	<i>C. buccinator</i>	3 $\frac{1}{2}$
Length of the same		4

The value of some of these differences can only be determined by repeated trials, but they furnish materials not undeserving of notice.

I believe the ferruginous colour on the head and upper portion of the neck of *C. buccinator* is constant and very characteristic of the species, and it is probably more widely diffused and conspicuous in the younger birds; yet our smaller bird has scarcely any of the ferruginous tint, which is replaced by very pale grey, whilst the wing-feathers, which are pure white in *C. buccinator*, are tipped in *C. Passmori* with a faint fawn-colour. I have mentioned the angular forehead of *C. Passmori*; whilst that of *C. buccinator* has the prominence wider and curved, and in *C. Americanus* it is a much shallower and more open curve. I wish to observe this character in the fresh specimen, lest it should be in any degree affected by the taxidermist's proceedings; but I am disposed to confide in it.

In *C. Passmori* the naked black skin reaches the eye, but does not surround it as in *C. buccinator*, where a narrow black border encloses the eye.

In conclusion, I propose the following character for *C. Passmori* :

CYGNUS PASSMORI, *Hincks*. Albus, capite, cervice et pennarum extremitatibus pallide cinereis, rostro etuberculato et pedibus nigris, fronte subangulatim prominente, trachea intra carinæ parietes et sterni tumorem anteriorem uncialem flexa.

To Sir J. Richardson's character of *Cygnus buccinator* I propose to add:—

Fronte curvatim prominente, trachea intra parietes carinæ flexa, anfractum cordiformem paulum intumescens faciente parte posteriore sterni, tunc tumorem alterum biuncialem dextrorsum inclinatum parte anteriore.

The accompanying figure of the head and neck is taken from a photograph by Mr. Octavius Thompson, of Toronto, from the only specimen yet obtained of *Cygnus Passmori*; and I am indebted



for the drawings of the sternum of *Cygnus buccinator* to my friend Charles Fuller, Esq., of Toronto.

EXPLANATION OF THE FIGURES.

Fig. 1. Side view of the beak of *Cygnus Passmori*, natural size.

Fig. 2. Similar view of the beak of *Cygnus buccinator*.

Figs. 3, 4, & 5. Diagrams showing the different figure of the forehead in the three American species of Swan.

Fig. 1.

*Cygnus Passmori.*

Fig. 2.

*Cygnus buccinator.*

Fig. 3.

*C. Passmori.*

Fig. 4.

*C. buccinator.*

Fig. 5.

*C. Americanus.*

Fig. 6.

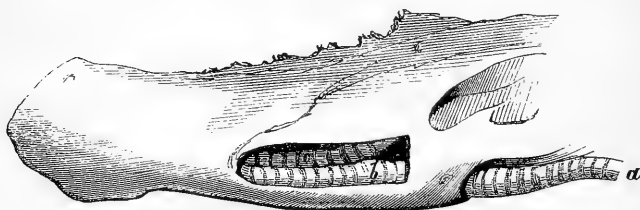


Fig. 7.

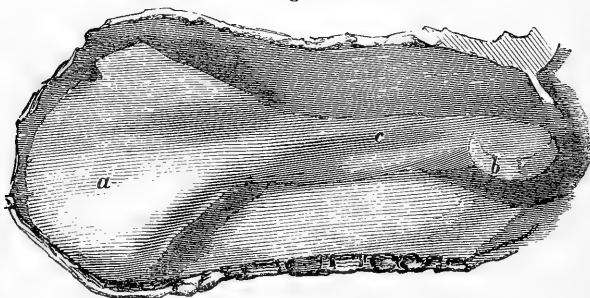


Fig. 8.

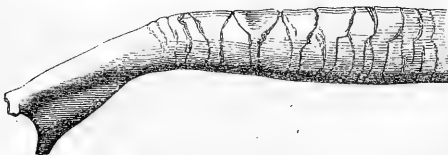


Fig. 6. Sternum of *Cygnus buccinator*, laid on its side ; a portion of the bone of the hollow carina being removed, to show the course of the trachea.

- a. The trachea entering the carina.
- b. The same, just reaching the place where it rises into the projection at the posterior part of the sternum.
- c. The trachea returning from the wide bow formed at the posterior part of the sternum, and bending upwards to enter the tumour after a flexure, within which it proceeds outward and upwards in the usual manner.

Fig. 7. Inner surface of the sternum of *Cygnus buccinator*, reduced to the proportion of three to five, showing

- a. The cordiform enlargement, formed by a horizontal flexure of the trachea, and raised half an inch from the general level of the sternum.
- b. The tumour at the anterior extremity of the sternum, rising two inches above the level, and one inch above the vertical bone, which the tumour in *C. Passmori* only equals in height.
- c. The course of the trachea manifested externally, but without any elevation, the part about c being on the level of the surface of the sternum.

The figure represents the sternum lying on its side, with the inner surface to the observer, the light coming from the posterior end.

Fig. 8. Upper portion of the trachea, with the bone of divarication, showing the broad rings and the mode in which they meet one another.

[Read May 5, 1864.]

Note.—The following is extracted from a letter received from Mr. Hincks since his paper was read:—

“ Toronto, April 10th, 1864.

“ During this winter I have made great efforts to obtain specimens throwing light upon the character of my supposed new species ; and though the season has not been very favourable for bringing Swans our way, I have succeeded in obtaining two young male Swans with the entirely black beak of *Cygnus buccinator*, whose sternum I have carefully examined. I take them both to be younger birds than those previously in my possession ; and I am in doubt whether, beginning with the younger, and placing our *C. Passmori* as part of the series, we have not a succession of degrees of development according to age, leading up to the condition of the trachea in what I have sent as the true *C. buccinator*. This supposition assumes that the trachea *extends with age*, that it enters the hollow carina of the sternum, and soon shows a tendency to a *double bend* ; that the pressure of the trachea on the bone of the sternum would modify *its (the bone's)* shape (as physiologists will readily acknowledge it might do), and

that the singular bony enlargements on the posterior face of the sternum and in the bumps or knobs at the sternal edge, as seen in the drawing sent, mark the ultimate development of the trachea; whilst the state of the trachea in the sternum sent by Sir John Richardson to Mr. Yarrell, and which I now assign to *C. Passmori*, may be a less advanced form of the same structure, and those I have since examined may be still younger forms of the same species.

"It may be, indeed, that the specimens since examined are younger specimens of *C. Passmori*, and that the true *C. buccinator* is less common, or at least a more northern form; but I think it right to indicate the doubt which I feel myself respecting the new species, leaving the facts for the consideration of better judges. I thought I followed excellent authority in considering such a difference in the trachea as a sufficient mark of a distinct species; but the facts will not be less interesting to ornithologists if they see reason for using such characters with greater caution in future. At present, I must leave the value of my distinctions as a subject for further inquiry, with as little wish to press an unnecessary specific name as to leave interesting facts unrecorded.

"W. HINCKS."

Description of a new British Annelide, belonging to the Tribe RUFACEA of Grube=*Annelida errantia* of Milne-Edwards. By W. BAIRD, M.D., F.L.S.

(Plate I.)

[Read April 21, 1864.]

Fam. NEREIDIDÆ.

Gen. HETERONEREIS.

HETERONEREIS SIGNATA, *Baird*. (Pl. I. figs. 1, 1 a-c.)

Char. Corpus pyramidatum, maculatum, dorso et ventre canaliculatum.

Segmenta 2^{ndum}, 3^{rtium}, 4^{tum} et 5^{ntum} brevissima; segmenta sexdecim sequentia magna, pedibus validis, simplicibus; segmenta partis posterioris corporis parva, confertim disposita, pedibus parvis, compositis; cirri pedum anteriorum simplices, non crenati.

Hab. Polperro, Cornwall; in fundo limoso. (Mus. Brit.)

The body of this Annelide (Pl. I. fig. 1) is nearly 3 inches long, consisting of about 106 segments. The anterior portion is

about one-third the whole length and is composed of 21 segments, the posterior containing 85. In form it tapers gradually from the head to the tail, which terminates in a blunt point without cirri. The dorsal surface is beautifully marked with dark-purple spots, which extend over the upper part of the feet, leaving a hollow space in the centre free from them. The anterior portion of the body is convex, the lower flattened. The segments of the anterior part are of considerable size, but those of the lower are small and very much crowded together. A canal runs down the ventral surface the whole length, while a similar one runs down the dorsal surface of the anterior portion only, beginning at the sixth or seventh segment and continuing to the twenty-first. The head is rather small; the first segment of the body of moderate size, and the four succeeding ones very narrow (fig. 1 *d*), the first nearly equalling the three following. The tentacular cirri are equal in length to about the four first segments. The feet of the anterior portion of the body (fig. 1 *a*) are all simple lobulated feet, without any foliaceous branchial lamina. The dorsal lobe is short, stout, and rounded at the apex, with a cirrus springing from near its root, about one-third longer than the lobe itself, and not crenated underneath. The ventral lobe is somewhat larger than the dorsal, and the cirrus attached to it is very short, not quite half the length of the lobe. The bristles attached to it are of two kinds: those especially attached to the lobe nearest the dorsal lobe (the superior fascicle) are all slender, compound, with a sharp-pointed smooth style inserted into a stouter cylindrical shaft which is slightly striated (*setæ spinosæ*). The bristles of the inferior branch are bifasciculate, and consist of one bundle composed of spinous bristles like those above described, and another composed of stouter and rather shorter setæ with a striated slightly bent cylindrical shaft cut obliquely at the tip, to which portion is articulated a short claw-like piece, quite smooth, and slightly bent at the apex (*setæ falcatae*). The aciculæ are stout and of a black colour. The posterior feet (fig. 1 *b*) are all much smaller than the anterior, but more complicated in structure. Above the base of the dorsal or superior lobe we find a compressed foliaceous lamella. The superior setiferous tubercle is also furnished with a similar lamina, but very large, extending across the middle lobes of the foot. The ventral cirrus has appended beneath its base another foliaceous lamina of about the same size as that attached to the dorsal lobe. The cirri of these lobes are rather short, that of the dorsal lobe being longer than

the lobe, while the ventral cirrus is shorter than its corresponding lobe. The bristles are of two kinds,—those of the setiferous tubercles being numerous, compound, and consisting of a flattened lancet-shaped blade, smooth and rather sharp-pointed, let into a somewhat cylindrical shaft which is striated half across (*setæ cultrate*) (fig. 1 c). Mixed with these are a few (about four or five) long and stout setæ of the falcate kind, but much longer and stronger than those of the anterior feet.

The species which approaches nearest to this is the *Heteronereis renalis* of Johnston=*H. arctica* of Oersted. It differs, however, in many respects. The relative size of the first and four succeeding segments, the colour and peculiar markings of the body, the canal running down the centre dorsally and ventrally, the number of anterior segments (in *renalis* or *arctica* being only twenty, while in this species there are twenty-one), the posterior portion of the body being more slender, and the tail destitute of cirri, the structure of the feet and cirri, &c.,—all separate it from that species.

The only specimen which I have seen was found by Mr. Laughrin at Polperro, Cornwall, in a muddy bottom, and is now in the national collection, British Museum.

Description of several new Species and Varieties of Tubicolous Annelides=Tribe LIMIVORA of Grube, in the Collection of the British Museum. By W. BAIRD, M.D., F.L.S.—PART I.

(Plate I.)

[Read April 21, 1864.]

IN the extensive collection of Annelides belonging to the British Museum, now in course of arrangement, there is a considerable number which appear to me to be undescribed. In many cases these are difficult to determine, from the fact that soft animals preserved in spirits do not always retain their form and consistence, or may be so hardened by the spirits as to offer great difficulties in making out the different parts. In the case of the Tubicolous Annelides, again, perhaps only the tubes or cases in which the animals dwell have been preserved, and thus it is almost impossible to refer them to their proper genera. As, however, notwithstanding these difficulties, we possess many

species which can be determined, it is my intention, from time to time, to offer to the Linnean Society, if approved of, descriptions of such species as appear to me new or worthy of particular attention.

Family SERPULIDÆ.

The genus *Serpula* of Linnæus, as established by the illustrious Swede, contained several species now known to belong to the genus *Vermetus*, a genus of mollusks. After these were withdrawn, there still remained many forms of shelly tubes which, though bearing a general resemblance to each other, were difficult to be arranged under one single genus. The animals, however, the architects of these tubes, after a time began to be a little more studied; and thus Lamarck, Blainville, Savigny, and some other naturalists were enabled to construct, upon good grounds, several genera to contain what might otherwise have been considered similar forms. The last author who has paid particular attention to this Linnean genus is Dr. A. Philippi. His subdivisions of *Serpula* are founded upon a character which has been discovered by malacologists to be of great value in the class Mollusca. The animals of the greater number of the species of *Serpula* which have been described possess a similar organ to that which characterizes so many of the Gasteropodous Mollusca. This is the operculum, which varies considerably in structure in the different species, and which thus forms an excellent character for dividing them into genera. As Philippi justly observes, "this character has, moreover, the advantage that it may still be frequently observed in dried specimens preserved in museums."

Little dependence can be placed on the *shelly tube* alone in distinguishing the species or even the genera: thus we find a similar shell possessed by two or three different Annelides belonging to two or three distinct genera; for, as Philippi remarks in his paper*, "the shells of *Serpula triquetra*, *Vermilia triquetra*, and *Pomatoceros tricuspis* are difficult to distinguish without the animals."

The structure of the operculum is far more varied, indeed, than it had been hitherto supposed to be; and I think Dr. Philippi has done good service to the students of this group of Annelides by so carefully distinguishing the structure of this appendage. It is owing to the fact mentioned above (that the operculum frequently

* Wiegmann's Archiv for 1844, Band i. p. 186. Translated into English by Dr. Francis, in Ann. & Mag. of Nat. Hist. 1844, vol. xiv. p. 153-162.

remains behind in dried specimens), that I have been enabled to add some new species, belonging to the national collection, not hitherto described. The number of genera characterized by Philippi belonging to the Serpulidæ is ten, and the species enumerated by him as occurring in the Mediterranean alone are twenty-five. Various other exotic species have been described at different times, and to these I now propose adding several more.

Genus *EUPOMATUS*, *Philippi* *.

1. *EUPOMATUS BOLTONI*, Baird. (Pl. I. figs. 2, 2*a*, *b*.)

Char. Animal (operculo excepto) ignotum. Operculum corneum, infundibuliforme, margine externo dense crenato, interne cuspidibus calcareis viginti dentatis instructum. Testa rubra, triquetra, adhærens, transversim rugosa, dorso canaliculata.

Hab. Nova Zelandia. (Mus. Brit.)

This is a fine species of the family Serpulidæ, of which, however, we have as yet only received the shelly tube and the operculum of the animal. In our national collection we possess three good specimens of the shell and three specimens of the operculum. This portion of the animal is large, and by means of it we can distinctly refer the species to the genus *Eupomatus* of Philippi. It is rounded, slightly funnel-shaped, and of a horny texture (Pl. I. fig. 2*a*). Externally the margin is densely crenated—the crenations being about eighty-eight or ninety in number, and tooth-like. Internally it is provided with a considerable number (about twenty) of hard, flattened, calcareous spikes (or, as Philippi elsewhere calls them, horns, *cornua*), rising up from the centre and strongly dentate—these teeth being four or five in number, stout, rather blunt, and arranged on one side only (fig. 2*b*). The spike itself terminates in a claw-shaped sharp point, slightly curved at the extremity. These spikes bear altogether an exact resemblance to the toothed extremity of the large claw of a lobster. The tube, in all the specimens which I have seen, is found attached to, and creeping on, dead shells (fig. 2). In one specimen, which, however, is not quite perfect at the posterior extremity, it is about three inches in length. It is of a red colour, triquetrous where attached, but round at the anterior ex-

* The genus *Eupomatus* was constituted by Philippi to receive those species of *Serpula* that had the operculum furnished on the upper side, in the centre, with a certain number of moveable spikes. The operculum, he says, is horny, and in the Mediterranean species these spikes are horny also; but this latter character does not hold good in all the other species which have been described.

tremity or mouth when the tube raises itself up from the shell upon which it creeps, is corrugated transversely (the striæ of growth?), and is marked with a large, distinct canal or furrow, running along the dorsal surface throughout its whole length.

Of the three specimens we possess, one, the largest, is attached to part of the shell of *Haliotis australis*, another to a fragment of a species of *Mastra*, and the third is coiled round a species of *Elenchus*.

They were all collected in New Zealand by Lieut.-Col. Bolton, R.E., to whom I have dedicated the species.

Genus *PLACOSTEGUS* *, *Philippi*.

2. *PLACOSTEGUS CARINIFERUS*, *Gray* (sp.), *Baird*.

Numerous specimens of this species of Annelide were brought at different times from New Zealand, and deposited in the national collection, by the late lamented Dr. Andrew Sinclair, R.N., Lieut.-Col. Bolton, R.E., the late Captain Sir Everard Home, Bart., and His Excellency Governor Sir George Grey.

The tube or shell was briefly described by Dr. Gray in 1843, in the 'Fauna of New Zealand' appended to Dr. Dieffenbach's 'Travels in New Zealand.' As only the operculum was known at that time to Dr. Gray, and as that resembles very much in form the operculum of the molluscous genus of shells "*Vermetus*," he described it under the name of *Vermetus cariniferus*. A similar, and, I believe, the identical species has since that time been described and the animal figured by Schmarda, in his 'Neue wirbellose Thiere,' 1861, under the name of *Placostegus cœruleus*. My chief object in this brief notice is to give a few more particulars with regard to this species, to correct the synonymy, and to restore the specific name attached to it originally by Dr. Gray. I wish also particularly to bring before the notice of the Society the fact that the animal gives out a beautiful dye or colour. The specimens which were the subjects of my examination had been for a number of years in the British Museum, some having been placed there in 1845, and others in 1847. Notwithstanding their having been so long dry, when softened in water, taken out of the tubes, and placed in spirits of wine, they imparted to the

* The genus *Placostegus* was constituted by Philippi to contain those species of *Serpula* which have a calcareous operculum (approaching very nearly in form to that of some of the Gasteropodous Mollusca) in the shape of a shallow disk, entire at the margin.

liquid a beautiful and delicate red tint. The whole animal is of a fine blue colour, and the elegant tuft of branchial filaments intensely azure banded with white. In describing the tube of this species of Annelide in 1843, Dr. Gray had only one or two specimens to describe from, as the other specimens, which are now in the Collection of the British Museum, arrived long after that description was drawn up. He says, "the shell is thick, irregularly twisted, opaque white, with a high compressed wavy keel along the upper edge; mouth orbicular, with a tooth above it, formed by the keel. Operculum orbicular, horny." In the collection there are two or three specimens which occur single, and were found creeping on dead shells. To these this description applies very well; but, in addition to those, we have various specimens collected together into large masses nearly the size of a small human head, and consisting of several thousands of tubes twisted and twined together. In the generality of these we see the keel, mentioned by Dr. Gray as "high," "compressed," and forming "a tooth" at its extremity, becoming double as it were at a certain distance from the mouth of the tube, diverging a little from each other, the surface of the tube between the two keels being raised to the same height as the tube, and thus forming a rather broad flat tooth or strap which projects considerably beyond the circular rim of the mouth. In many specimens this tooth is sharp-pointed, but in others it is blunt and rounded at the point.

Schmarda asserts that the species described by him is also a native of the Cape of Good Hope. His description applies better to the New Zealand specimens than to those from the Cape, and I was led at first to separate the two as distinct species. A more careful examination, however, of all the specimens we possess from both these habitats, has now induced me to consider those from the Cape of Good Hope to be only a variety of the other. Several specimens of this variety, occurring in large masses of some thousands of tubes clustered together, were collected by Dr. Krauss many years ago at the Cape of Good Hope, and are now in the Collection of the British Museum.

This variety I have named

PLACOSTEGUS CARINIFERUS, var. *Kraussii*;

and I here append a more detailed description of it.

Char. Animal *Placostego carinifero* valde simile, sed minus intense cæruleum. Branchiæ pallide cæruleæ, albo-fasciataæ, filamentis circiter viginti et sex, uno latere plumosis. Setæ pedum longæ, numerosæ,

simplices, ad finem curvatæ. Tubuli repentes, in massam magnam glomerati, dorso plane carinati, ligula plana, os supra extensa terminati.

Hab. Promontorio Bonæ Spei. (Mus. Brit.)

The animal differs from that of the specimens from New Zealand in being less deeply coloured, and perhaps being longer in proportion to the size of the tube. This is smaller, and the dorsal keel is perhaps rather flatter and less sharp-pointed at its extremity. The two sets of specimens, however, agree in this particular, that the animals, when softened in water and then immersed in spirits of wine, impart to the liquid the same beautiful red colour, though, as may be supposed from the animal being less deeply coloured, those from the Cape of Good Hope give out a slightly fainter hue.

3. *PLACOSTEGUS LATILIGULATUS*, Baird. (Pl. I. figs. 3, 3a, b.)

Char. Animal *Placostego carinifero* simile. Color corporis fuscus. Branchiæ albæ, cæruleo fasciatæ. Operculum calcareum, circulare, concavum, cæruleum. Tubuli repentes, flexuosi, dorso late carinati, carina in latam ligulam, supra os extensam desinens. Os interne cæruleum.

Hab. — ? (Mus. Brit.)

Only one mass, consisting of about 100 or more tubes, is in the possession of the Museum, and no history is attached to the specimen. The animal, softened in water and taken out of the tube, as far as can be ascertained from the imperfect state of the specimens, is very similar in appearance to the animal of the *Placostegus cariniferus*. It is about the same size as those taken from the var. *Kraussii*, from the Cape of Good Hope, but differs a good deal in colour. The body of the animal is of a fuscous-brown colour, the branchial filaments white, banded with blue, and the operculum is of an azure hue. The tubes are broad, clustered together, and creeping in a very flexuous manner; they are of a bluish colour, the mouth of the tube deeply so, and the flat dorsal keel is somewhat of the same hue. The tube itself and the keel which runs along the back are broad, the latter part especially so at its extremity, where it terminates in a flat, strap-like tooth or sort of hood which extends some way beyond the rounded mouth (fig. 3 b). The surface throughout is much wrinkled, and the whole tube presents an irregular form of growth.

We have no history attached to this specimen; and were it not that the animals in some of the tubes still exist, the mass might be taken for a group of fossil tubes.

4. *PLACOSTEGUS GRAYI*, Baird. (Pl. I. figs. 4, 4a, b.)

Char. Animal, operculo excepto, ignotum. Operculum corneum?, circulare, concavum. Tubuli flexuose repentes, depressi, valde rugosi, dorso late carinati, carina haud in ligulam os supra extensam desinens.

Hab. —? (Mus. Brit.)

The only specimens we possess in the collection of the British Museum are a few tubes creeping on a stone. The operculum was found in two or three of the tubes, and, unlike the others belonging to the genus *Placostegus*, appears to be horny, of a circular form, and hollow or concave on its upper surface. The tubes are flexuose, very rugose, and possess, like the last-described species (*P. latiligulatus*), a rather broad flat keel along the back of the shell. This keel is very rugose or wrinkled, and does not extend beyond the mouth of the tube, which is quite circular (fig. 4 b). The form of the tube is very irregular, and in several specimens at the larger extremity it is cemented as it were by a smooth, hard calcareous secretion to the stone to which it is attached. The specimens were presented many years ago to the Museum by Dr. Gray, whose name I have attached to the species.

EXPLANATION OF PLATE I.

- Fig. 1. *Heteronereis signata*, natural size; 1 a, one of anterior feet; 1 b, one of posterior feet; 1 c, seta of ditto; 1 d, head and 8 first segments of body: all magnified.
- Fig. 2. *Eupomatus Boltoni*, natural size, on *Haliotis*; 2 a, operculum of ditto; 2 b, one of the spikes of ditto: both magnified.
- Fig. 3. *Placostegus latiligulatus*, nat. size; 3 a, operculum of ditto: magnified; 3 b, extremity of tube, nat. size.
- Fig. 4. *Placostegus Grayi*, nat. size; 4 a, operculum of ditto: magnified; 4 b, extremity of tube, nat. size.

PART II.

(Plate II.)

[Read June 2, 1864.]

Genus CYMOSPIRA, Savigny.

Amongst the tubicolous Annelides belonging to the family Serpulidæ, the genus *Cymospira* of Savigny is remarkable. The branchiæ are described by Pallas and others as being very beautiful when seen in the living animal, and are rolled into spires of several turns. The operculum consists of a somewhat horny, elliptical, shallow plate, which supports two or more dentated horns or processes, generally near its hinder margin. The tubes of all the known species, of which only three or four have been described, burrow into or are attached to masses of Madrepore

in the seas of the West Indies. In the collection of Annelides belonging to the British Museum we possess several additional species, found inhabiting coral in other parts of the world. One of these was found on a coral reef in the Arabian Gulf, and, in the structure of the operculum, &c., materially differs from all that have been previously described. The following is its description:—

5. *CYMOSPIRA TRICORNIS*, *Baird*. (Pl. II. fig. 1, operculum.)

Branchiæ in spiras quinque convolutæ. Operculum magnum, cornibus tribus dentatis armatum.

The branchiæ are disposed in five whorls. The filaments are densely plumose on one side and are of moderate length. The operculigerous filament is thick and fleshy. The operculum is large, nearly flat on the upper surface, and is armed with three stout, irregularly-toothed horns. The collar is large and fleshy. The spines of the thoracic segments are stout, rather short, and yellowish-coloured. The abdominal portion of the body is about 2 inches long, smooth on the ventral surface with the exception of a few longitudinal strong striæ, and strongly and densely striated across on the dorsal surface. The tube in which this annelide dwells is large, nearly as thick as a man's little finger, but so covered with coral deposit that it is very difficult to ascertain its form. We possess in the British Museum only two specimens of this animal, one of them being partly contained in a fragment of its tube. The mouth of this tube seems to be nearly round; but the rest of it is so covered with madreporæ, in a mass of which it had apparently burrowed, that nothing more can be seen of its structure.

The whole animal is fully 3 inches long, tapered somewhat towards the tail, and about the centre of the body is nearly 4 lines in diameter.

Hab. Djedda, in coral reef. From the Collection of Mr. Metcalf. (Brit. Mus.)

6. *CYMOSPIRA BRACHYCERA*, *Baird*. (Pl. II. fig. 2, operculum.)

Branchiæ in spiras quinque convolutæ. Operculum magnum, cornibus duobus brevissimis irregulariter dentatis armatum.

Amongst the numerous objects of natural history collected during the surveying-voyage of H. M. S. 'Fly' by Mr. Jukes, Naturalist to the Expedition, and transmitted by him to the British Museum, are two specimens from Swain's Reefs, on the east coast of Australia, of the "animals of tubes that bore into

coral." Neither the tubes themselves, nor fragments of the coral containing them, were secured; but as no doubt the former, like the other known species, would be completely immersed in and incrustated by the latter, little information could be obtained from them.

The branchiæ are coiled round in five spires. The filaments are of moderate length, and plumose on one side. The collar is rather thin and membranous. The operculigerous filament is thick and fleshy, and the operculum itself is large, of an oval form, and armed on its slightly concave surface with two very short and irregularly-toothed horns. The thoracic portion of the body is short and rather square-shaped, with a free margin on each side and on the lower edge; and the setæ of the feet are rather short and bright yellow. The abdominal portion is strongly and densely striated across. The entire length of the animal is about 3 inches (in spirits).

Hab. East coast of Australia. (Brit. Mus.)

The way in which these animals were seen and collected is thus described by Mr. Jukes in his Narrative of the voyage:—"A block of coral rock that was brought up by a fish-hook from the bottom at one of our anchorages was interesting from the vast variety and abundance of animal life there was about it. It was a mere worn, dead fragment; but its surface was covered with brown, crimson, and yellow nulliporæ, many small actiniæ and soft branching corallines, sheets of flustra and eschara, and delicate reteporæ, looking like beautiful lacework carved in ivory. There were several small sponges and alcyonia, sea-weeds of two or three species, two species of comatula and one of ophiura of the most delicate colours and markings, and many small, flat, round corals, something like nummulites in external appearance. On breaking into the block, boring shells of several species were found buried in it; *tubes formed by Annelida* pierced it in all directions, many still containing their inhabitants, while two or three worms, or nereis, lay twisted in and out among its hollows and recesses, in which, likewise, were three small species of crabs. This block was not above a foot in diameter, and was a perfect museum in itself, while its outside glared with beauty from the many brightly and variously coloured animals and plants. It was by no means a solitary instance; every block that could be procured from the bottom, in from 10 to 20 fathoms, was like it. What an inconceivable amount of animal life must be here scattered over the bottom of the sea, to say nothing of that moving

through its waters, and this through spaces of hundreds of miles! Every corner and crevice, every point occupied by living beings, which, as they become more minute, increase in tenfold abundance." (p. 17.)

In the same collection of Annelides we possess specimens of a tube imbedded in madrepora collected by Mr. John MacGillivray from the coral reef of the island of Totoga, one of the Fiji group. From its appearance and habitat I consider it to belong to the same genus as the last, and propose naming it.

7. CYMOSPIRA MACGILLIVRAYI. (Pl. II. fig. 3, mouth of tube.)

Only the mouth of the tube is distinctly seen, the remainder being imbedded in and completely incrustated by the substance of the madrepora. The mouth of the tube is round, smooth internally but of a dark colour tinged with red, and at the upper edge is strongly marked with the projecting point of a keel, which most probably runs along the dorsal surface of the tube. This projecting point is somewhat tongue-shaped, of a smooth surface and a reddish colour, and reflected a little upwards and backwards.

It is to be regretted that the specimens we possess are so few in number, and the fragments of the madrepora which contain the tubes so small that it is impossible to ascertain the length of the tube. The circumference of the mouth of the largest specimen is fully $\frac{5}{8}$ ths of an inch.

Hab. Coral reef of Totoga, Fiji Islands. (Brit. Mus.)

GENUS POMATOSTEGUS, *Schmarda*.

When Philippi reconstructed the family Serpulidæ, taking the structure of the operculum as one of his chief generic characters, only two species of the genus *Cymospira* had then been described. One of these, the type of the genus, was the *Serpula gigantea* of Pallas, = the *Terebella bicornis* of Abildgaard, distinguished by its having an operculum consisting of an elliptical shallow plate armed with two ramified horns. The other was the *Terebella stellata* of Abildgaard, distinguished by the operculum being as it were multiplied, or raised up in three different floors or stories united to each other by a central column. Following up the subdivisions of Philippi founded on the operculum as a character, Schmarda has since founded a new genus for this latter annelide, which he has called *Pomatostegus*, and has described two new species from the coral reefs of Jamaica. The worm which I have now to describe belongs to this genus, but is a native of the seas

of Australia. A single specimen was added to our collection about eight or nine months ago by Dr. Bowerbank, but no tube was collected, nor have we any further information about it.

8. POMATOSTEGUS BOWERBANKI, *Baird*. (Pl. II. figs. 4 & 5, operculum.)

Branchiæ curtæ, in spiram unam et dimidiam convolutæ. Opercula quatuor, versus apicem decrescentia, inarmata.

The branchiæ are rather short, the filaments plumose on one side only. Operculigerous lobe thick and fleshy. Operculum consisting of four stories united by a common central column, and densely covered with a rough coat of short hairs or filaments of a fibrous substance. These opercula diminish in size as they ascend, the last being very small and not armed with any spines or horns. Collar small. Thoracic portion of body short, square-shaped. Bristles of feet rather long and of a yellowish colour. Abdominal portion of body gradually tapering to the extremity, and striated across, the striæ wide apart. It is of a reddish-brown colour. The total length is $2\frac{1}{2}$ inches.

Hab. Seas of Australia. (Brit. Mus.)

Genus SERPULA, as restricted by *Philippi*.

Taking the operculum as his principal character, *Philippi* restricts the old genus *Serpula* to those species which are distinguished by having the operculum of a horny substance, in the form of a rather shallow or funnel-shaped plate, the concave disk crenate on the margin, radiately grooved above, and supported on a subconical fleshy petiole. This organ is in many species of a beautiful shape, and, having in some instances a vitreous look, might, as Dr. Johnston well observes, "make an elegant pattern for a wineglass."

The species hitherto enumerated have been confined to the European fauna: I am not aware, at least, of any that have been described from any other part of the world; and *Schmarda*, who is amongst the latest authors that have paid attention to exotic Annelides, remarks that, however common they are in the Mediterranean, he has not found one exotic species. It is with much pleasure, therefore, that I dedicate the following, from Australia, to Mr. Jukes, to whom the British Museum is indebted for the specimen.

9. SERPULA JUKESII, *Baird*. (Pl. II. fig. 6, operculum.)

Branchiæ in spiram unam convolutæ, lacteæ, filamentis dorso canalicu-

latis. Operculum et filamentum operculigerum alba. Operculum profunde infundibulatum, multicrenatum. Tubus teres, solidus.

A single specimen of this species of the restricted genus *Serpula* was taken by Mr. Jukes, during the voyage of the 'Fly,' on the coast of Australia. The branchiæ are rolled up in a single spire, and are of a dull milk-white colour; the filaments are about thirty-four in number on each side, and on the dorsal surface are pretty deeply grooved or channelled. The operculum is deeply infundibuliform, of a white colour, the edge indented with numerous close-set crenations, the grooves extending down along the whole length of the outer surface. The body of the animal tapers towards the extremity, and is of a dull reddish colour and strongly striated across. The total length of the animal is about $1\frac{1}{2}$ inch, the breadth about $1\frac{1}{2}$ line. Only a fragment of the tube in which the worm lives was preserved. It is perfectly cylindrical, without any keel or striæ, is thick and solid, and of a white colour externally.

Hab. Seas of Australia. (Brit. Mus.)

10. SERPULA NARCONENSIS, *Baird*. (Pl. II. figs. 7 & 8, operculum.)

Branchiæ in spiram unam convolutæ. Operculum lacteum, minime profundum, dense crenatum; petiolum operculigerum gracile, prope finem nodosum.

This is a small species collected at Narcon Island during Captain Sir J. Ross's Antarctic exploring expedition; and only one specimen, without the tube, was procured. The chief character which marks the species is the form of the operculum. This is a white, rather shallow disk, elegantly formed, beautifully multicrenate on the margin, and radiately grooved on its upper surface internally as well as externally. The pedicle which supports it is slender, and terminates near the summit in a rounded knob, upon which the operculum is seated, being attached to it by a short stalk, which appears like a moveable joint. There is nothing particular in the form or characters of the body, except that it is short and stout, measuring in total length, including branchiæ and operculum, about 10 lines.

Hab. Narcon Island. (Brit. Mus.)

11. SERPULA ZELANDICA, *Baird*. (Pl. II. fig. 9, operculum.)

Animal, operculo excepto, ignotum. Operculum album, parvum, minime profundum, margine crenis viginti ornatum. Tubus gracilis, albus, repens, fere rotundus, carina longitudinali parva in dorso signatus; transversim flexuose striatus.

Several specimens of this small species of *Serpula* are in the collection of the Museum, the slender tubes creeping on fragments of old oyster-shells. The operculum is the only part of the animal preserved, as the specimens were transmitted in a dry state. Like that of the other known species of true *Serpula*, it is finely crenated on the margin. The crenæ are twenty in number, but the grooves externally are confined to the surface of the disk itself, and are not extended to the pedicel or stalk. The tube is slender, nearly round, with only a slight keel running longitudinally along its dorsal surface. It is white, the mouth is nearly circular, and the shell itself is strongly marked along its whole length with transverse flexuous striæ which encircle it.

The specimens in the collection are grouped together on the old oyster-shell, and mixed up with numerous specimens of zoophytes, *Alcyonia* &c. Most of them are more or less incrustated with these substances. Length of the tube about 16 lines; circumference about 1 line.

Hab. New Zealand. (Brit. Mus.)

EXPLANATION OF PLATE II.

- Fig. 1. *Cymospira tricornis*, operculum.
 2. *C. brachycera*, operculum.
 3. *C. MacGillivrayi*, mouth of tube, in coral.
 4, 5. *Pomatostegus Bowerbanki*, operculum.
 6. *Serpula Jukesii*, operculum.
 7, 8. *S. Narconensis*, operculum.
 9. *S. Zelandica*, operculum.
 10. *Eupomatus Boltoni*, operculum.
 11. *Galeolaria decumbens*, operculum.

Note on *Cœnurus*. By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S.,
 Lecturer on Comparative Anatomy at the Middlesex Hospital.

[Read May 5, 1864.]

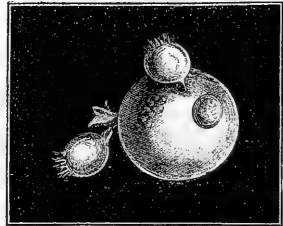
I BEG to call the attention of the Society to a specimen of *Cœnurus* obtained from the viscera of an American Squirrel which died at the Zoological Gardens, Regent's Park, several years back. In doing so, my object is partly to correct the opinion, still very generally held, that there is only one kind of *Cœnurus*, and partly, also, to point out the time when the existence of a second kind of *Cœnurus* was first demonstrated, and by whom, likewise, the discovery was made. When, in January 1859, I described to the Society a large *Cœnurus* obtained from the viscera of a Madagascar Lemur, I carefully abstained from theorizing on the subject,

but I never entertained any doubt as to its distinctness from the ordinary *Cœnurus cerebralis* of the Sheep. I refrained also from giving it any specific title, on the ground that it was only a larval parasite. Shortly afterwards, Leuckart, in one of his able 'Reports' in Wiegmann's Archiv (for 1860, S. 140), made special allusion to the description and figure as given in the Society's 'Transactions,' and at the same time referred to a case by Baillet who had recently discovered a Cœnurus in the pectoral muscle of a rabbit; he also quotes a similar example by Eichler, who had found a Cœnurus in the subdermal cellular tissue of a sheep. Until recently, I must confess that I was not aware that the discovery of a second kind of Cœnurus dated even much earlier than the period here mentioned, and I doubt if even Leuckart is yet aware of the earliest record on the subject. A few weeks ago, Mr. Caleb B. Rose, now of Great Yarmouth, but formerly of Swaffham, Norfolk, called my attention to the circumstance that he had described Cœnuri from the rabbit so far back as the year 1833. He had, indeed, mentioned the fact to me at the Cambridge meeting of the British Association, two years ago, but I could not, at that time, look fully into the matter. I further understood that Prof. Owen had doubted the correctness of Mr. Rose's interpretation of the facts observed. On comparing the facts as described in the original paper (published in the London Medical Gazette for November 9, 1833) with those observed by myself in the Cœnurus of the Lemur, and with those observable in the specimens now before the Society, I have no hesitation in saying that not only does a third kind of Cœnurus exist, but the priority of the discovery of the second kind of Cœnurus is due to Mr. Rose. How many kinds of Cœnuri may yet turn up, and how many specific tapeworm-forms they collectively represent, it is impossible to say; but my own examinations of, at least, three kinds of Cœnuri have led me to believe that they represent three separate species of *Tenia*. Proof on this score can only be obtained by future breeding-experiments. The study of Mr. Rose's paper further led me to look into Numan's elaborate Dutch memoir ("Over den Veelkop-blaasworm der Hersenen"), in which I find he has made frequent reference to Mr. Rose's paper, as well as to the earlier writings of Owen, Gulliver, Busk, Goodsir, and other English authors. As regards the Cœnurus in question, he merely gives the facts recorded by Mr. Rose; but he notifies the interesting circumstance that a veterinary surgeon of Burgau, Engelmeyer by name, has also found a

Cœnurus in the liver of a cat. Numan says *the* Cœnurus (“De Vee-arts wil *den* *Veelkop* gevonden hebben”), by which expression, as also by others elsewhere given, I conclude that the existence of a second, specifically distinct form of Cœnurus never once entered his mind. Be that as it may, he has done full justice to Mr. Rose and other English writers who have investigated the structure and economy of the hydatids and their allies.

From a microscopic examination of the specimens of the Cœnuri from the Squirrel, it would seem that these last undescribed polycephalous bladder-worms represent a kind of intermediate type between the ordinary brain-Cœnurus and Echinococcus properly so called. At all events, in place of separate heads (scoleces) in groups irregularly massed together as in *Cœnurus*, I find bundles of heads, so to speak, forming small nodules, which are often arranged in a linear manner. There is, on the other hand, no evidence of a true brood-capsule, such as we find in *Echinococcus*; but the formation of daughter vesicles, by the exogenous method of budding, reminds one of the ordinary mode of development seen in the hydatids derived from *Tœnia echinococcus*. There are some other minute points, on which I am not at present prepared to dwell; these may reasonably stand over for future investigation. The little drawing, of which the woodcut is a copy, lent by Mr. Rose, and representing his Cœnurus (called *C. cuniculi* in his MS., but not so named in his published papers), is not unlike some of the Cœnuri from the American Squirrel, and it is not improbable that it may represent the larval condition of one and the same *Tœnia*.

What species of *Tœnia* this may happen to be I do not care to conjecture, but I think it may be safely affirmed that it is not the *Tœnia cœnurus* of authors.



A moderate-sized *Cœnurus cuniculi*, with daughter vesicles proliferating externally.—ROSE.

CORYNODINORUM RECENSIO. By the REV. T. A. MARSHALL.

Communicated by the REV. HAMLET CLARK, F.L.S.

[Read April 21, 1864.]

THE following pages are the result of much investigation as to the published works of authors, and several weeks of careful examination as regards the material at my disposal. I propose in

them to deal with a small subfamily of the Eumolpidæ, at once singularly beautiful in form, and singularly difficult from the similarity of their structure. The former consideration will explain why they were willingly selected as the subject of study, the latter why the results of that study have been so long delayed. The pleasure of the hours that I have spent in the work I owe to the kindness of my friend the Rev. Hamlet Clark, who not only placed at my entire disposal the whole of his rich collection, but has incessantly laboured, and not without success, to inspire me with a portion of his own ardour for the study of the Phytophaga.

Mr. Clark's collection comprises nearly every described form (so far as I have been enabled to discover them) of the present limited subfamily, and, besides these, a great number of novelties which it is the object of the following pages to describe. I ought to add that, in selecting this section of the Eumolpidæ (the genera *Corynodes*, *Chrysochus*, and their affinities) as the first subject for publication, I was much influenced by the kind suggestion of J. S. Baly, Esq., of Kentish Town, that I should turn my attention to these special forms. I willingly concurred in his views, and began at once to devote some leisure time to the subject which he had been good enough to mark out for me. I did so the more readily as that gentleman has himself published excellent papers on the Eumolpidæ, and common courtesy (which debars every student from intruding willingly upon the labours of others) demanded the selection of a group far removed from the present sphere of his occupation. Fortunately, or unfortunately (according to taste), the unoccupied ground is so extensive, that a dozen or more entomologists might well enter upon separate allotments, without much fear of committing a trespass upon their neighbours'.

On the CORYNODINA, a Subfamily of the EUMOLPIDÆ.

The two genera *Corynodes* and *Chrysochus*, as they now stand in collections, comprise one of the most strongly marked, as well as one of the most beautiful subfamilies of the Eumolpidæ. The characters presented by the large flattened club of the antennæ, the cylindrical thorax, and the vertical head, invisible from above, are such as immediately strike the eye; while the splendid hues which adorn the species, as well as the interesting considerations arising from their geographical distribution, cannot fail in a lively manner to impress the imagination.

The number of species is now considerable; and as they present

several modifications of the typical form, which render their further subdivision necessary, it is intended in the following paper to propose a few sections, in which their mutual relations may be more adequately expressed. We shall also be enabled, through the kindness of the Rev. Hamlet Clark, to register for the first time many species hitherto unnamed, or only provisionally placed in collections under the MS. names of Dejean and others, as well as some of the nondescript rarities brought from the islands of the far East by Mr. Wallace.

A few words upon the literature of the group, comprising their history up to the present time, will not be considered out of place. One species only appears to have been known to Linné, *Chrysochares* (*Chrysochus*) *Asiaticus*, which was placed by him in the great genus *Chrysomela*. Fabricius first described some forms of the genus *Corynodes* or *Platycorynus*, arranging them in his earlier works under *Cryptocephalus*, and in the 'Systema Eleutheratorum' under *Eumolpus*. The seven Fabrician species are as follows:—

<i>Eumolpus nitidus</i> (<i>Corynodes</i> , <i>Hope</i>)	Siam ; Malabar.
— <i>Asiaticus</i> , <i>Linn.</i> (<i>Chrysochares</i> , <i>Moravitz</i>)	S. Russia.
— <i>cyaneus</i> (<i>Corynodes</i>)	W. Africa.
— <i>pretiosus</i> (<i>Chrysochus</i> , <i>Redt.</i>)	Europe.
— <i>auratus</i> (<i>Chrysochus</i>)	United States.
— <i>compressicornis</i> (<i>Corynodes</i>)	S. Africa.
— <i>antennatus</i> (<i>Corynodes</i>)	Java.

Olivier, in his 'Entomology,' redescribed the Fabrician species, mistaking however *cyaneus*, *Fab.*, for a different insect, and added four others: *bifasciatus* (China), *cyanicollis* (Java), *Senegalensis* (W. Africa), and *Chrysis* (Bengal); but of these *Senegalensis* is doubtless only a variety of *compressicornis*, *Fab.* Chevrolat, in Dejean's Catalogue and in d'Orbigny's Dictionary, first separated from *Eumolpus* the two genera *Platycorynus* and *Chrysochus*, but left them both undescribed. The former has since been briefly characterized by Hope, *Coleopt. Man.* pt. 3. p. 162, and more completely by Gerstäcker in Peters's *Reise nach Mossambique*, p. 335, under the name *Corynodes*. *Chrysochus**, so far as it refers to the European species, has been pretty fully described by Moravitz, *Horæ Soc. Ent. Rossicæ*, t. i. 1861, p. 159, with the addition of *Chrysochares*, to contain *C. Asiaticus*, *Linn.*, and also by Redtenbacher in the 'Fauna Austriaca.' Nine species

* *Chrysochus*, not *Chrysuchus*, as wrongly spelt in Schaum's Catalogue. The derivation (given by Chevrolat) is from χρυσσοχόος or χρυσσοχῶν, 'a goldsmith,' and not χρυσσοῦχος, 'having gold,' 'golden.'

of *Platycorynus* are mentioned in the 3rd edition of the Catalogue Dejean, of which four were at the date of its publication only MS. names. One of these, *P. Dejeanii*, has since found a describer in Gerstäcker, *l. c.* The same edition of the Catalogue contains three Fabrician species of *Chrysochus*—viz. *Asiaticus*, *pretiosus*, and *auratus*. A single additional description is to be gathered from Schönherr's Synon. Ins. i. 2. p. 235 note, *Corynodes Gröndalii*, Swartz, which is obviously a synonym of *bifasciatus*, Oliv. The above sketch comprises everything to be found in the older writers which conveys any certain information. More lately we have *Corynodes pyrophorus*, Parry (*Eumolpus*), described in the Ann. of Nat. Hist. 1844, vol. xiv. p. 454, and Trans. Ent. Soc. vol. iv. p. 86, which is identical with *C. gloriosus*, Baly, Ann. of Nat. Hist. 1859, vol. iv. p. 124. In Guérin-Ménéville's Rev. Zool. 1841, p. 228, Chevrolat characterizes *C. indigaceus*, from Manilla. Mr. Baly has also described four other species of *Corynodes* (*decemnotatus*, *pulchellus*, *igneofasciatus*, and *pyrospilotus*) in the first vol. of the Journal of Entomology. In the Trans. Ent. Soc. vol. iv. p. 17, Mr. Hope gives a diagnosis of *Eumolpus ignicollis*, from China, afterwards described as *Chrysochus thoracicus*, together with *Chr. Chinensis*, by Mr. Baly, Ann. and Mag. N.H. 1859. We have also *Chr. cobaltinus*, Leconte, in vol. ix. of Reports of Surveys for a Railroad from the Mississippi to the Atlantic. T. W. Harris, in Massachusetts Reports, Insects, p. 108, has again characterized and figured *Chr. auratus*, Fab. Gebler, in the Bull. d. Moscou for 1860, No. 3. p. 36, gives us *Chr. punctatus*, from the vicinity of the Balkash Lake; and Motschulsky, Etudes Entom. ix. p. 23, has described a beautiful insect from Japan and China as *Chr. Gaschkevitchii*. Lastly, we are compelled to omit in this résumé four insects indicated by Hope, in Gray's Zool. Misc. i. p. 30, but too briefly to be identified. The genus *Callisina* of Baly is designedly passed over, as belonging, according to that gentleman's present views, to a different group.

With respect to the geographical distribution of the first group, *Corynodes*, it will be remarked that the great majority are Asiatic. The district within which they are found may be described as bounded by a line drawn from the Chinese Wall to the Indian Ocean, passing through the great Gobi, or desert of Tartary, and waving more or less till it emerges at some indefinite point on the western coast of Hindostan, at or near Bombay. In a S.E. direction the species may be traced to the Philippines and the larger islands of the Malay archipelago, Java, &c. as far as Borneo and

Celebes, beyond which the present state of our knowledge does not permit us to follow them. The few African species which have been brought to Europe inhabit the southern half of the African continent, from Senegambia on the west, to the territories of the Imam of Maskat on the east, opposite to Madagascar. *C. Dejeanii*, Gerst., has been brought by Peters from Mozambique. *Dejeanii*, Drège, in Dej. Cat. (another variety of *compressicornis*, Fab.), is common at the Cape and in Caffraria. A closely allied, but distinct, species of great beauty is from the inland lake Ngami. From the Gaboon River comes the largest and most splendid of the genus; and in the same part of the African continent occurs in profusion *compressicornis*, Fab., as well as one or two blue forms, which resemble somewhat those of India.

The African species present a constant variation in form from that which obtains among those of Asia; they have a much longer thorax, narrowed in front, and their elytra are more narrowly oblong.

It is to be regretted that the island of Madagascar has not been searched for these insects. The occurrence of the Asiatic forms there, with or without the African, may be regarded as possible, and their presence would throw some light upon the supposed early connexion of that island with Asia, in a physical as well as an ethnographical point of view,—a question of the highest interest, but at present involved in the most inscrutable mystery. It is at least certain that the botany and other natural productions of Madagascar present strong analogies to those of India and Malaysia, and recede in a proportionate degree from the African type, while the facies of the natives, and, above all, irrefragable linguistic proofs drawn from the Malagassee, point to a prehistoric connexion of the island with the eastern continent. The hypothesis of a voyage of Malay proas sufficiently explains one portion of the difficulty, but leaves the natural-history question still untouched.

The second group, consisting of *Chrysochus* and its affinities, is represented in Europe, Asia, and North America, but not, so far as we are aware, in Africa, nor in the southern regions of the New World. The Asiatic forms are by far the most numerous, occurring in almost every part of the continent, from the central plateau of Mongolia to the Malay peninsula, and from the Caucasus to Japan. The American species have hitherto been brought only from the northern temperate zone; they are represented (in the collections we have seen) by two or three forms from the Far West, Oregon, and California, and by an insect common in the

United States, *Eumolpus auratus* of Fabricius. It is singular that no species of the group has hitherto occurred in South America, where the luxuriance of vegetable growth is so favourable to the peculiar habits of the Phytophaga. *Eumolpus*, properly so called, appears in those regions as the analogue of *Chrysochus* and *Corynodes*.

Although it is easy to collect the scattered statistics of natural history, and to note the prevalence of certain forms of animal life in particular regions, we cannot but feel humiliated at the reflection how feeble is the grasp of our faculties, and how imperfect the inductions we can draw from the facts observed. Of the real laws which govern the dispersion of different creatures upon the face of the globe, and of the reasons (for there must be reasons) which have suggested the infinite variation of their organs, we are, and must probably for ever remain, in complete ignorance. We are forced, in order to satisfy our conceptions of the fitness of things, to the assumption that the bewildering maze of phenomena which we see is the result of the mere luxuriance of Power, and is infinitely varied only because the Power which creates is infinite.

We now proceed to deal with the first section of the subfamily before us, regretting that the materials at hand, although considerable, must inevitably fall short of representing every variety of form. The following is an attempt to draw up a synopsis of genera, in which the chief difficulty has been to obtain characters of sufficient prominence, in a family of acknowledged difficulty from the great similarity of their organs.

Tabula Generum Synoptica.

Fam. EUMOLPIDÆ.

Subfam. CORYNODINA.

Antennæ extrorsum plus minus incrassatæ s. dilatatæ, corpore breviores: thorax cylindricus lateribus marginatus, verticem supra occultans, plerumque post oculos utrinque sinuatus: corpus oblongum, convexum; pedes robusti, tibiis canaliculatis, extus apice angulatim productis; unguiculis bifidis s. appendiculatis.

† Antennæ distincte clavatæ; clavæ articulis, numero 5-7, compresso-dilatatis.

* Articulo ultimo apice late obtuso, rotundato CORYNODES, *Hope*.

** Artic. ultimo apice acuminato ACROTHINIUM.

†† Antennæ haud clavatæ, interdum leviter extus incrassatæ, articulis nec valde compressis, nec dilatatis.

* Mandibulæ simplices . . . CHRYSOCHARES, *Moravitz*.

** Mandibulæ bidentatæ . . . CHRYSOCHUS, *Redt*.

Genus CORYNODES.

Hope, Col. Man. iii. 162. *Gerstäcker, Reise nach Mossambique*, p. 335.
—*Cryptocephalus et Eumolpus, Fab. and others.*—*Platycorynus, Chev., Baly.*

Caput verticale, thoraci profunde insertum, supra oculos profundius arcuatim impressum, desuper haud conspicuum. *Oculi* oblongi, intus leviter sinuati. *Antennæ* ad angulum oculorum infero-interiorem sitæ, corpore dimidio breviores, 12-articulatæ; articulus 1^{us} subglobosus, 2^{us} quintuplo minor, brevissimus; 3^{us} oblongus, compressus, duobus præcedentibus longitudine æqualis; 4–6^{tum} longitudine decrecentes, latitudine incrementales, compressi; 6^{tus} subtriangularis; 7–10^{num} latissimi, valde compressi, cum 11^{mo} et 12^{mo} clavam 5–7-articulatam spatuliformem constituentes; 7–9^{num} subtriangulares, latere externo emarginato, angulo interiore rotundato; 12^{mus} 11^{mo} fere absconditus §, arcte cum eo conjunctus, extus late rotundatus. *Labrum* oblongum, apice obtuse rotundatum, subito deflexum, utrinque hirtum. *Palpi maxillares* articulis ultimis duobus crassioribus, ultimo apice truncato. *Mandibulæ* obtuse bidentatæ. *Thorax* cylindricus, antice subito fornicatus, plus minus angustatus, genas arcte complectens, post oculos utrinque sinuatus, longior quam latior, lateribus subrectis. *Prosternum* antice subrectum, lateribus oblique deflexis; postice utrinque late sinuatum, lobo posteriore angusto. *Metasternum* angustum, antice 3-sinuatum angulis truncatis; lateribus subrectis, angulis posterioribus subacute productis. *Antepectoris processus antero-lateralis* scлено-triangularis, apice ab humero suam ipsius longitudinem remoto. *Scutellum* parvum, semiellipticum. *Elytra* thorace latiora, oblonga, convexa, lateribus parallelis, lentius ad apicem conjunctim clausa, angulis anticis obtusis aut nullis. *Pedes* robusti, tibiis extus apice dilatatis, canaliculatis; tarsorum articulis subæqualibus; unguium appendiculis variis.

Type of the genus, *Corynodes compressicornis*, Fab.

I have some diffidence in proposing this genus in its present

§ For the sake of convenience we shall for the future regard the antennæ as 11-jointed, reckoning the two last joints as one.

extent. I had originally intended to erect several of its sections into new genera, as well as to adopt Mr. Baly's *Platycorynus*. The only distinctions available for this method of division consist in the degree of dilatation of certain joints of the antennæ, and in the form of the appendiculæ of the claws, viz. whether they are free, and more or less acute (*bifidæ* of Lacordaire), or simply lobiform (*appendiculatæ* of Lacordaire). After mature consideration I am convinced that the attempt to establish genera upon these grounds alone would be highly artificial, and tend only to confusion by separating species otherwise closely allied. The characters are so vaguely expressed in some of the forms, that it might often be a question to which genus any given insect should be referred. The reader will therefore be spared the difficulty arising from this source. I have, however, characterized as subgenera some groups previously intended to form genera; such sections may be useful for the more ready determination of species, though they must be regarded as rather technical than natural.

Subg. i. (*Platycorynus*, Chev., nec Baly). Unguiculæ bifidæ; antennarum clava 5-articulata; thorax longior quam lator, utrinque post oculos plane sinuatus; corpus elongato-oblongum, angustum. Species Africanæ.

1. *C. COMPRESSICORNIS*, *Fab.*

Fab. El. i. 419. 7. *Oliv.* 901, pl. 1. fig. 7.—*Senegalensis*, *Oliv.* 902, pl. 1. fig. 10.—*Dejeanii*, *Gerstæcker*, *Reise nach Mossambique*, p. 335. *Cf. Monatsber. der Berlin. Akad. d. Wissensch.* 1855.

The commonest of the African species, one or other of its varieties being found in every part of the continent, except the north. These varieties stand in collections under different names, according to their colours, but present no structural differences whatever.

Var. A. *Dejeanii*, Gerst. Major, late purpureus, prothorace supra et capite igneo-cupreis, s. viridibus. Mozambique.

Var. B. *Senegalensis*, Oliv. Nigro-cyaneus, elytris æneis. Senegal.

Var. C. Totus igneo-purpureus, thorace et elytris concoloribus. Natal.

Var. D. Totus supra viridis, plus minus aureo micans. Natal.

Individuals are found of every intermediate shade of colour.

Note.—When the present descriptions were in an advanced state, a paper was unexpectedly sent to the author by J. S. Baly, Esq., issued, as he states, with the object of securing the priority to his nomenclature. It became necessary therefore either to suppress altogether the descriptions of the species handled by that gentleman, or else to retain them with the substitution of Mr. Baly's names for those originally proposed. The latter course has been adopted, after some deliberation. Mr. Baly's descriptions being limited to a Latin diagnosis, it is probable that the existence of a second and detailed description in a few cases will not be thought superfluous.

2. *C. CYANEUS*, *Fab.*

Fab. El. i. 429. 4. *Guér. Icon. R. Anim.* vol. iii. p. 295. *Fab. Ent. Syst.* i. 324. 84, nec *Oliv.*—*Platyc. laticornis, Dej. Cat.*

C. elongato-ovatus, totus splendide nigro-cyaneus; thorace minutissime remote punctulato; elytris subtiliter irregulariter, humeros versus sub-bistriatim punctatis; segmentorum abdominalium marginibus cum metasterno interdum violaceo tinctis; tibiis, tarsis breviter fulvo hirsutis.

Long. $5\frac{1}{2}$ – $6\frac{1}{2}$ lin.; lat. hum. 2 – $2\frac{1}{2}$ lin.

Vertex gibbous, shining, more coarsely punctured than the thorax; vertical impressed line nearly, sometimes entirely, obsolete. Labrum and palpi with fulvous hairs. Eyes dark rufo-fuscous. Thorax very delicately punctulate (the punctules invisible to the naked eye), distinctly sinuated behind the eyes, antero-lateral angles subacute. Elytra irregularly punctulate, with traces of two punctured striæ descending from the humerus and obliterated posteriorly. Ungues rufo-piceous.

Hab. Senegambia.

The Fabrician diagnosis of this insect is as follows:—"Cyaneus, nitidus, pedibus nigris. *Hab.* in America meridionali. Mus. D. Banks."

The type specimens in the cabinet referred to are two in number; the first or left-hand-side one being *Chrysochus Chinensis*, Baly, the other *C. cyaneus*, Fab., distinctly labelled "in Africa æquin." The *Chrysochus* was probably the hasty addition of a later hand. The habitat given by Fabricius in his writings, and which differs from the ticket attached to the type, can only be an oversight, as no species of the present genus has ever been discovered in the New World. Olivier rectified, as he thought, the habitat, but mistook the insect altogether for an Indian species, which has done duty ever since in collections for the true *cyaneus*, Fab.

3. *C. SIMILLIMUS*.

C. cyaneo affinis, subelongato-ovatus, violaceo-niger, nitidus; thorace subtilissime remote punctulato; elytris confertim irregulariter punctatis; subtus cum pedibus niger, minus nitidus.

Long. 5 lin.; lat. hum. $2\frac{1}{4}$ lin.

Closely allied to the preceding; differs in being more broadly ovate; thorax shorter in proportion, wider at the base, and less deeply sinuated behind the eyes; antero-lateral angles more obtuse. Elytra much more coarsely punctured, without traces of the faint humeral punctured striæ. The colour of the superior surface, especially the thorax, is violaceous black; the underside and legs black, much less shining.

Hab. Gold Coast.

A single specimen in the Rev. H. Clark's collection. It may prove to be only a variety of the preceding.

4. *C. LAUTISSIMUS*.

C. elongato-ovatus, thorace subtilissime punctulato, punctis paulo majoribus interspersis, metallico-cæruleus, splendidus, abdomine plus minus violaceo; elytris striato-punctatis, nitidissimis, aureo-viridibus; scutello cæruleo.

Long. $5\frac{1}{2}$ – $6\frac{3}{4}$ lin.; lat. hum. 2–3 lin.

Elongate-ovate; front gibbous, with a faint vertical impression; eyes rufo-fuscous; head and thorax finely and irregularly punctured, with still finer and more numerous punctules between the punctures, dark shining blue, sometimes with a violaceous tinge; scutellum, and sometimes the suture, blue, the former punctulate. Elytra bright metallic green, with more or less of a golden tinge, densely punctate-striate, the punctures much coarser than those of the thorax; abdomen punctured, especially towards the apex; legs shining blue, thickly punctulate, apex of the tibiæ and the tarsi with fulvous hairs.

Brought by Deyrolle from the Gaboon River. Thomson's collection. Also in the British Museum.

One of the largest of the genus; very distinct from green examples of *C. compressicornis* by its superior size and brilliant polish.

5. *C. PUSIO*.

C. parvulus, elongatus, cupreo-purpureus, thorace supra, capite antice, scutello viridibus, nitidis; antennis nigris; thorace elongato, antice valde angustato, confertim punctato; elytris punctis majoribus densissime consitis; capite subexserto, vertice desuper conspicuo.

Long. $3\frac{3}{4}$ lin.; lat. hum. $1\frac{1}{4}$ lin.

Thorax at the base more than twice as broad as in front; the sides subparallel from the base to rather more than one-half their length, then obliquely rounded to the front; head subexserted, eyes projecting at each side beyond the thorax; vertex gibbous, visible from above. Antennæ dull black. Labrum, palpi, and mandibles piceous. Front, vertex, and disk of the thorax metallic green, very thickly punctured, almost rugose; scutellum golden green, brilliant, nearly impunctate. The rest of the insect cupreous, with a purple or violaceous tinge, except the tibiæ and tarsi, which are blackish.

Hab. Shores of Lake Ngami.

The smallest of the African species, and distinguished from all others by its prominent head and by the shape of the thorax. It is probably the type of a subsection peculiar to the interior of Africa.

A single specimen in the Rev. H. Clark's collection.

Subg. ii. (*Corynodes*, Hope, Baly). Unguiculæ bifidæ; antenarum clava 6-articulata. Thorax brevior, plerumque transversus, antice minus angustatus, post oculos vix aut ne vix quidem sinuatus. Corpus crassius, magis convexum; elytris sæpe versicoloribus, maculis, fasciis, præclare distinctis, quum eadem in subgenere primo semper unicolora reperiantur. Species ab Africa exsulant.

6. C. BIFASCIATUS, *Oliv.*

Oliv. 900, pl. 1. fig. 5.—undatus, *Oliv. Encycl. Méth.* vi. 614. 31.—

Gröndalii, *Swartz, Schönh. Syn. Ins.* i. 2. p. 235, note.

Hab. China.

Common in collections.

7. C. ANTENNATUS, *Fab.*

Fab. El. i. 419. 8.—*Oliv.* 900, pl. 1. fig. 6.

Hab. Java.

Easily recognized by its black colour. Common in collections.

8. C. PEREGRINUS, *Füessly.*

Füessly, Archiv Ins. iv. p. 63. no. 16, tab. 23. fig. 25 (Cryptocephalus).—
cyaneus, *Oliv.* 899, pl. 1. fig. 4 a, b, nec *Fab.*

Hab. India.

A very abundant species, varying much in size, but easily recognized by the coarse irregular punctuation of the thorax. It stands in collections as *cyaneus*, *Fab.*, *Oliv.*, which however are two different insects (see Sp. 2, remarks). In any case, *Füessly's* name *peregrinus* must be restored, in obedience to the law of priority.

9. C. CYANICOLLIS, *Oliv.*

Oliv. 902, pl. 1. fig. 9.

Hab. Java.

A single specimen in the Rev. H. Clark's collection.

10. C. PYROPHORUS, *Parry.*

Parry, Ann. N. H. vol. xiv. 1844, p. 454, and *Trans. Ent. Soc.* vol. iv. p. 86.—*gloriosus*, *Baly, Ann. N. H.* vol. iv. 1859, p. 125.

Hab. Assam.

In the collections of the Rev. H. Clark and Mr. Baly; also in the British Museum.

11. *C. INDIGACEUS*, *Chevr.*

Chevr., Guér.-Mén. Rev. Zool. 1841, p. 228.—Hopei, *Baly, Descriptions of new gen. and sp. of Phytophaga*, April 19, 1864, p. 7.

Hab. Philippine Islands.

In the collections of the Rev. H. Clark and Mr. Baly.

12. *C. IANTHINUS*.

C. oblongus, ovatus, depressus, elytris latis; totus cyaneus, fronte, thorace, humeris, corpore subtus purpureo tinctis; thorace irregulariter, elytris subtilius substriatim punctatis.

Long. $4\frac{1}{2}$ lin.; lat. hum. 2 lin.

Front transversely rugose, with irregular punctures, the longitudinal furrow wanting. Thorax much narrower than the elytra, subglobose above, irregularly punctured, the punctures larger and more remote at the base and on the middle of the disk. Fifth and sixth joints of the antennæ dilated; the remaining joints very broadly dilated. Elytra wide, not very convex, depressed, parallel to about $\frac{5}{8}$ ths of their length, then obtusely rounded; cyaneous, with purple reflexions, especially on the shoulders and sides; very finely punctulate, the punctures not forming distinct striæ. Underside and legs concolorous.

Hab. —?

A single specimen in the Rev. H. Clark's collection, derived from that of Chevrolat.

Subg. iii. (*Theumorus*, nobis). *Caput* declive, cum oculis exsertum; his breviter ovatis, prominulis, intus vix sinuatis; *antennæ* prælongæ, articulis 7 ultimis compresso-dilatatis: articulo 1^{mo} subglobo; 2^{do} minore, extus prominulo; 3^{tio} elongato, cylindrico; 4^{to} ad ultimum latitudine incrementibus, compresso-dilatatis; 5^{to} ad 9^{num} extus basi subito rotundatis, et cum articulorum sequentium angulis speciem serriformem præbentibus; articulo ultimo ovato. *Thorax* longior quam lator, supra globosus, medio gibbosus, basi et antice angustior, lateribus rotundatis; angulis anticis intro convergentibus, collum arete stringentibus. *Antepectoris processus anterolateralis* elongato-triquetrus, thoracis angulum fere attingens. *Scutellum* orbiculare. *Elytra* thorace latiora, modice convexa, disco antice subdepressa, parallela, thorace triplo longiora. *Pedes* validi, tibiis anticis elongatis, incurvatis: ungues appendiculis acutis, unguiformibus, a basi usque liberis.

13. *C. AMETHYSTINUS*.

C. supra saturate violaceus, splendidus; subtus cum antennis pedi-

busque niger; thorace fortissime irregulariter, elytris modice vix striatim punctatis; vertice impresso, fronte rugosa.

Long. 4 lin.; lat. hum. $1\frac{2}{3}$ lin.

Head coarsely and thickly punctured, irregularly impressed between the eyes, below which impression the surface becomes transversely rugose. Vertex with an ovate impression. Thorax and elytra very shining, the former coarsely punctured, the punctures less distinct towards the antero-lateral margins: the elytra less coarsely punctured, the punctures equidistant, and therefore forming only obscure striæ, except near the suture, where a single stria is isolated. Anterior tibiæ elongate, curved downwards and inwards. Antennæ and tarsi very robust.

Hab. not indicated.

In the Rev. H. Clark's collection.

Subg. iv. (*Eurycorynus*, nobis: *Platycorynus*, Baly). Antennarum clava 5-articulata. Tibiæ intermediae in ♂ plerumque extus ante apicem sinuatae. Unguiculæ appendiculatæ s. dentatæ. "Very closely allied to *Corynodes*, Hope" (Subg. ii.), "but separated by the appendiculated claws and 5-jointed club of the antennæ." Baly.

14. C. CHRYSIS, Oliv.

Oliv. 901, pl. 1. fig. 8.

Hab. India, Bengal.

The typical colour is bright metallic green. For the following description of a fine variety (at first supposed by me to be distinct) I am indebted to the kindness of the Rev. H. Clark.

C. subelongatus, metallico-aureus, ad latera sensim purpureus, juxta suturam et ad humeros viridi-aureus; capite punctato, ad medium longitudinaliter depresso, nigro-cyaneo; thorace sparsim irregulariter punctato; elytris crebre fortiter punctato-striatis; corpore subtus pedibusque fusco-æneis.

Long. $4\frac{1}{2}$ lin.; lat. hum. 2 lin.

Of a brilliant metallic gold colour, the sides tinged with purple, and the upper part with greenish gold; in form parallel and sufficiently elongate. Head thickly punctate, purplish copper-coloured, with a medial longitudinal dark-blue depression. Thorax subcylindrical, short, sparingly and very irregularly punctate. Scutellum deep purple, impunctate. Elytra subparallel, with prominent shoulders; their surface thickly punctate-striate (the punctures coarse and irregular, so that the striations are somewhat indefinite). Legs and underside dark greenish, metallic. The antennæ in the specimen described are unfortunately absent.

In the Rev. H. Clark's collection.

15. *C. NITIDUS*, *Fab.*

Fab. Ent. Syst. i. 325. 86; *El.* i. 418. 2. *Oliv.* 903, pl. 1. fig. 11.
Erichs. Schomb. Reise, Th. iii. p. 577.—*Platyc. Sheppardi*, *Baly*,
Descriptions of new gen. and sp. of Phytophaga, April 19, 1864, p. 7.
Hab. Southern India.

I have verified this insect from the original type in the Bank-
sian collection. It has much of the facies of the genus *Tricho-*
chrysea of Baly, or of the larger undescribed forms of *Bromius*.
In Dejean's Catalogue it is placed doubtfully as a true *Eumolpus*.
Frequent in collections.

16. *C. 10-NOTATUS*, *Baly.*

Baly, Journ. Ent. vol. i. 1860, p. 31.
Hab. India, Vizapore.

In the collections of the Rev. H. Clark, Mr. Baly, and the British
Museum.

17. *C. PULCHELLUS*, *Baly.*

Baly, Journ. Ent. vol. i. 1860, p. 31.
Hab. Siam.

In the collections of Messrs. Clark and Baly.

18. *C. IGNEOFASCIATUS*, *Baly.*

Baly, Journ. Ent. vol. i. 1860, p. 32.
Hab. Siam.

19. *C. PYROPILOTUS*, *Baly.*

Baly, Journ. Ent. vol. i. 1860, p. 32.
Hab. Siam.

Var. A. Thorax maculis aureis obsoletis.

In the Rev. H. Clark's collection.

20. *C. FLOSCULUS*.

C. oblongo-elongatus, valde convexus, purpureo-cæruleus, metallicus;
thorace sparsim punctato; elytris punctato-striatis, singulis macula
parva laterali sub humero aurea, fasciis duabus latis, linea suturali
connexis, splendide viridi-aureis.

Long. $4\frac{3}{4}$ lin.; lat. hum. 2 lin.

Facies and punctuation of *C. pulchellus*, Baly, but the thorax is less
transverse and the colours different. Of a rich metallic purple or
violaceous blue. Elytra with two small aureous spots placed one on
each side below the humeral callus. Two large rounded patches
occupy the base, filling up the sutural angle and extending nearly to
the exterior margin, connected along the suture with a broad trans-

verse fascia just behind the middle, which touches the suture and all but reaches the exterior margin, its anterior edge nearly straight, the hinder obliquely sloping, so that the lateral edge of the fascia is twice as broad as the sutural. These spots and fasciæ bright golden, metallic; green when viewed obliquely. Punctate striæ obsolete behind.

Brought from Camboja by M. Mouhot.

A single specimen in the Rev. H. Clark's collection.

21. *C. COSTATUS*, *Baly*.

Baly, *Descriptions &c.* p. 2.—*Hab.* Manilla.

22. *C. MARSHALLI*, *Baly*.

Baly, *ibid.*—*Hab.* Gilolo.

23. *C. LONGICOENIS*, *Baly*.

Baly, *ibid.*—*Hab.* Manilla.

24. *C. CUMINGII*, *Baly*.

Baly, *ibid.* p. 3.—*Hab.* Manilla.

25. *C. ROBUSTUS*, *Baly*.

Baly, *ibid.*—*Hab.* Sumatra.

26. *C. CONGENER*, *Baly*.

Baly, *ibid.*

C. oblongo-ovatus, crassiusculus, valde convexus, nitidus, totus saturate violaceo-cæruleus; elytris subseriatim, capite et thorace irregulariter punctatis s. punctulatis; subtus tenuiter fulvo-villosus; antennis (modice tantum dilatatis) et tarsis nigris.

Long. 5 lin.; lat. hum. $2\frac{1}{2}$ lin.

Head, thorax, and elytra very finely punctured; impressed line of the vertex nearly obsolete; eyes reddish. Punctures of the elytra more distinct at the lateral margins, less visible at the apex, arranged in somewhat irregular lines upon the disk. Thorax longer than broad, one-half wider at the base than in front: anterior angles distinctly produced; moderately sinuated behind the eyes. Elytra about one-fourth wider than the thorax, twice as long as their width, not attenuated posteriorly until just before the apex, very convex, suddenly deflexed behind. The humeral callus impunctate, within which is the usual linear impression; and on the disk of the elytra, much before the middle, a slightly curved transverse impression extending from the suture nearly to the deflexed margin. Abdomen and lateral edges of the elytra violaceous; legs with violet and green reflexions.

Hab. Manilla; Java.

From Reiche's collection.

I have before me a specimen with the thorax much more coarsely punctured and somewhat less elongate; but as it differs in no other respect from the individuals described, I cannot but regard them as belonging to the same species. Similar and even greater discrepancies are to be observed in the common *C. peregrinus*, Füssly.

27. *C. MUTABILIS*, Baly.

Baly, ibid.—*Hab.* Menado, Sumatra, Ceram.

28. *C. FABRICII*, Baly.

Baly, ibid. p. 4.—*Hab.* Sumatra.

29. *C. BISERIATUS*, Baly.

Baly, ibid.—*Hab.* Macassar.

30. *C. WATERHOUSII*, Baly.

Baly, ibid.—*Hab.* Manilla.

31. *C. DOHRNII*, Baly.

Baly, ibid.

C. elongato-oblongus, modice convexus, humeris latis, subrectangulis, supra splendide cyaneus, fronte viridi, thorace, humeris, elytrorum lateribus violaceo tinctis; subtus cum pedibus cæruleo-viridis; antennis fulvis, clava nigra.

Long. $6\frac{1}{4}$ lin.; lat. hum. 3 lin.

Vertex gibbous, thickly punctured, violaceous blue, with a fine central impressed green line. Labrum, palpi, and antennæ fulvous, except the five dilated joints of the last, which are black. Front dull green, rugosely punctate, with a small lamina on each side, next the eyes, bright green, impunctate. The face and ocular orbits beset with testaceous hairs. Thorax very shining, finely and remotely punctured, sinuated on each side behind the eyes, cyaneous, with a purple gloss. Elytra long, the shoulders broad and rectangular, finely punctate-striate, the striæ invisible before the apex; bright cyaneous, with a purple reflexion on the shoulders and sides. Beneath dull bluish green; hairs of the tibiæ and the pulvilli fulvous.

Hab. Ceylon.

The finer punctuation of the thorax and elytra, the rectangular humeri, and the characters of the face above mentioned, render this species abundantly distinct from *peregrinus*, Füss., the only described species with which it can be confounded. Mr. Baly's type is described as being "viridi-æneus." The above is evidently a blue variety of the same insect.

32. *C. ÆNEUS*, Baly.

Baly, ibid. p. 5.—*Hab.* Sarawak, Borneo.

33. *C. STEVENSI*, *Baly*.

Baly, ibid.—*Hab.* Tondano; Menado.

34. *C. ELEGANTULUS*, *Baly*.

Baly, ibid.—*Hab.* Celebes.

35. *C. FRATERNUS*, *Baly*.

Baly, ibid.

C. ovatus, valde convexus, totus læte viridis, metallicus; thorace transverso, subtiliter punctato, basi lata, lateribus subdilatis, rotundatis, post oculos utrinque leviter sinuato; elytris striato-punctatis, lateribus et apice costatis.

Long. 3 lin.; lat. hum. $1\frac{1}{2}$ lin.

Vertex distinctly punctured, with a longitudinal furrow; face beset with fulvous hairs; orbital spaces blue. Thorax depressed at the base, nearly as broad as the elytra, compressed and very convex in front, remotely punctate, the punctures more distant and somewhat larger towards the base; sinuated behind the eyes. Elytra very convex, punctate-striate, the punctures larger and somewhat confused towards the shoulders and in the antemedial transverse impressions. The exterior half of each elytron costate, the costæ increasing in elevation towards the lateral margin and apex. Body and legs entirely metallic green, with a bluish reflexion when viewed obliquely.

Hab. Sumatra.

The specimens received from Reiche by the Rev. H. Clark are ticketed as Javan.

36. *C. FULGURANS*.

C. viridi-æneus; capite longitudinaliter impresso; thorace leviter punctato; elytris post humeros transverse depressis, leviter punctatis; corpore subtus pedibusque nigro-æneis; antennis rufo-fuscis.

Long. $4-4\frac{1}{2}$ lin.; lat. hum. $1\frac{3}{4}-2$ lin.

Entirely of a bright metallic green colour; head finely punctate, with a faint medial longitudinal depression, which is obsolete near the base. Thorax constricted in front, sparingly punctate. Scutellum impunctate. Elytra with an intermediate transverse depression on either side behind the shoulders; the surface finely punctate-striate (the punctures coarser near the margins). Underside and legs dark bluish green; apical segment of the abdomen and the pulvilli flavo-pubescent. Antennæ rufo-fuscous, the five apical joints largely dilated.

Hab. Ceram; taken by Mr. Wallace.

37. *C. PERPLEXUS*, *Baly*.

Baly, ibid.—*Hab.* Singapore.

38. *C. CUPREUS*, *Baly*.

Baly, ibid. p. 6.—*Hab.* Malay peninsula.

39. *C. CÆLESTINUS*, *Baly*.*Baly, ibid.*—*Hab.* Malay peninsula.40. *C. FUSCO-ÆNEUS*, *Baly*.*Baly, ibid.*—*Hab.* Singapore.41. *C. APPROXIMANS*, *Baly*.*Baly, ibid.*—*Hab.* Sumatra.42. *C. IGNITUS*, *Baly*.*Baly, ibid.*—*Hab.* Pulo Penang.43. *C. MOUHOTI*, *Baly*.*Baly, ibid.* p. 7.—*Hab.* Camboja.44. *C. PARVULUS*, *Baly*.*Baly, ibid.*—*Hab.* Singapore.45. *C. GRATIOSUS*, *Baly*.*Baly, ibid.**C. cyaneo-viridis*, punctatus, nitidus; capite thorace cyaneis, hoc sparsim, illo crebre punctato; scutello antice medio depresso; elytris viridi- vel nigro-cyaneis, ad latera cyaneis.

Long. 5-6 lin.; lat. hum. 2-2½ lin.

Bluish green, brilliant, impubescent, punctate. Head bright blue, thickly and minutely punctate. Thorax sufficiently angustate in front, the sides narrowly margined (the margination being invisible when the insect is viewed from above); surface finely and sparingly punctate, of a bright blue colour. Scutellum subcordiform, medially depressed in front, impunctate, greenish blue. Elytra robust, coarsely punctate, dark bluish green; the sides more distinctly blue. Under-side and legs dark greenish blue. Antennæ robust, fuscous, the five terminal joints broadly dilated.

Hab. Rangoon.

Received from Rangoon by Mr. Stevens; and in the collections of the Rev. H. Clark, Mr. Baly, and the British Museum.

46. *C. AMPULLATUS*.*C. cyaneus*, nitidus; capite punctato, inter oculos transverse depresso; thorace inæqualiter punctato; elytris subtiliter punctato-striatis; corpore subtus pedibusque nigro-cyaneis.

Long. 5 lin.; lat. hum. 2½ lin.

Entirely violaceous blue; head coarsely and thickly punctate, with an irregular transverse depression between the eyes. Thorax somewhat shorter than in *gratiosus*, sparingly and irregularly punctate. Scutellum fuscous, impunctate. Elytra large and broad, finely punctate-striate (the punctures smaller and more regular than in *gratiosus*).

Abdomen towards the apex slightly fusco-pubescent. Legs darkly azure-blue, the femora punctate, the tarsi on the under side thickly clothed with pale fulvous pubescence. Antennæ short, the apical joints considerably widened.

Hab. Java.

This species must be carefully distinguished from the preceding, and also from *cyaneus*, Fab. From the latter it may be known by the form of the thorax, which is much shorter, broader at the base, and more angustate in front, and by the much finer punctuation of the superior surface, which gives it a more glabrous appearance.

47. C. MALACHITICUS.

C. nigro-viridis, punctatus; capite impunctato, longitudinaliter foveolato; thorace sparsim punctato; elytris post humeros transverse depressis, tenuiter punctatis; pedibus nigro-viridibus, tarsis flavo-pubescentibus; antennis rufo-fuscis, in ♂ prælongis.

Long. 5 lin.; lat. hum. 2 lin.

Entirely of a dark bluish green colour. The antennæ very long. Head of a dark-blue colour, impunctate, with a faint medial longitudinal impression. Thorax angustate in front, very finely and sparingly punctate. Scutellum impunctate. Elytra robust, with a transverse depression on either side behind the shoulders; the surface is finely punctate-striate. Abdomen and underside dark bluish green; the apical segments, and also (more fully) the tarsi, clothed with fusco-flavous pubescence. Antennæ rufo-fuscous; the five apical joints broadly dilated.

Hab. India.

48. C. HYACINTHINUS.

C. congeneri proxime affinis, minor; saturate cæruleus; thorace nitidissimo, subtilissime punctulato, lateribus rotundato; subtus cum facie cæruleo-viridis, antennis (articulo primo excepto) tarsisque nigris.

Long. 4 lin.; lat. hum. $1\frac{3}{4}$ lin.

Very similar to *C. congener*, but smaller, without any violaceous reflexion, deep shining blue. Thorax very finely punctulate, the punctures invisible to the naked eye. Labrum, first joint of the antennæ, pectus, and abdomen bluish green, the last finely villose with pale hairs. Sides of the thorax distinctly rounded.

From Java; Reiche's collection.

49. C. SUAVEOLUS.

C. congeneri affinis, quintuplo minor; supra saturate violaceo-cæruleus, nitidus; thorace elytris que sat fortiter, his striatim punctatis; subtus cum elytrorum limbo violaceus, antennis tarsisque nigris.

Long. 3 lin.; lat. hum. $1\frac{1}{2}$ lin.

Front violaceous, with a green shining spot on the inner side of each eye; vertex with an impressed line and coarse scattered punctures; labrum violaceous, rugose; mandibles black. Thorax, viewed from above, semielliptical, the sides rounded; coarsely punctured. Elytra punctate-striate, with purple reflexions. Body beneath entirely purple or violaceous. Joints of the antennæ broadly dilated.

From Manilla; Reiche's collection.

50. C. ASPHODELUS.

C. suaveolo affinis; supra saturate cæruleus, violaceo et viridi variatus, scutello viridi, humeris elytrorum limbo indeterminate purpureis; subtus cæruleo-viridis, capite thorace subtiliter punctulatis; elytris striato-punctulatis, post humeros profunde transversim impressis, impressionibus fortiter punctatis.

Long. 3 lin.; lat. hum. $1\frac{1}{2}$ lin.

Size and form of the preceding; differs in the much finer punctuation of the head and thorax and in the colour. Front violaceous blue, with a large triangular elongate impression; the depressed space between the eyes and the vertex on each side green. Elytra moderately punctate-striate; the punctures much larger and deeper in the transverse discal impressions. The superior surface is dark blue, stained with ill-defined patches of green and purple; the margins of the elytra indeterminately purple. Beneath dull bluish green, the sterna and legs violaceous.

From Nepal; Reiche's collection.

51. C. SPECULUM.

C. ovatus, valde convexus, crassior, metallico-viridis, splendidus; elytris disco aureis; abdomine subtus, parapleuris femoribusque purpureis; scutello cæruleo-viridi; thorace antice fortiter crebre punctato, basin versus impunctato; elytris striato-punctulatis.

Long. 5 lin.; lat. hum. 3 lin.

Front thickly punctured, the punctures smaller than those of the thorax. Thorax short, only slightly narrowed in front, hardly sinuated behind the eyes, its breadth at the base about equal to its length; very coarsely punctured anteriorly and on the disk (like the thorax of *C. peregrinus*, Füessly), smooth and impunctate towards the base. Elytra short, very convex, much deflexed behind, with a wide, shallow circular impression on each side within the humeral callus, and a slight lateral transverse depression before the middle. Punctured striæ fine and regular, continued to the apex. Upper surface very brilliant, green if viewed obliquely, otherwise golden; the thorax is of a more bluish green.

Hab. Java.

A single specimen from Chevrolat's collection.

52. C. CHALYBEUS.

C. oblongo-ovatus, parum convexus; thorace basi lato, medio latiore, lateribus rotundatis, antice angustato; cæruleo-viridis, supra saturate chalybeus s. cyaneus; thorace parce omnium subtilissime punctulato, elytris substriatim punctatis.

Long. $4\frac{1}{2}$ – $2\frac{2}{3}$ lin.; lat. hum. $1\frac{3}{4}$ –1 lin.

Front finely punctulate, subcanaliculate; clypeus ovate, distinctly margined, separated from the epistoma by a curved line: ocular fovea shallow. Thorax smooth, shining, bright steel-blue, very finely and sparsely punctulate, wide at the base, still wider and rounded at the sides, subdepressed above, narrowed and compressed anteriorly, not sinuated behind the eyes. Elytra concolorous with the thorax, irregularly and finely punctate-striate, the punctures coarser at the sides and towards the shoulders; these last prominent, obtusely angular. Within the humeral callus is a deep, longitudinal, punctured fovea, and between this and the suture a large, round, smooth, elevated space. Underside and legs bluish green, metallic, with pale pubescence. Antennæ with the basal joints more or less fulvous, the club cyaneous.

Brought from Camboja, and the Shan country, in the Birman Peninsula, by M. Mouhot. It varies considerably in size.

Subg. v. (*Omodon*, nobis: *Platycorynus*, Baly.) *Antennæ* articulo 1^o globoso, magno; 2^{do} globoso, triplo minore; 3^{tio} et 4^{to} æqualibus, elongatis; 5^{to} et 6^{to} vix leviter compressis, paulum dilatatis, elongatis; 7^{mo} ad ultimum fortius compresso-dilatatis, ultimo ovato. *Palpi maxillares* articulo penultimo subgloboso, ultimo obtuse conico. *Thorax* transversus, basi latus, antice parum angustatus, utrinque post oculos vix sinuatus, lateribus rotundatis. *Antepectoris processus* brevis, isoscelitriangularis, apice a thoracis angulo longe remoto. *Scutellum* semiellipticum. *Elytra* thorace paulo latiora, inter humeros minus convexa, postice sensim attenuata, valde convexa; post humeros profunde transversim impressa, rugosa, tuberculis 4 vel 5 plus minus acutis munita. *Pedes* breves, robusti, tibiis extus latius canaliculatis; ungues appendiculis vix apice liberis. ♀. Antennæ ♂ prælongæ, corporis ultra secundum quadrantem extensæ.

53. C. TUBERCULATUS, Baly.

Baly, Descriptions &c. p. 3.

C. oblongo-ovatus, subtus cum capite thorace et pedibus cæruleo-viridis, metallicus; elytris cæruleis, prope humeros et scutellum subviridibus; subtiliter punctatus; antennis nigris, articulis 7 basalibus subcæruleis. ♀.

Long. 4 – $4\frac{1}{2}$ lin.; lat. hum. $1\frac{3}{4}$ –2 lin.

Vertex with a linear impression, thickly punctulate; face between the eyes bright metallic green. Thorax finely punctulate, the punctures much smaller than those of the elytra. Elytra moderately punctured, more coarsely towards the shoulders and sides; the punctures only partially arranged in striæ. Lateral tubercles of the elytra arranged in three interrupted costate lines commencing at the humerus; the inner series double at the base, obsolete before the middle of the elytron; the second series extending in a costa beyond the middle; both these series are interrupted by a broad transverse impression, abbreviated on both sides: third series not interrupted by the transverse impression, prolonged in a smooth costa to the apex. Underside and legs with fulvous pubescence.

Var. With the thorax dark blue, underside and legs dull purple; the lateral costæ and tubercles much less developed.

The elongate antennæ of the ♂ and (in the specimen examined) the different colour of the upper surface, with the absence of tubercles, caused me at first to regard it as a different species. I am ignorant whether examples of the female occur of a bright copper colour. The following is a description of the male in the Rev. H. Clark's collection:—

C. oblongo-ovatus, convexus, confertim subtiliter punctulatus, vertice sulcato; supra læte purpureo-cupreus; oculorum orbitis, scutello, thoracis elytrorum marginibus, sutura tenuiter, viridi-cæruleis; corpore subtus et pedibus cyaneis, fulvo-hirtis; antennis tarsis nigris. ♂. Long. $3\frac{1}{4}$ lin.; lat. hum. $1\frac{3}{4}$ lin.

Regularly oblong-ovate, moderately convex, finely and densely punctured—the vertex especially, where the punctures are oblong and confused. Labrum and vertex of a bright purplish copper-colour, the latter furrowed longitudinally; the orbital region blue; mandibles and antennæ black. Thorax seen from above semielliptical, truncate at the base, and rounded in front, where it is only one-third as broad as at the base; its anterior angles less than right angles, not produced; faintly sinuated on each side behind the eyes; purplish copper, very brilliant, finely and densely punctured, margined with bluish green at the sides and base. Scutellum semiorbicular, polished, bluish green, with a few punctules. Elytra concolorous with the thorax, more coarsely punctured, the punctures arranged in indistinct striæ continued to the apex; the suture narrowly bluish green. Beneath, with the legs, cyaneous; hairs of the tibiæ and pulvilli pale fulvous.

Hab. Sarawak, Borneo; discovered by Mr. Wallace.

In the collections of the Rev. H. Clark, Mr. Baly, and the British Museum.

Subg. vi. (*Erigenes*, nobis: *Platycorynus*, Baly). *Antennæ arti-*

culis 5 ultimis leviter compresso-dilatatis, ultimo oblongo, apice triangulo s. acuminato: *palpi maxillares* articulo ultimo ovato, penultimo globoso. *Thorax* supra hemisphæricus, latus, anticè gibbosus, post oculos haud sinuatus, lateribus rotundatis, margine basali leviter bisinuato. *Antepectoris processus anterolateralis* perbrevis, triquetrus, ab angulo thoracis plus quam suam ipsius longitudinem distans. *Scutellum* semiellipticum. *Elytra* thorace vix latiora, postice levissime ampliata, oblonga, convexa, apice subito rotundata. *Pedes* tibiis anticis elongatis, incurvatis; unguium appendiculis brevibus, apice tantum liberis, vix acutis. *Corpus* breviter oblongum, valde convexum.

54. C. CIRCUMDUCTUS.

C. breviter oblongus, parallelus, thorace gibboso; violaceus, elytris aureis, margine laterali anguste suturaque violaceis; thorace crebre fortiter punctato, elytris punctato-striatis; scutello violaceo.

Long. $4\frac{1}{2}$ lin.; lat. hum. 2 lin.

Thorax very convex, in front gibbous, not sinuated behind the eyes, coarsely and thickly punctured. Front rugose between the eyes. Elytra bright golden or purplish copper-coloured, with the suture, and the lateral margins very narrowly, violaceous. The rest of the insect is entirely violaceous. The anterior tibiæ of the ♂ are elongate and strongly curved, of the ♀ shorter, and slightly curved.

Hab. India.

In the collections of the Rev. H. Clark and the British Museum.

55. C. PRETIOSUS, *Baly*.

Platycorynus pretiosus, *Baly*, *Descriptions* &c. p. 4.

Hab. India.

In the collections of the Rev. H. Clark and Mr. Baly.

Subg. vii. (*Bathycolpus*, nobis: *Platycorynus*, *Baly*). *Caput* verticale, thoraci profunde insertum; oculis levissime emarginatis. *Antennæ* articulis post 4^{tum} plus minus incrassatis, subcompressis; articulus ultimus apice obtusus: articulus 1^{mus} oblongus, crassus, extus convexus; 2^{dus} quadruplo minor, extus apice convexus; 3^{tus} 2^{do} duplo longior, tenuis, cylindricus; 4^{tus} 3^{tio} brevior, cylindricus. *Thorax* plerumque transversus, anticè globosus, non angustatus, gibbosus, caput ad oculos usque complectens. *Antepectoris processus anterolateralis* triquetrus, ab angulo thoracis suam ipsius longitudinem distans. *Scutellum* rotundatum, interdum utrinque subsinuatum. *Elytra* convexa, parallela, breviuscula,

humeris valde obtusis. *Pedes* breves, validi, ungues appendiculis parvis, vix apice liberis.

56. *C. IGNICOLLIS*, Hope.

Hope, *Trans. Ent. Soc.* vol. iv. p. 17.—*Chrysochus thoracicus*, Baly, *Ann. & Mag. N. H.* August 1859.

C. oblongus, convexus, cylindricus, cæruleo-niger, capite æneo-viridi; thorace aureo, splendido, subtiliter punctulato; antennis nigris, articulis 4 basalibus apice fulvescentibus; elytris fortiter striato-punctatis, striis apicem versus levioribus.

Long. $3\frac{3}{4}$ lin.; lat. hum. $1\frac{2}{3}$ lin.

Face metallic green, tinged with gold between the eyes, longitudinally furrowed, distinctly and rather closely punctate. Eyes golden. Antennæ of the ♂ twice as long as the thorax, of the ♀ shorter, the apical joints much dilated, almost as in *Corynodes*; the minute 12th joint triangular, exerted. Thorax globose and scarcely angustate in front, rounded at the sides, rather narrower than the elytra, punctulate when seen under a lens, bright coppery or gold-coloured. Elytra parallel, cylindrical, of the ♂ elongate and rather narrow, of the ♀ broader and more convex; very obtuse at the shoulders, punctate-striate, the punctures more profound towards the humeral angles. Underside and legs black, with or without a bluish tinge; pubescence of the tibiæ and tarsi fulvous.

Hab. China.

Var. Thorax concolorous with the elytra.

Frequent in collections.

Genus ACROTHINUM, *nobis*.

Caput verticale, ad oculos thoraci insertum, oculis prominulis, ovatis, supra ampliatis, integris. *Antennæ* articulis 5 ultimis leviter dilatatis, compressis; articulo 1^{mo} magno, ovato; 2^{do} cylindrico, curvato, brevi; 3^{tio} ad 6^{tum} elongatis, filiformibus; 6^{to} brevior quam præcedens; 7^{mo} conico, cæteris longiore; ultimo apice triangulo, s. acuminato. *Thorax* transversus, elytris parum angustior (♀), s. oblongus, attenuatus, elytris multo angustior (♂); antice et lateribus rotundatus, basi truncatus, post oculos vix bisinuatus. *Antepectoris processus anterolateralis* trigonus, ab angulo thoracis suam ipsius longitudinem distans. *Scutellum* semiellipticum. *Elytra* (maris) lata, brevia, dorso subdepressa, lateribus parallelis, apice subito clausa; (feminæ) magis oblonga et convexa; in utroque sexu antice transversim subimpressa. *Pedes* longi, validi, tibiis extus apice fortius angulatis: unguium appendiculis vix apice liberis.

Type of the genus, *Chrysochus Gaschkevitchii*, Motsch. Etud. Ent. ix. p. 23. The more strongly dilated antennæ appear to separate this insect from *Chrysochus* and to approximate it to *Corynodes*, while in habit it more resembles the former genus. It is a common insect in Japan and Northern China, and has been named after Madame Gaschkevitch, wife of the Russian envoy at Khakodody.

GENUS CHRYSOCHARES, *Moravitz*.

Moravitz, Horæ Soc. Ent. Rossicæ, t. i. p. 159.—*Chrysomela*, Linn., *Pallas*.—*Eumolpus*, *Fab*.—*Chrysochus* of modern writers.

C. ASIATICUS, *Linn*.

Linn., Gmelin, i. 4. p. 1670. no. 91. *Pallas, Icon. t. G. fig. 1. Fab. El. i.*
419. 3. *Schönh. Syn. Ins. i. 2. p. 234. no. 5. Küst. Käf. Eur. i. 97.*

Hab. S. Russia, Caucasus.

Common in collections.

GENUS CHRYSOCHUS, *Redt. Fn. Austr.* 894.

Moravitz, Horæ Soc. Ent. Ross. t. i. p. 159.—*Chrysomela* et *Eumolpus*, *Fab.*, &c.—*Cryptocephalus*, *Schneider, Mag.* p. 218.

1. C. PRETIOSUS, *Fab*.

Fab. Ent. Syst. i. 324. 85; El. i. 419. 5. Panz. Fn. 44. 13. Schneider, l. c.
no. 20. *Schönh. Syn. Ins. i. 2. p. 235. no. 8. Küst. Käf. Eur. i. 96.*

Hab. Central and Southern Europe; Central Asia.

Common in collections. This species appears to have a wide range; four individuals in Mr. Clark's collection, ticketed "China," are indistinguishable from those of Europe.

2. C. PUNCTATUS, *Gebler*.

Gebler, Bull. Mosc. 1860, no. 3. p. 36.—*Hab.* Kirghiz Steppes.

I have not seen this species.

3. C. CHINENSIS, *Baly*.

Baly, Ann. & Mag. N. H. August 1859.—*Hab.* N. China.

In the collections of the Rev. H. Clark and Mr. Baly. It is perhaps the same as *C. exquisitus*, Eschscholtz, from Dauria. Some insects of Chevrolat's collection, bearing this name, are rather smaller than the Chinese examples, but present no other difference whatever. Having been unable to find any description of *C. exquisitus*, Esch., I conclude that the name is only MS.

4. C. PULCHER, *Baly*.

Baly, Descriptions &c. p. 1.—*Hab.* Malay peninsula.

Discovered by M. Mouhot, and in the collections of the Rev. H. Clark and Mr. Baly.

The following species are from North America; they are somewhat more elongate in form, but possess no characters sufficiently salient to justify the establishment of a new genus.

5. *C. AURATUS*, *Fab.*

Fab. Ent. Syst. i. 325. 87; *El.* i. 419. 6. *Oliv.* 903, pl. 1. fig. 12.

T. W. Harris, Massachusetts Reports, Insects, p. 108.

Hab. United States. Common in collections.

6. *C. COBALTINUS*, *Lec.*

Leconte, Reports of Surveys &c. no. 1. p. 67.

Hab. Oregon and California.

In the collections of the Rev. H. Clark and the British Museum.

7. *C. CALIFORNICUS*.

C. elongatus, cylindricus, cæruleo-viridis, metallicus; oculis rufis, antennis piceis; thorace subtiliter punctulato, punctis majoribus interjectis, antice gibboso, lateribus rotundato-ampliatis, basin versus subrectis, angulis posticis rectis; elytris confertim punctulatis; scutello lævi, purpureo; pedibus cæruleo-viridibus.

Long. 5 lin.; lat. hum. $2\frac{1}{4}$ lin.

This and the two next are allied to *C. cobaltinus*, Leconte. The present species differs from that insect in being somewhat larger, and of a shining bluish-green colour, instead of dark blue. The thorax is broader in proportion, much more gibbous at the sides and in front, and more profoundly punctured. The underside and legs are concolorous, thinly scattered with short pale ferruginous hairs; the claws are pitchy.—*Hab.* California.

8. *C. TENEBRICOSUS*.

C. præcedenti affinis, totus ater, minus nitidus; thorace antice parum gibboso, lateribus rectis, basin versus vage et fortiter punctato, præsertim apud angulos posticos.

Long. 5 lin.; lat. hum. $2\frac{1}{2}$ lin.

Distinguished from the preceding, and from *cobaltinus*, Leconte, by the thorax, which is neither gibbous in front nor laterally dilated. The scutellum is brown, shining, and impunctate. The elytra are broader in proportion to their length than those of *Californicus*, but similarly punctured. The entire insect is of a black colour, slightly tinged with dull blue, and on the elytra, in certain lights, with purple.

Hab. California.

9. *C. CASTANEUS*.

C. elongato-ovatus, subdepressus, supra saturate castaneus, nitidus, punctulatus; subtus testaceus; antennis pedibusque castaneis.

Long. 4 lin.; lat. hum. $1\frac{3}{4}$ lin.

Vertex finely punctured, with a deep oblong vulviform impression. Thorax transverse, very slightly dilated at the sides, not distinctly gibbous in front, densely covered with irregular punctures of two different sizes, which are especially numerous towards the posterior angles. Elytra more finely punctulate, the punctules forming indistinct striæ. Beneath pale testaceous, the sternal plates and legs darker, inclining to castaneous.—*Hab.* California.

The coloration of this species, so different from its congeners, might induce the suspicion of its being immature. If so, it is still distinct from any other species that I have met with.

Notice of a nearly Complete Skeleton of a *Dinornis*, presented by Dr. GIBSON to the MUSEUM of the Yorkshire Philosophical Society. By THOMAS ALLIS, Esq., F.L.S., Hon. Sec. Yorksh. Phil. Soc.

[Read June 16, 1864.]

(Abstract.)

IN the course of last summer, Mr. Allis had an opportunity, on the occasion of Dr. Gibson and his brother, who is a resident in New Zealand, visiting the Museum of the Yorkshire Philosophical Society, to suggest to those gentlemen how desirable it would be if the Museum could obtain some bones of the *Moa*, of which it possessed only a single small fragment. Mr. Allis was, at the same time, anxious to procure a specimen of the *Apteryx*, with a view of his tracing out the rudimentary wing-bones in that bird.

A few weeks since, Mr. Allis was informed by Dr. Gibson that his brother had succeeded in obtaining a perfect skeleton of the *Moa*, as well as an *Apteryx* and some of its eggs, all of which had been forwarded to England. This collection reached the York Museum at the end of May, and, when examined, was found to contain a very nearly complete skeleton of a gigantic species of *Dinornis*, together with numerous bones belonging to four distinct young birds of the same species. The best-marked of these bones were an ischium, an os pubis, a few ribs, and a small cruciform bone (the immature sternum). Before the skeleton was mounted, some photographic views of the bones were taken, copies of which were exhibited to the Society. One of the photographs shows the inner aspect of the sacrum; the three anchylosed vertebræ adjoining the sacrum, with their ribs still attached by cartilage to them;

the next dorsal rib, attached in like manner; the bones of the inner toe of the left foot, kept in position by cartilage; the phalanges exposed on their upper surface, with the periosteum entire, but retaining on their under surface the whole of their cartilage and also the outer integument of the sole. The head, with the exception of the loss of the left zygomatic bone, is as perfect as it would have come from the hands of the most expert anatomist, and without a trace of foreign matter on its surface. The tympanic bones retain the normal action they have in the living bird. A portion of the outer skin adheres to one of the fibulæ. Three of the dorsal ribs have articulating surfaces and cartilage at their lower end,—evidence of there being three sternal ribs on each side, although but two are represented in the only published figure Mr. Allis has had access to. The sternum is also shown with three of its ribs *in situ*; the sides of that bone are unsymmetrical, probably arising from injury in early youth. The second photograph shows the femur, with the still flexible *ligamentum teres* and the articular cartilage on its head, and having a portion of skin attached to it; a view of the under surface of the head, with its detached mandible; a view of the sternum, showing its anterior border, with the fossæ, in which are the articulating surfaces for the attachment of the anterior limbs; the tarsus; and an outer view of the pelvis; together with a considerable portion of the skin, studded with the quill-parts of the feathers, which are bifid as in the Emu; some of the feathers preserve a portion of the web.

A bystander attempted, by a sudden jerk of the hand, to pull out one of the feathers, but did not succeed in doing so; the feather would neither move nor break, but, slipping through the fingers, retained its position, texture, and elasticity alike uninjured.

Besides these parts, the same photograph exhibits a view of the eight caudal vertebræ, retained in their proper relative position by the cartilage on their under surface; and the os coccygis, which differs in form from that of any other bird, having two finely-pointed processes pointing upwards, beautifully preserved.

The other bones received consist of nine true cervical vertebræ; how many are wanting is unknown, but at least two or three, as well as the atlas; two dorsal vertebræ with short ribs (the upper pair is wanting); next in order a single vertebra, with the left rib attached; then three others normally ankylosed, and all with the left rib attached to them. The first sacral vertebra has one

of its ribs attached by cartilage, the other detached; the next two have ribs ankylosed to them. Of the nine left dorsal ribs, seven retain their cartilaginous attachment to the vertebræ just as they were when the bird was alive, and one of the nine is missing. The posterior limbs are perfect, except in the loss of the middle toe of the left foot. When all the bones had been placed in proper order on the table, one was left for which no place could be found, the unusual shape of which rendered it difficult to form an opinion as to what it was; it was evident, however, that it belonged to an adult bird; and Mr. Allis soon convinced himself that it was the rudimentary wing-bone for which he had before sought in vain; it was less than an ounce in weight.

The most striking peculiarity of this skeleton is its great strength, especially in the neck. The cervical vertebræ want those acicular processes which are found on the under side of those bones in the Ostrich, and bear in this respect a closer resemblance to those of the Emu.

The bones wanting to complete the skeleton are the left zygomatic, the atlas, two or more of the upper cervical vertebræ, the first pair of dorsal ribs, the first pair of sternal ribs and the third left sternal rib, one of the rudimentary anterior limbs, and the left middle toe.

With respect to the species of *Dinornis* to which these bones belong, Mr. Allis is uncertain. Looking at the general character of the skeleton, no more appropriate name could be found than "*robusta*;" but whether it be *D. robusta* of Prof. Owen is doubtful. Dr. Gibson has carefully measured the leg-bones, and does not find them agree in all respects with any described by Prof. Owen, though the difference, Mr. Allis suggests, may possibly be only sexual.

It appears that the skeleton was discovered by some persons who were on a "prospecting" expedition in search of gold, almost completely buried in a heap of sand, and having beneath it the bones of the four young ones. Judging from the condition of the cervical vertebræ, Mr. Allis is of opinion that the bird was buried with its body and head bent down, whilst the neck, arching upwards, was more exposed,—all the bones of the trunk and limbs, and of the head itself, being perfectly preserved, and apparently in a quite fresh condition, with their articular cartilages entire, and ligaments flexible and strong; whilst the middle cervical vertebræ were much weather-worn, and evidently had suffered from exposure above the surface of the ground.

The Œsophagus of the Ruminantia*. By WILLIAM RUTHERFORD, M.D., Resident Surgeon, Royal Infirmary, Edinburgh; formerly Demonstrator of Anatomy at the Royal College of Surgeons, Edinburgh; President of the Royal Medical Society. Communicated by JOHN ANDERSON, M.D., F.L.S.

[PLATE III.]

[Read June 16, 1864.]

THE muscular structure of the œsophagus of the Ruminantia seems to have been a subject which, nearly two centuries ago, attracted a considerable share of attention; for, in Peyer's work on the Ruminantia, the opinions of no fewer than twelve distinguished anatomists are quoted in reference to it.

In recent times it has not, so far as I have been able to ascertain, been re-examined, except perhaps by Mr. Spencer Cobbold (Todd's Cyclopædia of Anatomy and Physiology).

I have not been able, however, to meet with any description which at all approaches the truth. I will briefly allude to the opinions of previous authors before giving the results of my own investigations.

The first writers on this subject appear to have been Apopenensis and Æmylianus, who said that the muscular fibres are arranged in two layers, the outer consisting of longitudinal, the inner of transverse fibres.

Aquapendentius and Guilandinus accepted this description; and Galen expressed the opinion, that while the food was swallowed by all the fibres, it was returned to the mouth through the action of the transverse ones only. On the other hand, Fabricius and Fallopius went so far as to say that the Ruminant's œsophagus contained no muscular fibres at all, but that it was composed of a peculiar tissue met with in no other part of the animal.

Stenson described the muscular fibres as forming double spirals, the bundles running spirally from one end of the œsophagus to the other, forming two layers, which interlace at two raphes; so that the same bundle, while running from one end to the other, lies alternately in the inner and outer layer.

* Being a portion of a Thesis for which a Gold Medal was awarded by the Senators of the University of Edinburgh at the Graduation in 1863. The Thesis was accompanied by numerous dissections and models, which were examined and approved of by Professor Goodsir and the other Members of the Medical Faculty, and are now in the University Museum.

Bartholinus and Grew's accounts somewhat resemble this; but they thought that there was an internal and also an external series of double spirals. Ducernus, Delphinus, and Willis adopted Stenson's description; and Peyer's account, though evidently intended to be original, does not differ from Stenson's, excepting that it is a more lucid and intelligible exposition of a mistaken notion as to the structure.

Monro (Secundus) has, in a thesis on dysphagia, mentioned the fact that the muscular fibres in the Ruminant's gullet cross each other like the lines of the letter X. But this was nothing new; it had been pointed out long before; and it is a fact which any one might perceive almost at a glance.

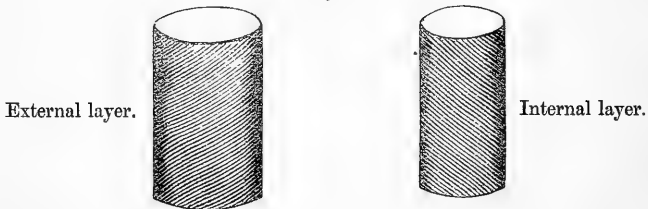
Dr. Spencer Cobbold's description* is the latest. He says that the muscular fibres are arranged in two layers, the *outer* "transversely circular," the *inner* "obliquely longitudinal."

These descriptions are all incorrect. Certainly Stenson's is nearer the truth than any of the others; but it is, nevertheless, wide of the mark.

After prolonged and careful dissection, I feel convinced that the following will be found to be the true description.

The muscular structure of the œsophagus consists of two layers of fibres running in an oblique direction. The fibres of both layers do not, however, run in the same direction, but cross each other like the letter X. The two layers are everywhere

Fig. 1.

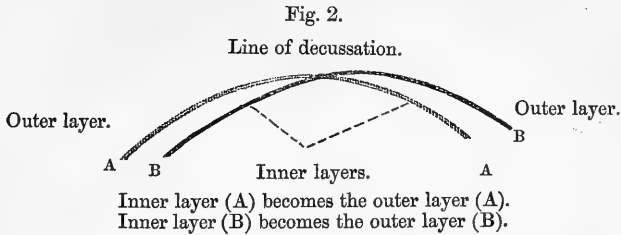


separable, except at two lines, which are exactly opposite each other, and run from one end of the gullet to the other, dividing it longitudinally into two symmetrical halves. (Plate III. fig. 2.)

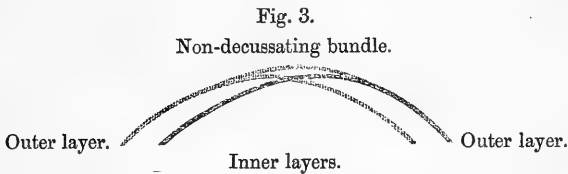
These lines I shall call the *decussations*; for there the two layers intermingle, the inner layer of either side passing out to become the outer layer of the opposite side; that is to say, the inner layer of one side passes outward, to become the outer layer

* Todd's Cyclopædia of Anatomy and Physiology.

of the opposite side, and, in so doing, crosses and interdigitates with the inner layer of the other side as it runs outwards also.



On examining one of the lines of decussation more minutely on both its outer and inner aspects (Plate III. figs. 1 & 3), it will be observed that, whereas internally the crossing is clear and distinct, externally it is obscure. This is caused by bundles of fibres of the outer layer, which, instead of dipping down to become internal, continue over the decussation to the outer layer of the other side (Plate III. fig. 1, A). These fibres, for the sake of convenience,



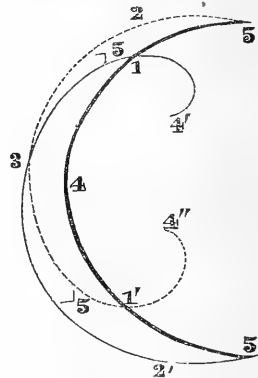
may be termed the non-decussating bundles—an incorrect term, however; for, if these bundles be traced round to the other line of decussation, they will *always* be found to decussate there, and pass into the inner layers. Further, the concavity of the non-decussating bundles (for they all run obliquely) (fig. 7) looks at the one decussation upwards, at the other downwards. At both decussations, *all* the fibres of the inner layers run into the outer layers; but *all* the fibres of the outer layers do not, in like manner, run into the inner layers, but the *half* of the fibres of the outer layer of one side *over* the decussation into the *outer* layer of the other side; and whether you trace these non-decussating bundles upwards from the one decussation, or downwards from the other, they will always be found to decussate at the decussation of the opposite side, so that they do not form a layer of *circular* fibres.



The great difficulty in ascertaining the structure lies in tracing these non-decussating bundles from one decussation to the other; for an intermingling of the fibres of the outer layer takes place between the decussations (Plate III. fig. 2, F). The non-decussating bundle (which is external to everything at the one decussation), when traced downwards, *e.g.*, gets below the non-decussating bundle coming up from the other decussation; while the latter, in turn, gets below the former; so that at both decussations the non-decussating bundles are necessarily external, while the decussating bundles are internal (*vide* Fig. 7).

It would be an easy task to trace these bundles in the outer layer, did the fibres of both bundles not intermingle as they cross each other; but the bundles break up into their finest fibres, thereby rendering the interdigitation very minute and difficult to trace (Plate III. fig. 2, F). I have often failed to do so, but I have succeeded a sufficient number of times to warrant my advancing the above description as correct. Now, *all* the fibres of the inner layers, whether traced upwards or downwards, will always be found to decussate (except at the lower end of the œsophagus); and if they be traced onwards in the outer layers, they will be found to form the non-decussating bundles at the *next* decussation (*vide* Fig. 7, A' & B'). This being true, the structure is simply this:—Each bundle of fibres forms a perfect loop, which crosses the œsophagus obliquely three times (Fig. 6). That is to say, a bundle of fibres (A, Fig. 6) in the outer layer, which runs over a decussation without decussating, when traced round to the other decussation (c) is there found to decussate and pass into the inner layer (F F), in which it crosses the gullet a second time and again decussates (D), passing into the outer layer (E E), in which it crosses the gullet for the third time, and forms at B the non-decussating bundle; so that the one *extremity* (so to speak) of the loop is *above*, on the one side of the œsophagus, while the other extremity is *below* and on the

Fig. 5.
Diagrammatic representation of the course of the fibres in one lateral half of the gullet, including both decussations.

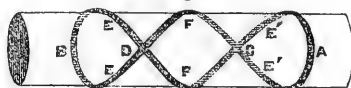


- 1, 1'. The two lines of decussation.
- 2, 2'. Non-decussating bundles.
3. Crossing of the fibres forming the outer layer.
- 4, 4', 4''. Inner layers.
5. Outer layers.

opposite side. The same bundle is twice in the external, but only once in the internal layer; hence it is that the outer layer contains twice as many fibres as the inner layer; it is not, however, twice as thick, because it contains much less cellular tissue than the inner layer, and is, in consequence, more compact than that layer.

The fact which must more especially be borne in mind is, that the bundles of the inner layer, when traced either upwards or downwards, *always* decussate at the nearest decussation; and when traced onwards in the outer layers they form the non-decussating bundles at the next decussation. If this fact be for a moment thought over, it will be seen how impossible it is to draw from it any but the above conclusion as to structure, viz. that the bundles form perfect loops, crossing the gullet three times (Fig. 6). The manner in which the loops are linked

Fig. 6.



Drawing from a model made with an india-rubber band upon a cylinder of wood. It shows the essential element in the structure, viz. a continuous band of fibres crossing the œsophagus three times; it begins at A (which is a line of decussation) on one side, and ends at B (the other line of decussation) as a *non*-decussating bundle on the other side. At A, B, and E, E', it is in the outer layer; it decussates at C and D, between which, F, F', it is in the inner layer; so that it is twice in the external, but only once in the internal layer: it decussates at both decussations C and D, and also forms non-decussating bundles at both A and B.

together, so as to form a continuous tube, is extremely ingenious. A diagram will, however, explain the arrangement better than any description (Fig. 7).

Fig. 7.



Drawing from a model made with three india-rubber bands instead of one, to show how the bands are connected one to another.

When the band 1 is decussating for the second time at A', the band 2 begins as the *non*-decussating bundle, which, it will be observed, is external to the decussating bundles; as the second band runs round to the opposite decussation, B', it gets in below the first band, which ends at B' (external to the second bundle) as the *non*-decussating bundle. In the drawing, the first band has been folded round the second band between A' and B'. The same arrangement as that described occurs when a third band is added (between A'' and B''), and so on.

The first turn of the first band (A) and the last turn of the third band (B''') are necessarily incomplete, owing to the want of other bands. Between A and

B, A' and B', A'' and B'', A''' and B''', the bands form the outer layer, which, however, is structurally complete only between A' and B', A'' and B''. The bands form the inner layer between B and A', B' and A'', B'' and A'''. The inner layers, unlike the outer, are, on the model, all perfect; it will be observed that they contain only single bands, and are, in consequence, only half as thick as the outer layers between A' and B', A'' and B'', which have double bands.

The whole could be converted into a solid tube by multiplying the bands, thereby filling up the open spaces.

Just before the gullet joins the stomach, the inner layer becomes very much thicker than the outer layer, owing to the presence of circular fibres, which probably act as a sphincter.

Two other theories suggested themselves to me in the course of my investigations:—First, that although a perfect loop, the bundle might be longer than I now suppose it to be; that is, instead of crossing the œsophagus only thrice, it might do so oftener, say five or seven times (Fig. 8). This I soon abandoned; for I

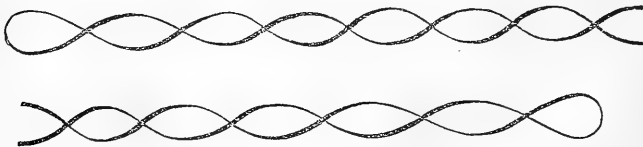
Fig. 8.



found that *all* the fibres of the inner layer, after passing into the outer, become non-decussating at the next decussation, which could not be the case if the loop crossed the gullet more than three times; and, moreover, I found that at a decussation the *non*-decussating bundle is as large as the decussating bundle, which could not be the case were this long-loop view correct.

The same facts overthrew the other theory which suggested itself to me, viz. that the fibres form long bundles, beginning by loops at the decussations—at one decussation the convexities of the loops pointing downwards, and the bundles running spirally to the upper extremity of the œsophagus, while at the other decussation the convexities of the loops point upwards, and the bundles run spirally towards the lower extremity. According to

Fig. 9.

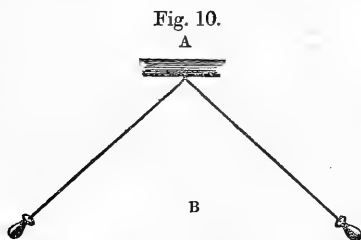


this view, the gullet would certainly have been of equal thickness throughout; but its truth is negated by the same facts which oppose the long-loop view, viz. that the *non*-decussating bundles at the decussation are as large as the decussating bundles, and

all the fibres of the inner layer, when traced round in the outer layer, become non-decussating at the first decussation at which they arrive after having entered the outer layer*. I have calculated that, were this last theory true, the decussating bundle, at a decussation, would be ten times as large as the non-decussating; because a spiral running from the one end of the œsophagus to the other would cross it nine or ten times.

Now, what is the use of this remarkable and beautiful arrangement of the fibres? Is it to enable the animal to ruminate? It would be difficult to conceive why so elaborate and ingenious a structure should be required to bring the food *back* from the stomach; for the simpler human œsophagus, with its longitudinal and transverse layers, ought to be just as able to carry the food *up* from the stomach as to take it down; and that it is so is shown by the act of vomiting. And further, the idea that it is a special provision for rumination is proved to be erroneous by the fact (as I have ascertained) that the œsophagus of the dog has the same structure as that of the Ruminant. I have not examined the œsophagus of any of the other Carnivora; but the above is true of the dog's, at any rate.

The advantage gained by a structure such as this, seems to be, 1st, *rapidity of transmission*. A body at A, if pulled by two oblique strings, will be advanced to B more rapidly than if these strings were pulled directly before the body, supposing the power



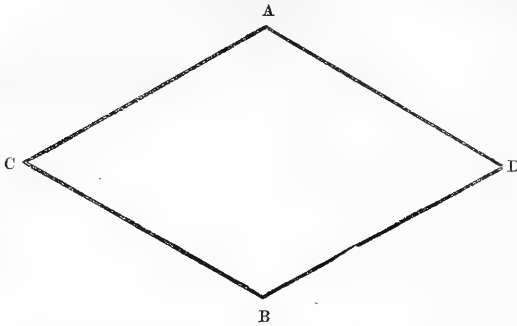
moves at the same rate in both cases. When the strings are oblique, however, although rapidity of transmission is gained, there is a loss of power.

A bundle of fibres of the inner and outer layers, when viewed in relation one to another, form a parallelogram (*vide* Fig. 11).

* I have frequently used the term "layer" both in the singular and plural numbers: *e. g.* the term "inner layers" refers to the internal layers of both of the symmetrical halves into which the œsophagus may be longitudinally divided, while "inner layer" refers to the internal layer of one of these halves.

During contraction, the points A and B, and also c and D, are approximated. By the approximation of A to B the gullet

Fig. 11.



is more rapidly *shortened*, and by the approximation of c to D it is more rapidly *constricted*, than is the human gullet by the action of the longitudinal and circular fibres; and thereby a bolus is carried more rapidly along the Ruminant's gullet than along Man's, or that of a Bird with its circular fibres only. This is a great advantage in the case of the Ruminant; for the slow passage of so much food backwards and forwards would very seriously interfere with respiration by pressing upon the trachea. But, on the other hand, why should the carnivorous animal have such an œsophagus? This fact renders necessary a second explanation, viz. *that by this arrangement great strength is gained*. The same number of fibres as are present in the human gullet would form a much stronger and more compact tube if interwoven in a manner similar to that in the Ruminant's œsophagus; for the fibres are so closely interlaced, that separation of them is extremely difficult; while, in the human gullet, the fibres are more apt to separate when pressing upon a hard bolus. And as the muscular tunic of even the dog's and sheep's gullet is thicker than that in the human subject, *strength*, in addition to rapidity of transmission, is certainly gained. I have often been astonished (before I knew the structure of its gullet) at the large masses of unchewed food which a dog can readily swallow.

I have examined the sheep's œsophagus more especially; for that of the ox, though having the same structure, is much more difficult to dissect on account of the greater brittleness of its fibres when boiled. I have not examined the gullet of any other Ruminant, as I have been unable to procure any other.

Finally, the Ruminant's œsophagus differs widely from the human as regards the microscopic character of its muscular fibre; for while in the human gullet there is a mixture of striped and unstriped fibres, in the Ruminant's they are all of the striped variety.

In conclusion, I have to acknowledge my obligations to my friend Mr. Deas, to whose kindness I owe the beautiful and very accurate drawings which illustrate this paper.

EXPLANATION OF THE PLATE.

PLATE III.

- Fig. 1. Portion of sheep's gullet, twice the natural size (seen from within). The fibres of the internal layer, *c c*, are seen decussating and running into the external layer, *b b*; while at *A* is seen a *non*-decussating bundle passing outside the decussation, from the outer layer of the one side of the decussation to that of the other side.
- Fig. 2. The entire circumference of a sheep's œsophagus, seen from within (natural size). It has been simply slit open and dissected. Above, *A'*, *A''*, are seen the two lines of decussation; *B*, a bundle of fibres which has not decussated at the decussation *A'*; and *c*, a similar bundle which has not decussated at *A''*. *D*, a bundle of fibres of the inner layer which decussates at the line of decussation *A''*; and *E*, a similar bundle which decussates at the line *A'*. *D* runs up to form *B*, and *E* goes to form *c*, both in the outer layer; below *F* they separate into their finest fibres and interdigitate one with another. *G G*, outer layer.
- Fig. 3. Two portions of the œsophagus of a sheep (natural size), to show the difference between the inner and outer aspects of the line of decussation. In *A* it is seen from the inside. All the fibres decussate, so that the decussation is sharp and well defined; but on the outside, *B*, it is much obscured by the *non*-decussating fibres, which, instead of dipping down as in *A*, run across from one side of the line to the other. *G G*, outer layers. *D*, inner layer.

Descriptions of New Species of Hymenopterous Insects from the Islands of Sumatra, Sula, Gilolo, Salwatty, and New Guinea, collected by Mr. A. R. WALLACE. By FREDERICK SMITH, Assistant in the Zoological Department, British Museum. Communicated by W. W. SAUNDERS, Esq., V.P.L.S.

[PLATE IV.]

[Read June 2, 1864.]

THE collections of Hymenoptera which are described in the following list contain several insects of especial interest. Three new

genera of Formicidæ are characterized. The insect which forms the type of the new genus *Cephaloxys* is one of the most anomalous forms hitherto discovered, belonging to the Cryptoceridæ: viewed above, it would appear to be a blind Ant; but further examination reveals the fact of the eyes being situated on the underside of the head—a circumstance unparalleled in the Formicidæ. Figures of some of the more interesting genera and species are given, including the Tenthredinidous genus *Cladomacra*, the males of which have the antennæ beautifully pectinated. A new species of the genus *Pterochilus* is described, and is undoubtedly the finest discovered belonging to that genus of Wasps.

Fam. TENTHREDINIDÆ, *Leach*.

Gen. SELANDRIA, *Leach*.

1. SELANDRIA DORYCA, *Smith, Proc. Linn. Soc.* v. p. 135.

Hab. Salwatty.

Gen. CLADOMACRA, *Smith*. (Pl. IV. fig. 1, ♂.)

1. CLADOMACRA MACROPUS, *Smith, Ann. & Mag. Nat. Hist.* (1860) vi.

Hab. New Guinea.

Fam. CHRYSIDIDÆ, *Leach*.

Gen. CHRYSIS, *Latr.*

1. CHRYSIS INTRUDENS. *C. viridi-cyanea*; capite thoracque confertissime punctulatis; abdominis segmentis delicatule punctatis, apice sex-dentato; alis subhyalinis.

Length $4\frac{1}{2}$ lines. Blue-green, abdomen brightest green and subopaque; head and thorax closely and strongly punctured; the flagellum black; the tarsi fuscous, with the basal joint green outside; wings subhyaline. Abdomen finely punctured, the basal segment most strongly so; the extreme base of the second and third segments blue-black; the apical segment with six acute spines.

Hab. New Guinea.

This species belongs to the fifth section of the eighth phalanx of Dahlbom's divisions of the Chrysididæ, and is evidently quite distinct from any of the species described by that author.

Fam. EVANIADÆ, *Leach*.

Gen. MEGISCHUS, *Brullé*.

1. MEGISCHUS CORONATOR, *Fabr. Syst. Piez.* p. 118 (♀).

Hab. Morty Island; Salwatty.

Fam. ICHNEUMONIDÆ, *Leach.*Gen. MESOSTENUS, *Brullé.*

1. MESOSTENUS MULTIPICTUS,
- Smith, Proc. Linn. Soc. vii. p. 8.*

Hab. Salwatty.

2. MESOSTENUS ARROGANS.
- M. niger*
- ; antennis medio albis; thorace pedibusque albo variegatis; abdominis marginibus fasciis albis; alis hyalinis.

Female. Length 5 lines. Black; the face, mandibles, inner orbits of the eyes, and the sixth to the fourteenth joints of the antennæ white. The thorax finely punctured above; a spot on each side of the prothorax, the tegulæ and a spot beneath them, the scutellum, and the margin of the truncation of the metathorax white; the anterior and intermediate legs, a spot on the posterior coxæ above, the base of the trochanters, the outside of the tibiæ, and two basal joints of the tarsi white; the anterior and intermediate tarsi and the apical joints of the posterior pair fuscous; three white spots on each side of the thorax; the metathorax with two spines; the wings hyaline and iridescent; the posterior femora ferruginous. The apical margins of the segments of the abdomen white; the fifth segment has a widely interrupted fascia in the middle.

Hab. New Guinea.Gen. CRYPTUS, *Fabr.*

1. CRYPTUS TARSATUS,
- Smith, Proc. Linn. Soc. vii. p. 7.*

Hab. New Guinea.

2. CRYPTUS VOLATILIS,
- Smith, Proc. Linn. Soc. vii. p. 7.*

Hab. New Guinea.

3. CRYPTUS DUCALIS.
- C. ferrugineus*
- , mandibulis thoraceque lateribus nigris; abdominis angulis duabus nigris; alis flavo-hyalinis.

Female. Length 10 lines. Ferruginous; the antennæ pale ferruginous, with ten or eleven of the apical joints black; the mandibles bidentate, their tips black. An indistinct fuscous stripe on each side of the mesothorax above; the sides of the thorax and the posterior coxæ black; the wings yellow hyaline, the nervures ferruginous. Abdomen with two black rings; the first narrow and situated at the base of the second segment; the other broad, occupying the third, fourth, fifth, and base of the sixth segments; the seventh segment with two black spots at its base; the second segment also has two indistinct spots beyond the black band; the ovipositor the length of the abdomen.

Hab. Morty Island.Gen. PIMPLA, *Fabr.*

1. PIMPLA INSIDIATOR,
- Smith, Proc. Linn. Soc. vii. p. 9.*

Hab. New Guinea.

2. *PIMPLA BRACONOIDES*, *Smith, Proc. Linn. Soc.* iii. p. 172.

Hab. New Guinea.

3. *PIMPLA PENETRANS*, *Smith, Proc. Linn. Soc.* iv. p. 173.

Hab. Salwatty.

4. *PIMPLA INTEGRATOR*, *Smith, Proc. Linn. Soc.* v. p. 141.

Hab. Morty Island.

5. *PIMPLA FLAVICEPS*, *Smith, Proc. Linn. Soc.* v. p. 139.

Hab. Morty Island.

6. *PIMPLA OBNOXIA*. *P. flavo-ferruginea*; *antennis nigris*; *alis fuscis*, *basi flavo-hyalinis*.

Female. Length 6 lines. Reddish yellow, the legs and body beneath palest; the thorax shining above; the head pale testaceous; the antennæ black; the wings dark fuscous, their base yellow hyaline, with a subhyaline spot beneath the stigma. Abdomen closely punctured; the first segment with a deep lateral impression; the second, third, and fourth segments with a curved, deep, transverse depression; the ovipositor as long as the body.

Hab. Morty Island.

7. *PIMPLA DILIGENS*. *P. flavo-ferruginea*; *antennis fuscis*; *capite strigisque duabus mesothoracis pallide testaceis*; *alis hyalinis*.

Female. Length 6 lines. Reddish yellow; the antennæ fuscous, slightly reddish beneath; tips of the mandibles black; the head and two longitudinal stripes on the mesothorax pale testaceous; the wings hyaline and iridescent, the nervures black; the extreme base of the posterior tibiæ and the claws fuscous; the ovipositor black, half the length of the abdomen.

Hab. Morty Island.

8. *PIMPLA TRIFASCIATA*. *P. flava*; *antennis maculisque tribus mesothoracis nigris*; *abdomine tribus fasciis nigris*; *alis hyalinis*, *apice fuscis*.

Female. Length $4\frac{1}{2}$ lines. Yellow; the scape behind, a spot enclosing the ocelli, and the flagellum black. Thorax shining, punctured on the disk, and having three subquadrate spots between the tegulæ; wings hyaline, with a narrow fuscous border at their apex, the nervures black; the claw-joint of the posterior tarsi and the extreme base of the tibiæ fuscous. Abdomen with three fasciæ and the aculeus black, the latter half the length of the abdomen.

Hab. New Guinea.

9. *PIMPLA NIGRICORNIS*. *P. ferruginea*; *antennis nigris*; *alis flavo-hyalinis*, *apice fuscis*.

Male. Length 9 lines. Ferruginous; the face and the scape of the antennæ yellow; the flagellum black; the thorax shining, the disk punctured; the mesothorax punctured; the antennæ black; the wings yellowish hyaline, the nervures dark fuscous; the anterior pair with

a dark fuscous cloud at their apex. The abdomen finely punctured and shining.

Hab. New Guinea.

10. *PIMPLA INTERCEPTOR*. *P. lutea*; antennis strigisque tribus mesothoracis nigris; alis hyalinis, apice fuscis.

Female. Length 7 lines. Luteous; the face, and extreme base of the abdomen pale yellow; a triangular spot behind the vertex, a smaller spot enclosing the antennæ uniting with the former, the longitudinal stripes on the mesothorax, the central one running to the scutellum, and the ovipositor black; the scape yellow in front; the legs stout; the wings hyaline, the nervures black, the apex of the anterior wings fuscous; the thorax smooth and shining above. Abdomen reddish yellow towards the apex, punctured, and slightly shining.

Hab. New Guinea.

Gen. *RHYSSA*, *Grav.*

1. *RHYSSA INSTIGATOR*. *R. capite flavo, vertice nigro*; thorace nigro, scabriusculo et flavo maculato; alis hyalinis, anticis fascia fusca ante apicem ornatis; abdomine nigro, segmentis primo et secundo dorso flavo maculatis, tertio, quarto et quinto maculis duabus flavis; tibiis tarsisque ferrugineis.

Female. Length 9 lines, of the ovipositor 13 lines. Head yellow, with the vertex, mandibles, and a minute spot on the front beneath the insertion of the antennæ black; antennæ wanting. Thorax black, rugose, with a transverse striation above; the collar, two stripes on the mesothorax, the scutellum and a spot on the middle of the metathorax, a larger spot on each side, an irregular spot beneath the wings, and a line on the sides of the coxæ yellow; the geniculations of the coxæ, trochanters, and femora, and the tibiæ and tarsi ferruginous; the claw-joint of the tarsi dark fuscous; the wings hyaline and iridescent, the anterior pair with a dark fuscous fascia crossing at the second submarginal cell. Abdomen black; a yellow spot in the middle of the first and second segments, the following segments with a yellow ovate spot on each side, each in succession becoming more oblong; the apical ones forming an oblong curved stripe; the margins of the segments beneath broadly yellow.

Hab. New Guinea.

Gen. *GLYPTA*, *Grav.*

1. *GLYPTA FRACTICORNIS*, *Smith, Proc. Linn. Soc. vii. p. 10.*

Hab. New Guinea.

Gen. *OPHION*, *Fabr.*

1. *OPHION STIMULATOR*. *O. rufescenti-flavus*, antennis abdomineque apice nigris; alis hyalinis, iridescentibus.

Female. Length 10 lines. Bright reddish yellow; the antennæ black, the ocelli placed in a black patch on the vertex. The metathorax rugose, with a series of divergent carinæ running from the centre and

passing down the sides; the wings hyaline and iridescent, the nervures black. The two first segments of the abdomen that form the petiole reddish yellow, the following black.

Hab. New Guinea.

Fam. BRACONIDÆ, *Westw.*

Gen. BRACON, *Fabr.*

1. BRACON PALLIFRONS, *Smith, Proc. Linn. Soc.* iii. p. 176.

Hab. Aru.

2. BRACON JACULATOR, *Smith, Proc. Linn. Soc.* v. p. 141.

Hab. Morty Island.

3. BRACON GRAVIDUS. *B. rufescenti-flavus*; capite luteo; alis brunneo-fuscis, macula hyalina sub stigmatē.

Female. Length 7 lines. Head luteous, the tips of the mandibles and the antennæ black; covered with a fine pale pubescence. The thorax pubescent, the disk very smooth and shining; the wings dark brown, with a minute hyaline spot beneath the stigma, the extreme base of the wings pale; the posterior tarsi fuscous. Abdomen slightly fuscous towards the apex, the fourth and fifth segments with a slightly elevated tubercle in the middle of their basal margins; the ovipositor half the length of the abdomen.

Hab. New Guinea.

4. BRACON FERAX. *B. niger*; thorace pedibusque ferrugineis; tibiis tarsisque posticis fuscis; alis obscure fuscis.

Female. Length $4\frac{1}{2}$ lines. Head and abdomen shining black, the antennæ opaque black; the front below the insertion of the antennæ and the mandibles pale ferruginous; a black spot in the middle of the front. The thorax very smooth and shining; legs stout, and, as well as the thorax, ferruginous, with the posterior tibiæ, tarsi, and coxæ fuscous; wings dark fuscous. Abdomen with a white spot at the sides of the basal segment; ovipositor short, about half the length of the abdomen.

Hab. New Guinea.

5. BRACON FLAVICEPS. *B. capite flavo*, thorace pedibusque pallide ferrugineis; abdomine nitido, nigro; alis fuscis.

Female. Length $4\frac{1}{2}$ lines. Head yellow, antennæ and eyes fuscous. Thorax and legs pale ferruginous, with the claws and pulvilli black; the mesothorax and scutellum very smooth and shining; wings fuscous, their extreme base pale ferruginous; three subhyaline spots beneath the stigma. Abdomen shining black, with a minute white spot on each side of the basal segment; the abdomen pale beneath, with a double row of black spots down the centre; the apical segment produced into an elevated spine; the ovipositor about the same length as the abdomen.

Hab. Salwatty.

Gen. AGATHIS, *Latr.*

1. AGATHIS ATROCEPHALUS,
- Smith, Proc. Linn. Soc. v. p. 142.*

Hab. Morty Island.

2. AGATHIS INTERDICTA.
- A. ferruginea*
- ; antennis tarsisque posticis nigris; alis nigro-fuscis, macula hyalina sub stigmatate.

Female. Length $5\frac{1}{2}$ lines. Ferruginous; the flagellum black; the head, mesothorax, and abdomen smooth and shining; the wings dark fuscous, with an irregular hyaline spot beneath the stigma; the posterior tarsi and apex of the tibiæ black.*Hab.* New Guinea.

3. AGATHIS FENESTRATA.
- A. flavo-ferruginea*
- ; capite, abdominis apice tarsisque posticis nigris; alis nigro-fuscis, macula hyalina sub stigmatate.

Female. Length 5 lines. Reddish yellow; the head and antennæ black; the anterior margin of the clypeus, the labrum, and the mandibles pale reddish yellow. The wings dark fuscous, with an irregular hyaline spot beneath the stigma, the extreme base also pale; the posterior legs stout and pubescent, with the tarsi and tips of their femora black. The fourth and following segments of the abdomen black.*Hab.* New Guinea.Gen. CENOCELIUS, *Halid.*

1. CENOCELIUS INSIDIATOR,
- Smith, Proc. Linn. Soc. vii. p. 12.*

Hab. New Guinea.Gen. SPINARIA, *Brullé.*

1. SPINARIA SULCATA.
- S. rufo-flava*
- ; antennis tarsisque posticis nigris; alis fuscis, basi flavo-hyalinis.

Female. Length 4 lines. Reddish yellow; the antennæ, posterior tarsi, and extreme base of the tibiæ black; the wings dark fuscous, with their extreme base yellow hyaline; the nervures brown; the stigma large, with an irregular subhyaline spot beneath. The head and mesothorax shining; the metathorax with a short blunt spine on each side; the prothorax with the characteristic acute bent spine above. The abdomen longitudinally grooved or striated; the third and fourth segments armed laterally with a stout acute spine. (Pl. IV. fig. 9, ♀.)*Hab.* Gilolo.

This species is quite distinct from the two described by Brullé in the 'Histoire Naturelle des Insectes,' and from that described by Guérin in the 'Voyage de la Coquille' under the name of *Bracon spinator*: our species most closely resembles the latter, but differs in having the wings entirely dark, in having the abdomen deeply striated, and in not having a spine in the middle of the margins of the third and fourth segments of the abdomen.

Fam. FORMICIDÆ, *Leach.*Gen. FORMICA, *Linn.*

1. FORMICA GIGAS, *Latr. Hist. Nat. Fourm.* p. 105.
Hab. Sumatra.
2. FORMICA COMPRESSA, *Fabr. Syst. Piez.* p. 396.
Hab. Sumatra.
3. FORMICA FESTINA, *Smith, Proc. Linn. Soc.* ii. p. 53.
Hab. Sumatra.
4. FORMICA RUFIFRONS, *Smith, Proc. Linn. Soc.* v. p. 95.
Hab. Morty Island, New Guinea, Salwatty.
5. FORMICA CAMELINA, *Smith, Proc. Linn. Soc.* ii. p. 57.
Hab. Sumatra.
6. FORMICA COXALIS, *Smith, Proc. Linn. Soc.* iv. p. 136.
Hab. New Guinea.
7. FORMICA QUADRICEPS, *Smith, Proc. Linn. Soc.* iv. p. 137.
Hab. New Guinea.

8. FORMICA (MYRMECOPSIS) RESPICIENS. *F. nigra, nitida*; mandibulis, scapo, tibiis tarsisque pallide ferrugineis; prothorace abdomineque basi pallide flavis; oculis magnis.

Worker. Length 3 lines. Black and shining; the head oblong, sides nearly parallel; the eyes very large, ovate, extending to the posterior angles of the head; the anterior portion of the clypeus, the mandibles, scape, tibiæ, tarsi, and tips of the femora pale ferruginous. Thorax compressed behind; the prothorax above, the first segment of the abdomen and the basal margin of the second pale yellow; the scale of the peduncle oblong, slightly rounded above. (Pl. IV. fig. 3, ♀.)

Hab. New Guinea.

This remarkable Ant, of which a figure is given, will probably constitute the type of a new genus. The greatly enlarged eyes, placed backwards on the head, give it a different aspect from any species previously described. Unfortunately the only specimen received is in such a mutilated condition that I could not examine the parts of the mouth. Should an examination of more specimens prove my conjecture to be correct, I would propose the name *Myrmecopsis* for the genus.

Gen. POLYRHACHIS, *Smith.*

1. POLYRHACHIS SEXSPINOSUS, *Latr. Hist. Nat. Fourm.* p. 126.
Hab. New Guinea.
2. POLYRHACHIS ITHONUS, *Smith, Proc. Linn. Soc.* v. p. 99.
Hab. Salwatty; Morty Island.

3. POLYRHACHIS BIHAMATUS, *Drury, Ins. ii. pl. 38.*
Hab. New Guinea; Sumatra.
4. POLYRHACHIS ACANTHA, *Smith, Proc. Linn. Soc. v. p. 98.*
Hab. Salwatty; Morty Island.
5. POLYRHACHIS SERICATUS, *Guér. Voy. Coq. Zool. ii. p. 203.*
Hab. Salwatty.
6. POLYRHACHIS CHALYBEUS, *Smith, Proc. Linn. Soc. ii. p. 61.*
Hab. Sumatra.
7. POLYRHACHIS PANDARUS, *Smith, Proc. Linn. Soc. ii. p. 62.*
Hab. Sumatra.
8. POLYRHACHIS EUDORA, *Smith, Proc. Linn. Soc. v. p. 99.*
Hab. Sumatra.
9. POLYRHACHIS VILLIPES, *Smith, Proc. Linn. Soc. ii. p. 61.*
Hab. Sumatra.
10. POLYRHACHIS BUBASTES, *Smith, Proc. Linn. Soc. vii. p. 15.*
Hab. Morty Island.
11. POLYRHACHIS BELLICOSUS, *Smith, Proc. Linn. Soc. iv. p. 142.*
Hab. Morty Island.
12. POLYRHACHIS MARGINATUS, *Smith, Proc. Linn. Soc. iv. p. 139.*
Hab. Gilolo.
13. POLYRHACHIS DIVES, *Smith, Proc. Linn. Soc. ii. p. 64.*
Hab. Sula.
14. POLYRHACHIS DIAPHANTUS, *Smith, Proc. Linn. Soc. vi. p. 40.*
Hab. Sula.
15. POLYRHACHIS RUGIFRONS, *Smith, Proc. Linn. Soc. v. p. 70.*
Hab. Salwatty.
16. POLYRHACHIS ATROPOS, *Smith, Proc. Linn. Soc. v. p. 100.*
Hab. Gilolo.
17. POLYRHACHIS NEPTUNUS. *P. niger*; thorace elongato, supra deplanato, dentibus duobus parvis antice et postice armato; abdominis pedunculo trispinoso.
Worker. Length $2\frac{1}{4}$ lines. Black; the apical joint of the flagellum and the claw-joint of the tarsi rufo-testaceous; tips of the mandibles ferruginous. The head anteriorly striated, posteriorly shagreened as far as the insertion of the antennæ; the extreme base of the scape ferruginous. Thorax flat above; transverse in front, with the lateral angles produced into short acute spines; the sutures of the pro- and mesothorax deeply impressed; the disk shagreened; the metathorax with two short erect spines. Abdomen globose, smooth and shining; the node of the peduncle incrassate, and armed above with three long, erect, acute spines. (Pl. IV. fig. 2, ♂.)
Hab. New Guinea.

Gen. ECHINOPLA, *Smith*.

1. ECHINOPLA MELANARCTOS, *Smith, Proc. Linn. Soc. ii. p. 79.*
Hab. Sumatra.
2. ECHINOPLA STRIATA, *Smith, Proc. Linn. Soc. ii. p. 80.*
Hab. Sumatra.

Gen. ŒCOPHYLLA, *Smith*.

1. ŒCOPHYLLA SMARAGDINA, *Smith, Proc. Linn. Soc. v. p. 101.*
Hab. Morty Island; Salwatty.

Fam. PONERIDÆ, *Smith*.Gen. ODONTOMACHUS, *Latr.*

1. ODONTOMACHUS CEPHALOTES, *Smith, Proc. Linn. Soc. vii. p. 19.*
Hab. Morty Island; Sula.
2. ODONTOMACHUS NIGRICEPS, *Smith, Proc. Linn. Soc. v. p. 103.*
Hab. Dory.
3. ODONTOMACHUS ACICULATUS, *Smith, Proc. Linn. Soc. vii. p. 19.*
Hab. New Guinea.

Gen. PONERA, *Latr.*

1. PONERA STRIATA, *Smith, Proc. Linn. Soc. v. p. 104.*
Hab. Morty Island.
2. PONERA CUPREA, *Smith, Proc. Linn. Soc. v. p. 104.*
Hab. New Guinea; Sula.
3. PONERA SIMILLIMA, *Smith, Proc. Linn. Soc. v. p. 104.*
Hab. New Guinea.
4. PONERA 4-DENTATA, *Smith, Proc. Linn. Soc. iv. p. 143.*
Hab. Sula.
5. PONERA FEROX. *P. nigra*; capite elongato, aciculato; thorace abdomineque lævibus, nitidis; flagello tarsisque pallide ferrugineis.
Worker. Length $4\frac{1}{4}$ lines. Shining black; the head longitudinally aciculate; the prothorax with a few fine striæ anteriorly; the sides of the thorax with a few irregular striæ, otherwise smooth and shining; the node of the peduncle subquadrate and incrassate, and, as well as the abdomen, smooth and shining; the apical segment ferruginous. The mandibles, extreme base and apex of the scape, the flagellum, except the basal joint, and the tarsi and articulations of the legs ferruginous; the calcaria pale testaceous.
Hab. Salwatty.

This species is very like *P. simillima*; but it is a larger insect; and the thorax is smooth and shining; in *P. simillima* it is striated and opaque.

Gen. PACHYCONDYLA, *Smith*.

1. PACHYCONDYLA MELANCHOLICA. *P. nigra*, opaca; antennis, mandibulis, tibiis tarsisque ferrugineis.

Worker. Length 3 lines. Opaque black, the second and following segments of the abdomen finely shagreened; the head oblong; the eyes small, not prominent, and situated near the base of the mandibles; the sides curved, the vertex transverse; the sides of the thorax nearly parallel, the metathorax obliquely truncate; the node of the peduncle rounded anteriorly, truncate posteriorly, and filling the base of the first abdominal segment, but not quite so wide, rugose above. The mandibles, antennæ, tibiæ, tarsi, and knees ferruginous.

Hab. Morty Island.

This species belongs to the genus *Pachycondyla* of my Catalogue, the insects included in which have the body almost parallel, as well as the node of the peduncle, and the calcaria pectinate. Some continental authors have sunk this well-defined genus.

Gen. ECTATOMMA, *Smith*.

1. ECTATOMMA RUGOSA, *Smith*, *Proc. Linn. Soc.* iv. p. 143.

Hab. Sula.

Gen. ANOMMA, *Shuck*.

1. ANOMMA ERRATICA. *A. nigro-ferruginea*; capite antice et abdomine basi pallide ferrugineis; flagello pedibusque ferrugineis.

Worker. Length 2 lines. Obscurely ferruginous; the anterior portion of the head, the mandibles, apex of the scape, and the flagellum pale ferruginous; the scape black; the mandibles with a single tooth inside, their apex curved and very acute. Thorax compressed; the legs ferruginous, the tibiæ and tarsi palest; the legs elongate. Abdomen ovate, the node of the peduncle and the first segment paler than the following segments. The insect impunctate, very smooth and shining.

Hab. New Guinea.

This species is distinguished from the three species of the genus with which I am acquainted by the following particulars: the antennæ are proportionally longer, the scape black, and the legs considerably more elongate.

The discovery of this genus in the Eastern Archipelago is, geographically, a circumstance of considerable interest, all the species previously known being African. Several hymenopterists have adopted the supposed affinity between *Anomma* and *Dorylus*, regarding the former as worker or neuter forms of the latter. This affinity was first suggested by Dr. Savage, but I am not acquainted with a single circumstance even apparently confirmatory of such a supposition. The genus *Dorylus* is very abundant in

India, but I have not seen a single *Anomma* from that country. I am much more inclined to suspect an affinity with *Typhlopone*, which I have frequently observed with *Dorylus* in collections from India, and also from Borneo.

Fam. MYRMICIDÆ, *Smith*.

Gen. MYRMICA, *Latr.*

1. MYRMICA PONEROIDES, *Smith, Proc. Linn. Soc. v. p. 107.*

Hab. Morty Island; Sula.

2. MYRMICA QUADRISPINOSA. *M. nigro-fusca*; thorace spinis duabus antice et postice armato.

Worker. Length 1 line. Dark brown-black, smooth and shining; the mandibles, antennæ, and tarsi pale ferruginous; a longitudinal carina runs from the insertion of each antenna halfway towards the posterior margin of the vertex; ocelli obsolete; eyes small, situated midway at the sides of the head; the head is of the same form as in *Myrmica rubra*; the club of the antennæ 3-jointed, the funiculus 8-jointed. Abdomen very finely striated longitudinally at the base; the peduncle subelongate, the first node conical, the second globose.

Hab. Salwatty. (Pl. IV. fig. 6, ♀.)

It will be seen from the above description that the insect has several characters in common with those of the genus *Myrmica*, in which I have placed it; but the discovery of the other sexes and an examination of the oral organs may render it necessary to separate it from the genus in which it is provisionally placed.

3. MYRMICA MALIGNA. *M. rufo-nigra*; clypeo, antennis pedibusque ferrugineis; capite et thorace dorso longitudinaliter striatis.

Female. Length 5 lines. Obscurely rufous, the head anteriorly and the antennæ bright ferruginous; the head longitudinally and strongly striated above, delicately so beneath. Thorax oblong-ovate; the mesothorax longitudinally striated above, with a smooth shining space down the middle and a narrower one on each side; the prothorax striated, as well as the sides of the metathorax, the latter with a delicate transverse striation above; the scutellum smooth and shining. Abdomen oblong-ovate, smooth and shining, with a few erect glittering white setæ at the apex; the nodes of the peduncle smooth and shining.

Hab. Morty Island.

This is probably the female of *M. aspersa*.

4. MYRMICA ASPERSA. *M. rufo-fulva*; antennis apice pedibusque pallide ferrugineis; capite thoraceque scabrosis; metathorace bispinoso; abdomine ovato, petioli nodis sublævibus.

Worker. Length 2 lines. Varying in brightness of colouring, rufo-

fulvous or dark ferruginous, with intermediate shade of colouring. Head and thorax very coarsely longitudinally rugose, the head deeply striated; mandibles smooth and pale ferruginous; the metathorax with two long, divergent, acute spines; the articulations of the legs and the tarsi pale ferruginous. The abdomen and nodes of the peduncle smooth and shining.

Hab. Morty Island.

5. *MYRMICA DILIGENS*. *M. capite abdomineque nigris; antennis, mandibulis, thorace pedibusque pallide ferrugineis; metathorace spinis longis acutis armato.*

Worker. Length 2 lines. Head black, smooth and shining, anteriorly obscurely ferruginous; a few abbreviated longitudinal striæ above the clypeus; the mandibles pale ferruginous; the antennæ ferruginous, palest towards their base. The thorax, legs, and first node of the abdomen pale ferruginous; the thorax coarsely rugose; the metathorax armed with two long acute spines, extending to the second node of the abdomen. Abdomen ovate, very smooth and shining.

Hab. New Guinea.

Gen. *PODOMYRMA*, *Smith.*

1. *PODOMYRMA SYLVICOLA*, *Smith, Proc. Linn. Soc. v. p. 110.*

Hab. Morty Island.

2. *PODOMYRMA BASALIS*, *Smith, Proc. Linn. Soc. iv. p. 147.*

Hab. New Guinea.

Gen. *PSEUDOMYRMA*, *Güér.*

1. *PSEUDOMYRMA RUFONIGRA*, *Jerdon, Madr. Journ. Lit. and Sci. iii. p. 53.*

Hab. Sumatra.

2. *PSEUDOMYRMA CARBONARIA*, *Smith, Proc. Linn. Soc. vii. p. 20.*

Hab. Morty Island.

Gen. *MYRMICARIA*, *Saund.*

1. *MYRMICARIA (HEPTACONDYLUS) RUGOSUS*, *Smith, Proc. Linn. Soc. v. p. 110.*

Hab. New Guinea.

I have received all the sexes of a species of *Myrmicaria* from Port Natal: the female constituted my own genus *Physatta*; the workers formed my genus *Heptacondylus*; both must now sink, and be included in Mr. Saunders's genus *Myrmicaria*, undoubtedly the male of *Physatta*. The male has the normal number of joints in the antennæ, namely thirteen, whilst the female, as well as the workers, have only seven.

Gen. CREMATOGASTER, *Lund.*

1. CREMATOGASTER POLITUS. *C. capite, thorace abdomineque basi castaneo-rufis; pedibus pallide rufo-testaceis.*

Worker. Length $1\frac{1}{4}$ line. Head, thorax, and base of the abdomen reddish chestnut; very smooth and shining. Head large, wider than the abdomen; eyes small and, as well as the tips of the mandibles, black. Thorax deeply strangulated between the meso- and metathorax, the latter armed with two short, stout, acute spines; the legs pale rufo-testaceous. The abdomen heart-shaped, black, with the base and nodes of the peduncle reddish chestnut.

Hab. New Guinea.

2. CREMATOGASTER IRIDIPENNIS. *C. pallide castaneo-rufus, lævis nitidusque; alis hyalinis, iridescentibus.*

Female. Length $2\frac{1}{4}$ lines. Pale chestnut-red, very smooth and highly polished. Head glassy smooth, the anterior part of a deeper red than the vertex; the ocelli situated in a darker stain; the mandibles with five black teeth. Thorax ovate, the metathorax without spines; the wings colourless and brilliantly iridescent; the legs paler than the thorax. Abdomen oblong-ovate, the margins of the segments deeply depressed; the basal margins of the segments pale.

Hab. New Guinea.

3. CREMATOGASTER TARSATUS. *C. aterrimus, lævis et nitidus; antennis pedibusque rufo-piceis, tarsi albis.*

Worker. Length $1\frac{3}{4}$ line. Shining black, impunctate; the anterior portion of the head and the mandibles obscurely ferruginous; the antennæ and legs rufo-piceous; the tarsi white; the anterior angles of the prothorax acute; the metathorax armed with two short, erect, acute spines. The abdomen rather wider than the head, its extreme apex pale testaceous.

Hab. Morty Island.

Fam. ATTIDÆ, *Smith.*Gen. PHEIDOLE, *Westw.*

1. PHEIDOLE MEGACEPHALA, *Smith, Proc. Linn. Soc. v. p. 112.*

Hab. Sula.

2. PHEIDOLE HOSPES. *P. rufo-ferruginea; capite maximo, in medio sulcato, longitudinaliter striato; antennis pedibusque pallide ferrugineis; abdomine nigro.*

Worker (major). Length $2\frac{1}{4}$ lines. Head and thorax rufo-ferruginous; the head oblong-ovate, deeply notched behind, its anterior margin truncate; longitudinally striated, and having a longitudinal carina running from each antenna towards the vertex; the mandibles smooth and shining, their inner edge edentate; the antennæ and legs pale ferruginous; the metathorax with two minute sharp spines; the second node of the abdomen, as well as the abdomen itself, black.

Worker (minor). Length $1\frac{1}{4}$ line. The general colouring the same as in the worker major, but rather paler; and of a very different form: the head of the ordinary size, oblong-ovate, narrowed behind the eyes abruptly towards the prothorax, which forms a neck; the eyes are prominent, and situated midway at the side of the head (in the worker major they are about one-third from the anterior margin); the antennæ and legs elongate; the metathoracic spines very minute.

Hab. New Guinea.

Gen. PHEIDOLACANTHINUS, *Smith*.

Head large in the worker major; mandibles very stout, their inner edge sharp and smooth, not toothed; the antennæ 11-jointed, the club consisting of three joints; eyes minute, placed a little beyond the middle at the sides of the head. Thorax oblong, armed on each side in front with a long stout spine, acute at its apex; the metathorax with two shorter spines. Abdomen ovate; the peduncle with two nodes.

The above characters are drawn from a unique example of a worker, and are necessarily incomplete, but, with the aid of a figure of the insect, will serve to discriminate the genus. It is very like a species of *Pheidole*, but has one joint less in the antennæ; and the armed prothorax indicates, I think, more than a specific distinction. The capture of the other sexes will, I expect, justify its separation as a genus.

1. PHEIDOLACANTHINUS ARMATUS. *P. rufo-ferrugineus*; capite maximo, in medio sulcato et striato; thorace spinis duabus acutis antice et postice armato.

Worker. Length 2 lines. Bright rufo-ferruginous; the abdomen very obscurely ferruginous, nearly black. Head very large, deeply striated longitudinally; the mandibles smooth and shining, their inner edge black and edentate. Thorax armed with two very stout, long spines in front, and two smaller ones on the metathorax; the femora incrassate in the middle; the tarsi slender and pale testaceous. Abdomen delicately aciculate at the extreme base; the first node of the peduncle compressed, the second incrassate and transverse. (Pl. IV. fig. 8, ♀.)

Hab. Salwatty.

Gen. SOLENOPSIS, *Westw.*

1. SOLENOPSIS LÆVIS. *S. rufo-testacea, lævis, tota nitidissima, nuda*; metathoracis spinis minutissimis.

Worker. Length $2\frac{1}{4}$ lines. Rufo-testaceous, smooth, shining, and impunctate; the inner margin of the mandibles with four black teeth; the head wider than the abdomen; the eyes very minute, situated midway at the sides of the head. Thorax rounded anteriorly; the

metathorax with two minute spines. Abdomen ovate; the nodes oblong-ovate, the first pedunculate.

Hab. Morty Island.

Subfam. CRYPTOCERIDÆ, *Smith.*

Gen. CATAULACUS, *Smith.*

1. CATAULACUS SETOSUS, *Smith, Proc. Linn. Soc. v. p. 114 & vii. p. 24.*

Hab. Morty Island.

2. CATAULACUS HISPIDULUS. *C. niger, hispidus*; capite thorace et abdomine rugosis; thorace spinis duabus validis postice armato.

Worker. Length $2\frac{3}{4}$ lines. Black and subopaque; thinly sprinkled with short erect white setæ; the head, thorax, legs, and nodes of the abdomen roughly sculptured, the face longitudinally so, the lateral posterior angles of the head with deep coarse punctures or fossulets which are more or less confluent; the sculpture of the thorax above and of the nodes of the abdomen is similar; the legs are coarsely roughened; the abdomen is much more finely sculptured and is somewhat longitudinally aciculate, the base is coarser than the disk. The anterior tibiæ and tarsi and the claw-joint of the intermediate and posterior pair ferruginous. The head transverse and widest behind, the sides being curved, the posterior angles acute. The thorax narrowed behind, transverse in front, the sides curved, terminating posteriorly in two short, broad, acute spines. Abdomen ovate. (Pl. IV. fig. 7, ♀.)

Hab. Sumatra.

Gen. CEPHALOXYS, *Smith.*

Head subtriangular in the ♀, deeply emarginate behind; eyes round, concealed beneath the grooves at the sides of the head; ocelli three, placed in a triangle on the vertex; the antennæ clavate, received into longitudinal grooves at the sides of the head above the eyes, the flagellum five-jointed; the mandibles subtriangular, multidentate. Thorax oblong-ovate, rounded anteriorly, posteriorly emarginate and bidentate; legs moderately long and stout, the anterior tibiæ armed with a stout spine at their apex, the intermediate and posterior pair unarmed. Abdomen ovate, the peduncle with two nodes.

The unique specimen from which the above characters are drawn is a female; unfortunately the wings are wanting. The insect somewhat resembles the *Ceratobasis singularis*, which I characterized in the first volume of the 'Journal of Entomology;' but from that remarkable genus it is separated by its six-jointed antennæ, besides other characters; it is one of the most remarkable insects with which I am acquainted, and it is the only

species which I have seen that has the eyes situated beneath the head.

1. *CEPHALOXYS CAPITATA*. *C. capite, thorace pedibusque ferrugineis, abdomine fusco-brunneo.*

Female. Length $1\frac{1}{2}$ line. Head, thorax, and legs ferruginous; the head heart-shaped; the mandibles porrect, continued in a line with the sides of the head, terminating in a point; the scape compressed; a black spot on the vertex, in which the ocelli are placed in a triangle. Thorax subovate, the metathorax with two short spines; the margins of the scutellum dusky; the head and thorax finely rugose and sprinkled with minute white scales or setæ. Abdomen smooth and shining, fuscous red or dark chestnut, with the base and apex pale; the nodes of the abdomen finely aciculate, and a few abbreviated striæ at the extreme base of the abdomen. (Pl. IV. fig. 5, ♀.)

Hab. New Guinea.

Fam. THYNNIDÆ, *Erichs.*

Gen. THYNNUS, *Fabr.*

1. *THYNNUS LÆVISSIMUS*. *T. nigro-piceus, antennis pedibusque ferrugineis; abdominis segmento secundo striis quatuor transversis.*

Female. Length 3 lines. Dark brown, nearly black, smooth and shining; the antennæ, mandibles, and legs ferruginous; the eyes lateral, touching the base of the mandibles. The mesothorax oblong-quadrate, slightly concave, with a central longitudinal carina; the metathorax obliquely truncate. Abdomen oblong, smooth and shining; the margins of the segments narrowly pale testaceous; the second segment with four deep transverse striæ; the apical segment ferruginous at the apex.

Hab. New Guinea.

2. *THYNNUS ATRATUS*. *T. niger, capite thoraceque rude punctatis; abdomine utrinque maculis flavis, segmento secundo transversim striato. (Fam.)*

Female. Length $6\frac{1}{4}$ lines. Black; the mandibles ferruginous in the middle; the legs obscurely rufo-testaceous, brightest beneath, the anterior and intermediate tibiæ pale ferruginous beneath; a yellow spot on each side of the basal segment of a suboval form, pointed within; two smaller ovate yellow spots on the third segment, and also a minute yellow spot at the extreme lateral margins of the third and fourth segments. The scape of the antennæ very slender at the base, thickened and bent at the apex, and produced within into a sharp angle; the thorax transverse anteriorly, the margin slightly curved or emarginate; coarsely punctured above. The mandibles, legs, and the margins of the apical segments of the abdomen

with long glittering pale hairs; the second segment of the abdomen with two ovate yellow spots beneath.

Hab. Gilolo.

The male of this species is described in the sixth volume of the 'Proceedings,' p. 21.

3. **THYNNUS (AGRIOMYIA) ABDUCTOR.** *T. niger*, capite thoraceque flavo variegatis, abdominis segmentis maculis duabus transversis flavis, alis hyalinis.

Male. Length $6\frac{1}{2}$ lines. Black; head and thorax very closely punctured, subopaque; abdomen shining, with delicate punctures at the base of the segments, sparing towards their apical margins. The sides of the clypeus bordered with yellow, and a V-shaped yellow mark between the antennæ; the anterior and posterior margins of the prothorax, the tegulæ, an ovate spot on the scutellum, the postscutellum, and a narrow line running from it to the base of the posterior wings yellow; a yellow oblong and also an ovate spot beneath the wings, and another on each side of the metathorax situated posteriorly; all the tibiæ and tarsi and the intermediate and posterior femora ferruginous; the tibiæ, tarsi, and posterior femora more or less fuscous above; the wings hyaline, the nervures black. Abdomen, all the segments with a narrow line on each side near their apical margins; the lines sometimes obsolete on the sixth segment.

Hab. Salwatty and New Guinea.

This species closely resembles *T. vagans*, but is at once distinguished by narrow yellow lines, interrupted in the middle, on the apical margins of the segments, and the margins are also much more depressed.

Gen. *ÆLURUS*, *Klug.*

1. **ÆLURUS FRAGILIS.** *Æ.* capite thoraceque nigris; abdomine, pedibus antennisque pallide ferrugineis.

Male. Length $4\frac{1}{2}$ lines. Head and thorax black, and clothed with silvery pubescence, that on the face and clypeus very fine, dense, and glittering; the cheeks with a long fringe of silvery hairs; the mandibles and antennæ pale ferruginous; a yellow spot on the clypeus, and a minute one at the base of each antenna. The anterior margin of the thorax, the tegulæ, and the postscutellum yellow; the wings hyaline and iridescent, the nervures pale ferruginous. The legs and abdomen ferruginous.

Hab. Morty Island.

This elegant species somewhat resembles the *Æ. abdominalis* of Guérin, but its red antennæ and the silvery pubescence on the head and abdomen will at once distinguish it.

Gen. ENICTUS, *Shuck.*

1. ENICTUS OBSCURUS. *E. capite thoraceque nigris, nitidis; abdomine pedibusque obscure ferrugineis.*

Male. Length 3 lines. Head and thorax shining black, thinly covered with a short silky white down; the antennæ rufo-testaceous; the mandibles long, curved, shining and testaceous at the apex, broadest at the base. Thorax, the profile subquadrate; the metathorax rounded behind; the legs obscurely ferruginous, with their geniculations and the tarsi pale testaceous. Abdomen oblong, obscurely ferruginous, finely and closely punctured, and thinly covered with pale down; the posterior margin of the apical segment rounded; the peduncle narrower than the following segment, concave above; beneath rufo-testaceous.

Hab. New Guinea.

This species is very distinct from *E. ambiguus*, the type of the genus, and which is in my possession; the following characteristics distinguish it: it is smaller, of a darker colour, and less pubescent; the abdomen is punctured, and the peduncle is not wider than the following segment.

Gen. SCLERODERMA, *Latr.*

1. SCLERODERMA PARASITICA. *S. rufo-picea, lævis, nitida; abdomine cingulato.*

Female. Length 2 lines. Rufo-piceous, smooth and shining; the anterior part of the head, the antennæ, and legs pale rufo-testaceous; the posterior margins of the segments of the abdomen dark rufo-piceous.

Hab. Salvatty.

Fam. MUTILLIDÆ, *Leach.*Gen. MUTILLA, *Linn.*

1. MUTILLA NIGRA, *Smith, Proc. Linn. Soc. iv. p. 151.*

Hab. Salvatty.

2. MUTILLA MIRABILIS, *Smith, Proc. Linn. Soc. vii. p. 24.*

Hab. New Guinea.

3. MUTILLA MANIFESTA, *Smith, Proc. Linn. Soc. ³iv. p. 150.*

Hab. New Guinea.

4. MUTILLA MEROPS, *Smith, Proc. Linn. Soc. v. p. 115.*

Hab. Morty Island.

5. MUTILLA AGILIS. *M. capite thoraceque rude punctatis; antennis, mandibulis pedibusque ferrugineis; abdomine albo cingulato; alis subhyalinis, unifasciatis fuscis.*

Male. Length $3\frac{1}{4}$ lines. Black; the antennæ, mandibles, and legs ferruginous, the coxæ black; the posterior tibiæ, except the base,

rufo-fuscous; the metathorax with large coarse subconfluent punctures; the wings subhyaline, with a broad fuscous fascia crossing at the stigma. Abdomen shining, with a long thin black pubescence, most dense towards the apex; the second segment with a fascia or fringe of white pubescence.

Hab. New Guinea.

6. *MUTILLA FLUCTUATA*. *M. nigra*; capite thoraceque rude punctatis et pubescentibus; abdomine lævigato, nitido; alis subhyalinis; prothorace pube argentata vestito.

Male. Length 4 lines. Black; head and thorax coarsely punctured, the punctures on the metathorax very large and subconfluent; a deep longitudinal channel runs from each posterior stemma halfway towards the margin of the vertex; the head, sides of the thorax, and legs have a scattered, long, glittering silvery pubescence; the clypeus and prothorax are densely clothed with short silvery pubescence; the wings subhyaline, iridescent, and their apical margins clouded; the tegulæ smooth and shining, with their posterior half silvery; the tibiæ have their calcaria white. Abdomen smooth and shining, with scattered fine punctures, the posterior margins of the segments with long silvery hairs; the apical segment coarsely punctured and fringed with black hairs.

Hab. Morty Island.

Tribe *FOSSORES*, Latr.

Fam. *SCOLIADÆ*, Leach.

Gen. *TIPHIA*, Fabr.

1. *TIPHIA FLAVIPENNIS*, Smith, *Proc. Linn. Soc.* ii. p. 91.

Hab. Gilolo; Morty Island.

Gen. *SCOLIA*, Fabr.

DIV. 1. *The anterior wings with two submarginal cells and one recurrent nervure.*

1. *SCOLIA FULGIDIPENNIS*, Smith, *Proc. Linn. Soc.* iv. p. 152.

Hab. Salwatty.

2. *SCOLIA NITIDA*, Smith, *Proc. Linn. Soc.* iv. p. 152.

Hab. New Guinea.

3. *SCOLIA QUADRICEPS*, Smith, *Proc. Linn. Soc.* iv. p. 153.

Hab. New Guinea.

4. *SCOLIA CAPTIVA*, Smith, *Proc. Linn. Soc.* vi. p. 52.

Hab. Sumatra.

DIV. 2. *The anterior wings with two submarginal cells and three recurrent nervures.*

5. *SCOLIA AUREICOLLIS*, St. Farg. *Hym.* iii. p. 499.

Hab. Sula.

6. *SCOLIA AURULENTA*, *Smith, Cat. Form.* p. 102.

Hab. Sula.

7. *SCOLIA ANNULATA*, *Fabr. Syst. Piez.* p. 234.

Hab. Salwatty.

8. *SCOLIA GROSSA*, *Fabr. Syst. Piez.* p. 232.

Hab. Sumatra.

DIV. 3. *The anterior wings with three submarginal cells and one recurrent nervure.*

9. *SCOLIA MOROSA*, *Smith, Proc. Linn. Soc. v.* p. 118.

Hab. Sula.

10. *SCOLIA PROCERA*, *Fabr. Syst. Piez.* p. 241.

Hab. Sumatra.

11. *SCOLIA DIMIDIATA*, *Guér. Voy. Coq. Zool. ii.* p. 247.

Hab. Sula ; Sumatra.

12. *SCOLIA CINCTA*, *Smith, Proc. Linn. Soc. ii.* p. 89.

Hab. Sumatra.

DIV. 4. *The anterior wings with three submarginal cells and two recurrent nervures.*

13. *SCOLIA FULVA*, *Gray, Cuv. Anim. Kingd. (Griffiths)* p. 516. pl. 71.
f. 1 ♀.

Hab. Morty Island.

14. *SCOLIA ARROGANS*. *S. nigra*, clypeo flavo, alis hyalinis; abdomine prismatico, flavo quinque-fasciato, secundo et tertio interruptis. *Male*. Length 6 lines. Black; the clypeus yellow; the mandibles rufopiceous at their apex. The prothorax before the wings, a spot beneath them, the scutellum, the postscutellum, and a broad stripe on each side of the metathorax yellow; the head, thorax, and legs thinly sprinkled with cinereous pubescence; the anterior tibiæ yellow in front; the wings hyaline, the superior pair fulvous at their anterior margin, the nervures rufo-testaceous. Abdomen, the first and four following segments margined with yellow, the first three broadly so, with the yellow fasciæ deeply emarginate in the middle, the second and third being slightly interrupted; entirely black beneath; the abdomen is pubescent, most densely so at the apex, where it is slightly fulvous; the apical segment trispinose, coarsely punctured at the base and shining.

Hab. Sumatra.

Fam. POMPILIDÆ, *Leach.*

Gen. POMPILUS, *Fabr.*

1. POMPILUS ANALIS, *Fabr. Syst. Piez.* p. 219.

Hab. Morty Island.

2. *POMPILUS JUCUNDUS*, *Smith, Proc. Linn. Soc.* vii. p. 29.

Hab. Morty Island.

3. *POMPILUS UNIFASCIATUS*, *Smith, Cat. Foss. Hym.* p. 145.

Hab. Sumatra.

4. *POMPILUS COGNATUS*. *P. niger*, facie utrinque ad marginem internum oculorum, prothoracis margine postico linea albida signato; tibiis posticis basi albis.

Male. Length $3\frac{1}{2}$ lines. Black, covered with cinereous downy pile; the mandibles black at the base, white in the middle, and ferruginous at the apex; the palpi pale testaceous. The posterior margin of the prothorax bordered with white; the wings hyaline and iridescent, tips of the anterior pair fuscous; the base of the posterior tibiæ above and the calcaria white.

Hab. Morty Island.

5. *POMPILUS ELATUS*. *P. niger*; pube argentato-alba variegata; alis fuscis.

Female. Length 5 lines. Black, smooth and shining; the face and cheeks clothed with silvery pubescence. The prothorax laterally, the posterior angles of the metathorax, a spot behind the wings, the coxæ, and the sides of the thorax adorned with bright, changeable, silvery pubescence; the posterior tibiæ and tarsi silvery; wings fuscous, the posterior pair palest. The abdomen adorned with silvery spots at the sides, which are more or less refulgent in different positions; beneath, the segments have lateral silvery spots.

Hab. Morty Island.

Gen. *PRIOCNEMIS*, *Schiodte*.

1. *PRIOCNEMIS FLAVIPENNIS*, *Smith, Proc. Linn. Soc.* v. p. 79.

Hab. New Guinea.

2. *PRIOCNEMIS PULCHERRIMUS*, *Smith, Proc. Linn. Soc.* iv. p. 156.

Hab. Salwatty.

3. *PRIOCNEMIS FERVIDUS*, *Smith, Proc. Linn. Soc.* iii. p. 156.

Hab. New Guinea.

Gen. *AGENIA*, *Schiodte*.

1. *AGENIA AMALTHEA*, *Smith, Proc. Linn. Soc.* iii. p. 156.

Hab. Salwatty.

2. *AGENIA NUMERIA*, *Smith, Proc. Linn. Soc.* vii. p. 31.

Hab. Morty Island.

3. *AGENIA PANDORA*. *A. ferruginea*, capite abdomineque apice nigris; alis anticis fascia transversa fusca.

Female. Length 5 lines. Head black and shining, the face and clypeus covered with silvery pile; the antennæ, anterior margin of the clypeus,

palpi, and mandibles ferruginous, the tips of the latter black; the antennæ slightly fuscous above. Thorax and legs ferruginous; the metathorax smooth and convex; the claw-joint of the tarsi fuscous; wings hyaline, the nervures pale ferruginous; the anterior wings with a fuscous fascia the width of the second and third submarginal cells, which it occupies, but does not quite cross the wing, terminating at the inferior margin of the third discoidal cell. Abdomen petiolated, the third and following segments black; the extreme apex ferruginous. The male differs in having the disk of the mesothorax black.

Hab. New Guinea.

Gen. MACROMERIS, *St. Farg.*

1. MACROMERIS VIOLACEA, *St. Farg. Hym.* iii. p. 464.

Hab. Sumatra.

2. MACROMERIS ARGENTIFRONS, *Smith, Proc. Linn. Soc.* ii. p. 97.

Hab. Sumatra.

Gen. MYGNIMIA, *Smith.*

1. MYGNIMIA FERRUGINEA, *Smith, Proc. Linn. Soc.* v. p. 121.

Hab. New Guinea.

2. MYGNIMIA FERVIDA, *Smith, Proc. Linn. Soc.* v. p. 82.

Hab. New Guinea.

3. MYGNIMIA FLAVA, *Fabr. Syst. Piez.* p. 197.

Hab. Sumatra.

4. MYGNIMIA DUCALIS, *Smith, Proc. Linn. Soc.* ii. p. 98.

Hab. Sumatra.

5. MYGNIMIA ANTHRACINA, *Smith, Cat. Foss. Hym.* p. 183.

Hab. Sumatra.

6. MYGNIMIA LACÆNA, *Smith, Proc. Linn. Soc.* v. p. 121.

Hab. Sumatra.

Fam. SPHEGIDÆ, *Leach.*

Gen. SPHEX, *Fabr.*

1. SPHEX NIGRIPES, *Smith, Cat. Foss. Hym.* p. 254.

Hab. Sumatra.

2. SPHEX SERICEA, *Fabr. Syst. Piez.* p. 211.

Hab. Sumatra.

3. SPHEX ARGENTATA, *Dahlb. Hym. Europ.* i. p. 25.

Hab. New Guinea; Morty Island.

4. SPHEX DIABOLICA, *Smith, Proc. Linn. Soc.* ii. p. 100.

Hab. New Guinea.

5. SPHEX FERRUGINEA, *St. Farg. Hym.* iii. p. 348.

Hab. Salwatty.

6. *SPEX TYRANNICA*, *Smith, Proc. Linn. Soc. v. p. 122.*

Hab. Sumatra; Sula.

Gen. *AMPULEX*, *Jurine.*

1. *AMPULEX SMARAGDINA*, *Smith, Proc. Linn. Soc. ii. p. 99.*

Hab. Sumatra.

Gen. *PELOPÆUS*, *Latr.*

1. *PELOPÆUS MURARIUS*, *Smith, Proc. Linn. Soc. vii. p. 34 (♂?).*

Hab. New Guinea.

Fam. *LARRIDÆ*, *Leach.*

Gen. *LARRADA*, *Smith.*

1. *LARRADA MODESTA*, *Smith, Proc. Linn. Soc. iii. p. 159.*

Hab. Salwatty.

2. *LARRADA MANSUETA*. *L. nigerrima*; capite abdomineque nitidis; thorace opaco; scapo, tibiis tarsisque ferrugineis; alis hyalinis, anticis fascia fusca.

Female. Length 7 lines. Black; the head shining and closely punctured; the clypeus covered with silvery pile; the scape, apex of the joints of the antennæ, the anterior margin of the clypeus, and the mandibles ferruginous; the palpi pale testaceous. Thorax opaque; the metathorax finely rugose, and clothed with silvery pile at the apex; the sides, beneath, the coxæ, and femora with a thin changeable silvery pile; the articulations of the coxæ, trochanters, and femora, the tibiæ and tarsi ferruginous; the posterior femora dusky above; wings hyaline, the anterior pair with a broad fuscous fascia. Abdomen smooth and shining, longer than the head and thorax; the extreme lateral margins of the segments ornamented with spots of changeable silvery pile.

Hab. New Guinea.

3. *LARRADA MENDAX*. *L. nigerrima*; mandibulis pedibusque ferrugineis; metathorace rugoso; alis subhyalinis.

Female. Length 5 lines. Black; mandibles and legs ferruginous, with the coxæ black. The head, thorax, and abdomen thinly covered with a short grey silky pubescence; the clypeus covered with silvery pile, as well as the lower part of the cheeks. The thorax closely punctured above; the metathorax rugose, having a few coarse radiating grooves at the base, and an abbreviated carina in the centre; the wings subhyaline, the apex of the anterior pair slightly fuscous; the intermediate and posterior tarsi fuscous above, with the tips of the joints ferruginous. The abdomen smooth and shining.

Hab. Gilolo.

Gen. LARRA, *Fabr.*

1. LARRA PRISMATICA,
- Smith, Proc. Linn. Soc. ii. p. 103.*

Hab. New Guinea; Morty Island.

2. LARRA SUADA.
- L. nigra, nitida*
- ; facie, pro- et metathorace abdominisque segmentorum fasciis argenteo sericeis; alis hyalinis.

Male. Length 3 lines. Head shining, the face and cheeks covered with silvery pubescence, the mandibles ferruginous, the palpi pale testaceous. Thorax, the disk finely and closely punctured; the pro- and metathorax covered with silvery pubescence; the legs with a fine silky silvery pile; the wings hyaline and iridescent, the nervures testaceous. Abdomen smooth and shining, the apical margins of the segments with silvery fasciæ.*Hab.* Gilolo.Gen. PISON, *Spin.*

1. PISON PALLIDIPALPIS,
- Smith, Proc. Linn. Soc. vii. p. 35.*

Hab. Morty Island.

2. PISON MOROSUS.
- P. niger, nitidus, distincte punctatus*
- ; alis subhyalinis, venis nigris; abdomine nitido, segmentorum marginibus argentatis.

Female. Length 4 lines. Head punctured, the punctures confluent on the face; the clypeus and the face along the inner margin of the eyes with silvery pile; the tips of the mandibles ferruginous. The thorax closely and strongly punctured, the tegulæ smooth and shining; the wings subhyaline and iridescent; the sides of the thorax with a thin cinereous pubescence; the legs with a glittering pile. Abdomen shining and finely punctured; the margins of the segments depressed; the apical margins with fasciæ of silvery pile, only visible in certain positions.*Hab.* New Guinea.

This species closely resembles *Pison pallidipalpis*, from Ceram; but it may be at once distinguished by the absence of the central longitudinal channel of the metathorax.

Fam. BEMBICIDÆ, *Westw.*Gen. BEMBEX, *Latr.*

1. BEMBEX MELANCHOLICA,
- Smith, Cat. Foss. Hym. p. 328.*

Hab. Salwatty; Morty Island.Fam. CRABRONIDÆ, *Leach.*Gen. TRYPOXYLON, *Latr.*

1. TRYPOXYLON PROVIDUM,
- Smith, Proc. Linn. Soc. v. p. 125.*

Hab. New Guinea.

2. TRYPOXYLON GRACILLIMUM, *Smith, Proc. Linn. Soc. vii. p. 35.**Hab.* Morty Island.Gen. CRABRO, *Fabr.*

1. CRABRO (RHOPALUM) LIGNARIUS. *C. niger*; abdomine petiolato, segmentis secundo tertio quartoque bimaculato flavis; scapo, collari, tuberculis, scutelloque maculis duabus flavis; tibiis tarsisque ferrugineis.

Female. Length $4\frac{1}{2}$ lines. Opaque black; the head large, wider than the thorax, and subquadrate; the ocelli in a curve on the vertex; the scape and a stripe on the mandibles yellow; the clypeus densely covered with silvery pile; the cheeks have a thin silvery pubescence. Thorax: an interrupted line on the collar, the tubercles, and two spots on the scutellum yellow; the sides of the thorax with hoary pubescence; wings subhyaline and iridescent; the apex of the tibiæ and the tarsi ferruginous, the claw-joint rufo-piceous. Abdomen: petiole black, the first segment with an ovate spot on each side, the two following segments with an oblong-ovate spot on each side; beneath immaculate.

Hab. Morty Island.Very closely allied to the *Megapodium Westermanni* of Dahlbom.

2. CRABRO BUCEPHALUS. *C. niger*; capite magno, ocellis triangulariter ordinatis in vertice; metathorace dorso longitudinaliter striato.

Female. Length 3 lines. Black: head large, wider than the thorax, subquadrate, smooth and shining; the ocelli in a triangle in the centre of the vertex; the clypeus and cheeks with a silvery pubescence; the scape yellow in front; the mandibles ferruginous at their apex; the clypeus produced in the middle into a blunt tooth. An interrupted line on the collar, the tubercles, two ovate spots on the scutellum, the postscutellum, the base of the tibiæ above, and the basal joint of the tarsi pale yellow; the tarsi reddish brown; the calcaria pale; a smooth enclosed space at the base of the metathorax, which is divided in the middle by a longitudinal channel which runs to the apex of the metathorax; the wings subhyaline and iridescent, the tegulæ rufo-testaceous. The abdomen smooth and shining, with the apical segments slightly pubescent.

Hab. Morty Island.Gen. MIMESA, *Shuck.*

1. MIMESA CARBONARIA. *M. atra*, leviter griseo pubescens; facie argenteo pubescente; metathorace rugoso.

Male. Length $4\frac{1}{4}$ lines. Black and shining, the disk of the thorax and the abdomen with a chalybeous reflexion; thinly sprinkled with grey pubescence, which is most dense and long on the metathorax; the face covered with silvery pile; the antennæ fulvous beneath, the scape black; the palpi and mandibles yellow, the tips of the latter ferruginous. Thorax: the metathorax coarsely rugose; the wings

clear hyaline and iridescent, the tegulæ pale testaceous; the legs ferruginous; the posterior coxæ black at their base; the femora and tibiæ with a darkish stain beneath, and the claw-joint of the tarsi dark. Abdomen: the petiole linear; the apex piceous and punctured.

Hab. Morty Island.

This I believe to be the first species of the genus that has been found within the tropics.

Fam. PHILANTHIDÆ, *Dahlb.*

Gen. CERCERIS, *Latr.*

1. CERCERIS SEPULCHRALIS, *Smith, Proc. Linn. Soc. ii, p. 107.*

Hab. Sumatra.

2. CERCERIS TUMULORUM. *C. nigra, flavo variegata*; clypeo bidentato; abdomine fasciis tribus flavis; pedibus flavo-ferrugineis; alis fulvo-hyalinis, marginibus anterioribus fuscis.

Female. Length 6 lines. Black, shining, and punctured, the head and thorax more closely and strongly so than the abdomen; the mandibles, face, clypeus, two minute spots on the vertex and a larger spot behind the eyes near their summit, yellow; the clypeus with two minute teeth; the tips of the mandibles rufo-piceous; the scape in front and the flagellum beneath fulvous. Thorax: two spots on the collar, two on the scutellum, the postscutellum, and the tegulæ yellow; the legs reddish yellow, with the coxæ, and the posterior tarsi towards their apex, dark fuscous; wings fulvo-hyaline, with a dark fuscous stain at the anterior margin of the superior pair. Abdomen: a spot on the basal segment, and a subinterrupted band on the apical margins of the three following segments, the bands narrowest in the middle.

Hab. Gilolo.

Group SOLITARY WASPS.

Fam. EUMENIDÆ, *Westw.*

Gen. EUMENES, *Fabr.*

1. EUMENES ARCUATUS, *Fabr. Syst. Piez. p. 286.*

Hab. Salwatty.

2. EUMENES PRASLINA, *Guér. Voy. Coq. Zool. ii. p. 267 (var. arcuatus).*

Hab. Morty Island.

3. EUMENES EXIMIUS, *Smith, Proc. Linn. Soc. v. p. 126.*

Hab. New Guinea; Morty Island.

4. EUMENES VOLATILIS, *Smith, Proc. Linn. Soc. vii. p. 38.*

Hab. New Guinea.

5. EUMENES FULVIPENNIS, *Smith, Cat. Vespidae, p. 24.*

Hab. Sula.

6. *EUMENES CIRCINALIS*, *Fabr. Syst. Piez.* p. 286.

Hab. Morty Island.

7. *EUMENES INSOLENS*. *E.* capite thoraceque flavo variegatis; abdominis petiolo elongato, medio utrinque dentato, segmento primo postico anguste flavo; alis infuscatis.

Female. Length 6 lines. Black: head and thorax opaque, strongly and closely punctured; the clypeus united to a spot above; the inner margin of the eyes and a narrow line behind them yellow. The anterior margin of the prothorax, a line beneath the wings, running down to the intermediate coxæ, the anterior legs, the intermediate tibiæ and tarsi, the posterior tibiæ and the knees yellow; the post-scutellum and a large macula on each side of the metathorax yellow. The abdomen smooth and shining, the first segment with a narrow marginal fascia.

Hab. Gilolo.

Gen. *ODYNERUS*, *Latr.*1. *ODYNERUS MULTIPICTUS*, *Smith, Proc. Linn. Soc.* ii. p. 112.

Hab. New Guinea.

2. *ODYNERUS LABORIOSUS*, *Smith, Proc. Linn. Soc.* vii. p. 41.

Hab. New Guinea.

3. *ODYNERUS CONSPICUUS*, *Smith, Proc. Linn. Soc.* vii. p. 40.

Hab. Salwatty.

4. *ODYNERUS IMPULSUS*. *O.* capite thoraceque rude punctatis et flavo variegatis; abdominis segmentis flavo fasciatis, segmento secundo bimaculato.

Female. Length 5 lines. Black; the head and thorax strongly and closely punctured. The clypeus emarginate in front, the angles produced into sharp teeth; a line on the mandibles, another at the inner margin of the eyes, terminating in their emargination, and a line behind the eyes yellow. Thorax: two angular spots on the prothorax, two on the scutellum, two angular spots on the posterior margin of the metathorax and a line passing outwardly from each, the tegulæ, tubercles, and a spot on the anterior and intermediate coxæ yellow; the wings subhyaline, the nervures black, a testaceous spot on the tegulæ; the legs ferruginous, with the posterior tarsi dusky. Abdomen very finely punctured and slightly shining; the margins of the segments bordered with yellow, the second segment with two yellow spots above and beneath.

Hab. Morty Island.

The specimen described has the heads of two females of a species of *Stylops* protruding from beneath the third segment.

Gen. *RHYNCHIUM*, *Spin.*1. *RHYNCHIUM HÆMORRHOIDALE*, *Fabr. Syst. Piez.* p. 259.

Hab. New Guinea.

2. *RHYNCHIUM RUBROPICTUM*, *Smith, Proc. Linn. Soc.* v. p. 128.

Hab. Morty Island.

3. *RHYNCHIUM METALLICUM*, *Sauss. Mon. Guêpes Sol.* p. 114.

Hab. Morty Island.

Gen. *PTEROCHILUS*, *Klug.*

1. *PTEROCHILUS EXIMIUS*. *P. niger*, capite thoraceque flavo variegatis; abdominis segmentis flavo marginatis, segmento secundo flavo binotato.

Male. Length $10\frac{1}{2}$ lines. Opaque black, with the disk of the thorax slightly shining. The clypeus, and a spot above it, between the antennæ and the scape in front, yellow. A semicircular spot on each side of the prothorax, an ovate spot beneath the wings, and two sub-ovate spots on the scutellum yellow; the wings fulvo-hyaline, with a fusco-ferruginous stain at the anterior margin of the superior pair, not passing beyond the stigma; the nervures ferruginous; the tibiæ, tarsi, and knees yellow, with a dark stain on the tibiæ behind. Abdomen, the margins of all the segments bordered with yellow, that on the basal segment recurved at the sides. (Pl. IV. fig. 4, ♂.)

Hab. New Guinea.

All the species of this genus are rare. The present, of which only a single specimen was captured, is one of the finest hitherto discovered.

Group *SOCIAL WASPS*.

Gen. *ISCHNOGASTER*, *Guér.*

1. *ISCHNOGASTER UNICOLOR*, *Smith, Proc. Linn. Soc.* vii. p. 41.

Hab. New Guinea.

2. *ISCHNOGASTER IRIDIPENNIS*, *Smith, Proc. Linn. Soc.* iii. p. 166.

Hab. New Guinea; Sula.

Gen. *VESPA*, *Linn.*

1. *VESPA AFFINIS*, *Fabr. Syst. Piez.* p. 254 (var. *V. cincta*).

Hab. Sula; New Guinea; Morty Island.

2. *VESPA BELLICOSA*, *Sauss. Mon. Guêpes Soc.* p. 146.

Hab. Sumatra.

3. *VESPA DORYLLOIDES*, *Sauss. Mon. Guêpes Soc.* p. 112.

Hab. Sumatra.

Gen. *POLISTES*, *Latr.*

1. *POLISTES SIMULATUS*, *Smith, Proc. Linn. Soc.* v. p. 130.

Hab. New Guinea; Morty Island.

2. *POLISTES NIGRIFRONS*, *Smith, Proc. Linn. Soc.* iii. p. 168.

Hab. Salwatty.

3. *POLISTES DIABOLICUS*, *Sauss. Mon. Guêpes Soc.* p. 68.
Hab. New Guinea.
4. *POLISTES SAGITTARIUS*, *Sauss. Mon. Guêpes Soc.* p. 56.
Hab. Sumatra.
5. *POLISTES STIGMA*, *Fabr. Syst. Piez.* p. 261.
Hab. Sumatra.
6. *POLISTES TEPIDUS*, *Fabr. Syst. Piez.* p. 271.
Hab. Gilolo; Morty Island.
7. *POLISTES MULTIPICTUS*, *Smith, Proc. Linn. Soc.* v. p. 130.
Hab. Gilolo; Morty Island.

Gen. ICARIA, *Sauss.*

1. *ICARIA MACULIVENTRIS*, *Sauss. Mon. Guêpes Soc.* p. 23.
Hab. Salwatty.
2. *ICARIA IRRITATA*, *Smith, Proc. Linn. Soc.* vii. p. 42.
Hab. New Guinea.
3. *ICARIA NIGRA*, *Smith, Proc. Linn. Soc.* iii. p. 167.
Hab. New Guinea.
4. *ICARIA GRACILIS*, *Smith, Proc. Linn. Soc.* iv. p. 167.
Hab. New Guinea.
5. *ICARIA CONSERVATOR*, *Smith, Proc. Linn. Soc.* v. p. 130.
Hab. Salwatty.
6. *ICARIA FESTINA*. *I. opaca*, nigra; clypeo maculato, oculis intus, scutello, metathorace abdominisque marginibus segmentorum anguste flavis; alis hyalinis.
Female. Length $3\frac{3}{4}$ lines. Opaque black, covered with a thin silky pile; the antennæ fulvous beneath; the mandibles ferruginous; a line on the inner margin of the eyes, two spots on the clypeus, and a line on the cheeks yellow. The posterior margin of the prothorax, a spot beneath the wings, the scutellum, and metathorax behind, yellow; the tarsi and the tibiæ beneath ferruginous; the wings hyaline and iridescent, the nervures black; the anterior margin of the superior pair towards their apex fuscous. Abdomen, the margins of the segments narrowly bordered with yellow.
Hab. New Guinea.
7. *ICARIA BICOLOR*. *I. opaca*, nigra, pube sericea vestita; clypei margine antico, mandibulis, antennis, pedibus, metathorace abdominisque petiolo ferrugineis; alis saturate fulvis.
Female. Length $5\frac{1}{2}$ lines. Opaque black, thinly covered with a silky pile; the anterior margin of the clypeus, the mandibles, antennæ, legs, metathorax, and the petiole of the abdomen ferruginous; the anterior margin of the clypeus angular, produced in the middle into a

sharp point or tooth; the wings fulvous, the tegulæ fulvous. The apical margins of the second and three following segments of the abdomen ferruginous, the terminal segment entirely so.

Hab. New Guinea.

Fam. ANDRENIDÆ, *Leach.*

Gen. PROSOPIS, *Fabr.*

1. PROSOPIS ELEGANS. *P.* capite thoraceque viridibus, flavo pulchre pictis; abdomine purpureo, splendide micante; pedibus ferrugineis; alis hyalinis, iridescentibus.

Female. Length $3\frac{3}{4}$ lines. Head and thorax green, not shining, very closely punctured; the enclosed triangular space at the base of the metathorax very delicately punctured; the front with a central yellow line, extending from the anterior stemma to the anterior margin of the clypeus, and a similar stripe on each side, close to the inner orbit of the eyes; a narrow yellow line behind the eyes; the labrum yellow; the tips of the mandibles ferruginous; the antennæ fulvous beneath. Thorax: the collar, a line passing over the tegulæ and the sides of the scutellum, a spot in the middle of the postscutellum, the tegulæ, and a spot behind them yellow; the tips of the anterior femora, the intermediate and posterior pairs, and all the tibiæ and tarsi ferruginous, the latter more or less fuscous above; the base of the posterior tibiæ whitish; wings hyaline and splendidly iridescent, the nervures testaceous, with the costal black. Abdomen purple, splendidly iridescent, changing in different lights; the posterior margins of the first, second, and third segments with a little white pubescence at the sides of the abdomen.

Hab. New Guinea.

Gen. NOMIA, *Latr.*

1. NOMIA DENTATA, *Smith, Proc. Linn. Soc.* iv. p. 133.

Hab. New Guinea.

2. NOMIA CLAVATA, *Smith, Proc. Linn. Soc.* vi. p. 29.

Hab. Morty Island.

3. NOMIA OPULENTA. *N.* nigra; capite thoraceque punctatis, opacis; abdomine nitido, segmentis ad marginem apicalem cæruleo-viridibus pulchriter ornatis.

Male. Length 4 lines. Black: the face, sides of the thorax and beneath, the metathorax and legs with a cinereous pubescence; the collar and postscutellum with dense short white pubescence; the antennæ slightly fulvous beneath; the wings subhyaline, their apical margins clouded, the nervures testaceous, the tegulæ pale testaceous; the legs rufo-testaceous. Abdomen smooth, shining, finely and closely punctured; the apical margins of the segments with fasciæ of

very bright blue-green, changing in different lights; beneath rufo-testaceous.

Hab. Morty Island.

This insect so closely resembles the *N. concinna* from Celebes and Ceram, that I suspect it may be the true male of that species; that which I have described as being so is probably a distinct species.

Fam. MELECTIDÆ, *Westw.*

Gen. CROCISA, *Latr.*

1. CROCISA NITIDULA, *Fabr. Syst. Piez.* p. 386.

Hab. Salwatty; Gilolo.

Gen. CÆLIOXYS, *Latr.*

1. CÆLIOXYS INTRUDENS, *Smith, Proc. Linn. Soc.* v. p. 132 (♂?).

Hab. Morty Island.

Fam. DASYGASTRÆ, *Latr.*

Gen. MEGACHILE, *Latr.*

1. MEGACHILE LACHESIS, *Smith, Proc. Linn. Soc.* v. p. 133.

Hab. Salwatty.

2. MEGACHILE CLOTHO, *Smith, Proc. Linn. Soc.* v. p. 134.

Hab. Morty Island.

3. MEGACHILE ALECTO, *Smith, Proc. Linn. Soc.* v. p. 134.

Hab. Morty Island.

4. MEGACHILE NIDULATOR. *M. nigra*; abdominis basi pube alba, apice ferruginea vestito; alis fuscis.

Female. Length 6 lines. Black, and clothed with black pubescence, which is short and very sparing; the disk of the thorax shining and punctured; wings dark fuscous; the base of the abdomen and margin of the scutellum fringed with white pubescence; the apical margin of the third segment of the abdomen and the three following segments covered with short red pubescence; all the segments clothed beneath with pubescence of the same colour.

Hab. New Guinea.

5. MEGACHILE SENEX. *M. nigra*; capite pube alba vestito; abdominis segmentis apicalibus fulvis; alis fulvo-hyalinis.

Female. Length 8 lines. Black; the head densely clothed with short white pubescence, the pubescence on the thorax and abdomen short and black; the sixth segment of the latter red, and covered with short fulvous pubescence; the basal joint of the posterior tarsi fulvous within, the tibiæ with an ashy pubescence within; the wings fulvo-hyaline, the nervures black.

Hab. New Guinea.

6. *MEGACHILE* APICATA. *M. nigra*, opaca, facie pube pallide flava vestita; alis infuscatis; abdomine segmentis duobus apicalibus ferrugineis tomentosis.

Male. Length 4 lines. Black, opaque, clothed with a dense short pubescence; the face covered with pale yellow pubescence, as well as the lower portion of the cheeks. The wings fuscous, palest at their base; the anterior and intermediate tarsi ferruginous, the latter fuscous above; the anterior coxæ armed with short acute teeth. Abdomen: beneath, the apical margins of the segments rufo-testaceous; the two apical segments clothed with pale ferruginous pubescence.

Hab. Morty Island.

Fam. SCOPULIPEDES.

Gen. CERATINA, *Latr.*

1. *CERATINA* HIEROGLYPHICA, *Smith, Cat. Apidæ*, p. 224.

Hab. Gilolo.

Gen. XYLOCOPA, *Latr.*

1. *XYLOCOPA* LATIPES, *Drury, Ill. Exot. Ins.* ii. p. 98.

Hab. Sumatra.

2. *XYLOCOPA* CÆRULEA, *Fabr. Syst. Piez.* p. 345.

Hab. Sumatra.

3. *XYLOCOPA* DEJEANII, *St. Farg. Hym.* ii. p. 209.

Hab. Sumatra.

4. *XYLOCOPA* PROVIDA, *Smith, Proc. Linn. Soc.* vii. p. 48.

Hab. Morty Island.

5. *XYLOCOPA* NOBILIS, *Smith, Proc. Linn. Soc.* iii. p. 8.

Hab. Sula.

6. *XYLOCOPA* CORONATA, *Smith, Proc. Linn. Soc.* v. p. 135.

Hab. Morty Island.

Gen. ANTHOPHORA, *Latr.*

1. *ANTHOPHORA* ZONATA, *Linn. Syst. Nat.* i. p. 995.

Hab. Salwatty; New Guinea.

Gen. TRIGONA, *Jurine.*

1. *TRIGONA* LÆVICEPS, *Smith, Proc. Linn. Soc.* ii. 51, iii. 135.

Hab. New Guinea.

2. *TRIGONA* PLANIFRONS. *T. nigra*, nitida; pectore abdomineque subtus pube cinerea tectis; alis subhyalinis, nervuris atris.

Worker. Length $2\frac{1}{2}$ lines. Shining black; the flagellum beneath obscurely fulvous; the apex of the mandibles rufo-piceous. Thorax

beneath thinly clothed with cinereous pile or short pubescence; the wings subhyaline, the nervures black; the posterior tibiæ broadly expanded towards their apex, and fringed outwardly with black pubescence. Abdomen conical, and thinly clothed beneath with cinereous pubescence.

Hab. New Guinea.

3. *TRIGONA ATRICORNIS*. *T. melleo-flava*; flagello, tibiis tarsisque intermediis et posticis nigris.

Worker. Length 2 lines. Honey-yellow, smooth and shining; the inner edge of the mandibles rufo-piceous; the flagellum black, slightly fulvous beneath. Thorax: a glassy-smooth and shining pale space enclosed by a suture; the wings hyaline and iridescent, the nervures dark fusco-ferruginous; the intermediate and posterior tarsi, the posterior tibiæ outside, except at their base, and a line on the posterior femora above black. The two apical segments of the abdomen thinly covered with white downy pile; beneath, the segments fringed with pale hairs.

Hab. New Guinea.

DESCRIPTION OF PLATE IV.

- Fig. 1. *Cladomacra macropus*, ♂. 1 *a.* Antenna of ditto.
 Fig. 2. *Polyrhachis Neptunus*, ♀.
 Fig. 3. *Formica (Myrmecopsis) respiciens*, ♀. 3 *a.* Head of ditto.
 Fig. 4. *Pterochilus eximius*, ♂.
 Fig. 5. *Cephaloxys capitata*, ♀.
 Fig. 5 *a.* Under side of the head of ditto.
 Fig. 5 *b.* Upper side of the head of ditto.
 Fig. 6. *Myrmica quadrispinosa*, ♀.
 Fig. 6 *a.* Thorax of ditto.
 Fig. 7. *Cataulacus hispidulus*, ♀.
 Fig. 8. *Pheidolacanthinus armatus*, ♀.
 Fig. 9. *Spinaria sulcata*, ♀.

Account of a Heronry, and Breeding-place of other Water-birds,
 in Southern India. By JOHN SHORTT, M.D., F.L.S.

[Read Nov. 3, 1864.]

IN the Madras district, about fifty miles from Madras and twelve miles from Chingleput in a south-easterly direction, is a small village called Vaden Thaugul, which means literally "Hunter's Rest," from *vaden*, "hunter," and *thaugul*, "rest." To the south of the village lies one of those small tanks called *Thaugul* by the Tamil ryots, implying a water-rest or temporary reservoir, from which

the village derives its name; but why *Vaden* was added to it is not known. It is possible that, from its being the resort of numbers of birds, the people connected it with the term *vaden*, or "hunter," a name given to a rude class of people in Southern India who are known as hunters and birdcatchers, but who have never been found residing here. The Vaden Thaugul tank is situated N.N.W. of the Carangooly Fort, and is $3\frac{1}{2}$ miles distant in a direct line from the Great Southern Trunk road.

The bund, whose greatest height is 12 feet, commences from a piece of high ground near the village, runs for a distance of about 600 yards in a south-easterly direction, then takes a sharp turn almost at a right angle, and terminates in high ground about 200 yards further. The water-spread is limited on the north-east by slightly rising ground overgrown with low jungle, and on the east-south-east by high gravelly and rocky ground. The area comprised in the tank is about four acres and a half (thirty cawnies *).

From the north-east to the centre of the bed of the tank there are some 500 or 600 trees of the *Barringtonia racemosa*, from about 10 to 15 feet in height, with circular, regular, moderate-sized crowns; and when the tank fills, which it does during the monsoons, the tops only of the trees are just visible above the level of the water.

This place forms the breeding-resort of an immense number of water-fowl; Herons, Storks, Cranes, Ibises, Water-crows or Cormorants, Darters and Paddy-birds, &c., make it their rendezvous on these occasions.

From about the middle of October to the middle of November small flocks of twenty or thirty of some of these birds are to be seen, coming from the north to settle here during the breeding-season. By the beginning of December they have all settled down; each tribe knows its appointed time, and arrives year after year with the utmost regularity within a fortnight, later or earlier, depending partly on the seasons. Some, from the lateness at which they arrive, appear to have come from great distances. They commence immediately by building their nests or repairing the old ones, preparatory to depositing their eggs. When they have fully settled down, the scene becomes one of great interest and animation.

During the day the majority are out feeding, and towards evening the various birds begin to arrive in parties of ten, fifteen,

* A cawnie is 6400 square yards.

or more, and in a short time the trees are literally covered with bird-life : every part of the crown is hidden by its noisy occupants, who fight and struggle with each other for perches ; each tree appears like a moving mass of black, white, and grey ; the snowy-white plumage of the Egrets and Curlews contrasting with, and relieved by the glossy black of the Water-crows and Darters and by the grey and black plumage of the Storks.

The nests lie side by side, touching each other ; those of the different species arranged in groups of five or six, or even as many as ten or twenty, on each tree.

The nests are shallow, and vary in inside diameter from 6 to 8 inches, according to the size of the bird.

The Curlews do not build separate nests, but raise a large mound of twigs and sticks, shelved into terraces as it were ; and each terrace forms a separate nest : thus eight or ten run into each other. The Storks sometimes adopt a similar plan.

The whole of the nests are built of sticks and twigs, interwoven to the height of 8 or 10 inches, with an outside diameter of 18 to 24 inches ; the inside is slightly hollowed out, in some more and in others less, and lined with grass ; reeds and quantities of leaves are laid on the nests. In January the callow young are to be seen in the nests. During this time the parent birds are constantly moving on the wing, backwards and forwards, in search for food, now returning to their young loaded with the spoil, and again, as soon as they have satisfied their cravings, going off in search of a further supply. About the end of January or early in February the young are able to leave their nests and scramble into those of others. They begin to perch about the trees, and by the end of February or the beginning of March those that were hatched first are able to take wing and accompany their parents on foraging expeditions ; and a week or two later, in consequence of the drying up of the tanks in the vicinity, they begin to emigrate towards the north with their parents and friends, except perhaps a few whose young are not as yet fledged, and who stay behind some time longer. Thus, in succession, the different birds leave the place, so that it is completely deserted by the middle of April, by which time the tank also becomes dry ; and the village cattle graze in its bed, or shelter themselves under the trees from the scorching heat of the midday sun, while the cow-boys find amusement in pulling down the deserted nests.

This village and tank are completely isolated from the public

thoroughfare, and very few seem aware of its existence. The villagers hold an agreement, from the ancient Nabob's government, which continues in force by a renewal from the British Government, that no one is to shoot over the tank, which is strictly enforced to the present day; and the birds continue in undisturbed possession of this place as a favourite breeding-resort every winter or monsoon.

The natives understand the value of the dung of the birds in enriching their rice-fields; and when the tank becomes dry, the silt deposited in its bed is taken up to the depth of a foot, and spread over the rice-fields; consequently they are careful not to disturb the birds.

When I first discovered the locality, I was under the impression that the birds were venerated from some superstitious motives, but an acquaintance with the villagers undeceived me as to this point. Anxious to examine the nests, I visited the locality at various periods when the tank was full of water, first in January, and subsequently on the 8th of March, 1864. I caused a raft of wood to be constructed for the occasion. On the last excursion I was accompanied by some of the European and native officials of the district; and we were pushed along on the raft by two fishermen swimming one on either side, their heads only visible above water, whilst the tank bund was lined with the villagers, who witnessed our operations with great curiosity. As we approached the trees the birds at first remained quite unconcerned, but as we got nearer they began to look on with amazement at a scene which was evidently new to them; then they rose *en masse* over our heads, and uttering piercing cries, some, with threatening gestures, rested a moment on the adjoining trees, and then took to their wings again: although so crowded, they performed their evolutions with the greatest nicety and dexterity, never interfering with each other's movements. Some ascended to a great height, and were hardly perceptible in the air, while others gyrated immediately above our heads; many crowded on adjoining trees, and witnessed our intrusion with dismay. On the first occasion, in January 1864, I was alone on the raft; most of the young of the Water-crows, Storks, Herons, and Darters were fully feathered, and were able to scramble to other nests, and some to the tops of trees; a few nests contained eggs, and others callow young. The Water-crows and Darters, young as they were, immediately took to the water and dived out of sight. On the second occasion, in March last, the young of the Ibises

were fully feathered, as were also a few Grey and Purple Herons and Darters; two or three nests only contained eggs, and some few callow young.

The following is a detailed account of the nests, and of the number of eggs, or young, I found in each nest on the different times I visited the place:—

1. The small Grey and Black Stork, *Leptoptilos Javanica*?; Tamil name, *Nutha coottee narai*; literally “Shell-fish- (*Ampullaria*) picking Crane.” These birds were the most numerous; their nests were two feet in diameter, and contained three eggs or young. The eggs were of a dirty-white colour, of the same shape, but not quite so large, as those of the Turkey. The young when fully feathered were in prime condition. The flesh is eaten by Mussulmans and Pariahs. I remember on one occasion, when one was shot in the jungles of Orissa, one of the Sepoys, a Bengal Bramin, begged for the dead bird, which was given him; and after eating it he came back to say he had enjoyed his dinner greatly. That he had made a hearty one was evidenced by his protuberant stomach. The bird is common about here, but keeps entirely to marshy fields, edges of tanks, &c.; it never approaches towns. Some half-dozen or more of these birds may often be seen in the morning sunning themselves with outstretched wings in the dry fields. They only differ from the Adjutant (or *Leptoptilos Argala*) in size and colour. These nest early, and the young are firm on the wing in the month of February.

2. The Ibis or Curlew, *Ibis Falcinellus**; Tamil, *Arroova mooken*, literally “Sickle-nosed,” which name they take from their long curved beaks. The nest of this bird contained from three to five eggs, and I found from three to four young in each nest. The eggs resemble in size and shape a medium-sized hen’s egg, but are of a dirty-white colour. The birds are white, with black head, feet, and neck, and have a long curved black bill. The head and neck are naked, and the tail-feathers of rather a rusty-brown colour; the lower sides of the wings, from the axillæ to the extremities, are naked; and the skin in the old birds is of a deep scarlet colour; in the young this is absent, although the part is naked. The young are fully fledged in March, and take to the wing in April.

3. The Grey Heron, *Ardea cinerea*; Tamil, *Narai*, sometimes *Pamboo narai*, or Snake Crane; has a similar nest, built of twigs, containing sometimes two, sometimes three eggs. I only found

* *Falcinellus igneus*, Gould.

two young in the nests; they are fledged from January to April, according to the time of depositing their eggs, which some do earlier than others. The eggs are of a light-green colour; they are not so large in circumference as a large-sized hen's egg, but are longer, with the small end sharp.

4. The Purple Heron, *Ardea purpurea*; Tamil, *Cumbly narai*, or Blanket Crane. Nest the same; deposits two to three eggs, of same size and colour as last; seems to rear only two young. The young are fully fledged in April.

5. *Ardea Nycticorax*; Tamil, *Wukka*. Nests are built after the same fashion, but smaller in size, and contain five eggs; hatches four or five young; eggs the size of a bantam's, and of the same shape. The young are fledged in April.

6. The Cormorant, *Graculus pygmæus*; Tamil, *Neer cakai*, or Water-crow. Nest the same as the others, built of sticks; deposits three or four eggs, and rears three or four young, which are fledged and on the wing in January; eggs like those of a small-sized bantam's, rather sharp-pointed at small end, with a slight greenish tinge.

7. The Large Cormorant, *Graculus Siennensis*; Tamil, *Peroon neer cakai*, or Large Water-crow. Builds a very rude nest, chiefly formed of sticks; lays four eggs, and rears two, three, or four young. The eggs are the size of a medium-sized domestic hen's, and have a slight greenish tinge; the young are fledged sometimes in January, sometimes in March, according to the time of their nesting. These birds, as well as *G. pygmæus*, are to be seen fishing in the tank itself; and the rapidity with which they find their prey, by diving, is wonderful.

8. The Darter, *Plotus melanogaster*; Tamil, *Pamboo Thalai neer cakai*, or Snake-headed Water-crow. Nest same as last; three, sometimes four eggs of same size and colour; young fledged and on the wing, some in January, others not till April.

I succeeded in capturing young of all the birds described here, and sent them to the People's Park at Madras. I was in great hopes of sending a few of each to the Zoological Society's Gardens, Regent's Park, London, by Mr. Thompson, the head keeper, of whose intended visit to India in the "Hydaspes" the Secretary, Dr. Sclater, obligingly apprised me, but unfortunately I lost the opportunity, which I greatly regret.

Returning to the subject of Vaden Thaugul, the villagers tell me that the Pelican sometimes comes and breeds here, as also the

Black Curlew. Occasionally different kinds of Teal, Widgeons, &c., are said to nest in the rushes that bound the inner surface of the tank bund. But, although I visited this place frequently, I saw no other birds than those described here.

The Egrets, or *Herodias Garzetta*, *Bubulcus*, and *intermedia*, were congregated in very large numbers, and roosted on the trees at night; but they do not nest, which seems singular. The natives had observed this, and I found it to be the case. Yet I believe, of all the birds that assemble here, these occur in the greatest number. *Ardea alba*, or *Herodias alba*, and *H. intermedia* are also found here; and the natives say that they breed, but I did not find any of their nests in the place during my visits to Vaden Thaugul.

A brief Account of the *Myrmica Kirbii* as found in Southern India. By JOHN SHORTT, M.D., F.L.S.

[Read Nov. 3, 1864.]

SOME years ago, when in medical charge of the Ganjam trigonometrical survey, in the jungles of Orissa, my attention was drawn to nests of this species of Ant, which, I believe, has been described by Colonel Sykes. A trip last year to the Shervaroys gave me further opportunities of examining these nests more carefully, and also afforded me the opportunity of watching the habits of the ants, as they are very plentiful on this plateau; and believing that any information on the subject may prove interesting, I beg to submit a short account of the same to the Society.

The nests of these ants are built on different kinds of trees and shrubs. I have found them on the *Syzygium Jambolana*, *Coffea Arabica*, *Psidium pomiferum*, *Citrus Aurantium*, &c. The largest nest I ever saw was taken from a *Syzygium Jambolana* at Nagalore, Shervaroy Hills, and is now in my possession; it weighs 3lbs. 8oz., is irregularly oval in form, its extreme length is 19½ inches, its girth or circumference in the centre 32½ inches, and it is sufficiently solid to withstand moderate force. I had some difficulty in securing the nest, in consequence of the ferocity of its inmates; and the tree was of some height. The nest was situated about 30 feet from the ground, on a fork of the tree, and was built round some of the branches, which protruded through it in various directions; the girth of the thickest or lowermost

branch of the fork measured $1\frac{3}{4}$ inch; all the other branches that protruded through the nest were much smaller.

The structure was made up of a fine mixture of cowdung and leaves of various kinds; but the outside was well smeared with cowdung, and honeycombed with tile-like appendages, which, whilst they permitted the free ventilation of the interior, at the same time, by a slight projection of the scale-like eaves, rendered the nest impervious to rain.

The interior was composed of irregularly tunnelled cells, comprising nurseries, stores, &c.

At Yercand, on the Shervaroys, I on one occasion procured two nests of small size (about that of a medium-sized cocoa-nut with the husk on) from two different coffee shrubs, and placed them one on either side of a window-sill in a bath-room, in the hope of watching their habits.

It was amusing to witness the threatening attitudes these diminutive creatures put on, with their abdomens flexed over their back or thorax, and their mandibles extended. They ran to and fro in a state of excitement in search of the enemy, on whom, when found, they at once advanced, and used their expanded jaws to such purpose as to cause extreme pain to the individual attacked. Considering their small size, the ferocity and undaunted courage they exhibited, and their readiness to attack man or beast who approached them were very remarkable. It was late one evening when I placed the nests in the window; early next morning I returned to see how they were, and, to my great astonishment, the window-sill was completely covered with dead and dying ants. On further examination I found that a battle had taken place between the inhabitants of the two nests; and so ferocious were the little creatures, that I found numbers even in death clinging to each other; and the battle had been so vigorously contested that the survivors were but few in number. The victors were already busily engaged in plundering the nest of the vanquished of its cocoons, and carrying them off to their own. I regretted extremely that I had lost the opportunity of witnessing so interesting a sight as this battle must have been; and as I had to leave the place a few days after, I had no opportunity of procuring another nest. I examined numerous deserted and broken-down nests, and found that all of these had been taken possession of by one or more millepedes, or *Iulus*. Whether these animals had destroyed the ants and taken

possession of their nests, or whether they had merely sought shelter in their deserted habitations, I am not prepared to say. As the millepedes are considered to feed on vegetables, it is possible that they had taken possession of these abodes to feed at leisure on their structure. I am the more inclined to this opinion from the worm-eaten appearance of some of the deserted nests.

Descriptions of New Species of the Dipterous Insects of New Guinea. By FRANCIS WALKER, F.L.S.

[Read March 3, 1864.]

Fam. MYCETOPHILIDÆ, *Haliday*.

Gen. SCIARA, *Meigen*.

1. SCIARA VARIPES. *Fem.* Testacea, antennis nigricantibus basi testaceis, pedibus longiusculis, tarsis nigris, alis cinereis.

Female. Testaceous. Antennæ blackish, testaceous towards the base, not longer than the thorax. Abdomen a little longer than the thorax. Legs slender, rather long; tarsi black. Wings cinereous; veins black; radial vein extending a little beyond the fork of the subapical vein. Length of the body 2 lines; of the wings 6 lines.

2. SCIARA? FILIPES. *Mas.* Testacea, gracilis, abdomine attenuato apicem versus nigro, pedibus longissimis, tibiis apice tarsisque fusciscentibus, alis cinereis.

Male. Testaceous, slender. Abdomen attenuated, black towards the tip, more than twice as long as the thorax. Legs slender, extremely long; tarsi and tips of the tibiæ brownish. Wings cinereous; veins brownish; radial vein ending at a little before the fork of the subapical vein; cubital vein very near the costa. Length of the body 3 lines; of the wings 7 lines.

The specimen here described is mutilated, and therefore can hardly be characterized as a new genus.

Fam. CULICIDÆ, *Haliday*.

Gen. MEGARHINA, *Desv.*

3. MEGARHINA INORNATA. *Mas.* Fusca, palpis purpureis argenteo bifasciatis, antennis nigris, pectore femoribusque argenteis, abdomine lurido apicem versus nigro, pedibus non fasciatis, alis fusciscenti-cinereis.

Male. Brown. Palpi purple, with two silvery bands, longer than the thorax. Rostrum black, bent, nearly as long as the abdomen. Antennæ black. Pectus silvery cinereous. Abdomen lurid, black towards the tip, where it is furnished with diverging lateral black hairs. Legs setulose, without bands; femora silvery cinereous, except towards the tips. Wings brownish cinereous; veins brown. Length of the body 6 lines; of the wings 10 lines.

Gen. CULEX, *Linn.*

4. CULEX VENTRALIS. *Fœm.* Nigricans, pectore argenteo, abdomine subtus fasciis sex argenteo-albis, femoribus argenteo-albidis apice nigricantibus, alis cinereis.

Female. Blackish. Rostrum and palpi black, the former slightly bent downward, a little longer than the thorax. Pectus silvery cinereous. Abdomen beneath with six silvery-white bands. Legs long, slender; femora silvery whitish, except towards the tips; tibiæ and tarsi setulose. Wings cinereous; veins blackish, fringed; fork of the subapical vein rather short. Length of the body 4 lines; of the wings 6 lines.

Fam. CHIRONOMIDÆ, *Haliday.*

Gen. CHIRONOMUS, *Meigen.*

5. CHIRONOMUS INSTABILIS. *Mas.* Pallide fuscus, nitens, thorace antice producto vittis duabus nigricantibus, pedibus albidis subpubescentibus, alis lacteis.

Male. Pale brown, shining. Eyes deep black. Thorax very prominent in front, with two slender blackish stripes. Legs whitish, long, slender, very minutely pubescent; fore metatarsus almost twice the length of the fore tibia. Wings milk-white; veins white. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Fam. TIPULIDÆ, *Haliday.*

Gen. LIMNOBIA, *Meigen.*

6. LIMNOBIA PLENIPENNIS. *Mas.* Badia, capite nigro, thorace antice attenuato, abdomine brevi subochraceo apicem versus nigro, femoribus testaceis apice fuscis, alis cinereis luteo variis, vittis tribus deviis nigricantibus, maculis guttisque albis.

Male. Chestnut colour, shining. Head, palpi, and antennæ black. Thorax attenuated in front; pectus testaceous in front. Abdomen short, dull ochraceous, black towards the tip, very little longer than the thorax. Legs brown, long, slender; coxæ and femora testaceous, the latter with brown tips. Wings cinereous; basal and subapical parts pale luteous; three irregular blackish stripes; first stripe costal,

terminated by a white transversely elongated blackish-bordered spot ; second including two elongated white spots and two white points, beyond which there are two white blackish-bordered dots ; third paler and diffuse, including one elongated white spot ; a discal areolet ; radial vein not forked ; first externo-medial vein not forked ; no second externo-medial vein ; third externo-medial vein forked ; one veinlet between the third externo-medial vein and the subanal vein, nearer than the discal areolet to the base of the wing ; halteres testaceous, with white knobs. Length of the body 5 lines ; of the wings 14 lines.

7. *LIMNOBIA LATIFASCIA*. *Fem.* Atra, abdomine fascia latissima lutea, femoribus basi luteis, alis nigris fascia latissima lutea, gutta costali alba.

Female. Deep black. Abdomen with a very broad pale luteous band, which extends from near the base to much beyond the middle. Femora pale luteous towards the base ; this hue is most prevalent in the fore femora. Wings black, with a very broad pale luteous middle band ; a white costal dot adjoining the exterior black part, and bordered with black on the inner side ; veins like the wings in colour ; halteres black. Length of the body 6 lines ; of the wings 14 lines.

In structure like *L. euchroma*, Journ. Linn. Soc. vol. vi. p. 4.

8. *LIMNOBIA INFIXA*. *Mas.* Testacea, capite nigro, thorace antice attenuato, abdomine longo fasciis nigricantibus, alis cinereis guttis tribus costalibus fusciscentibus.

Male. Testaceous. Head, palpi, and antennæ black. Antennæ moniliform, tapering, shorter than half the length of the thorax. Thorax attenuated in front. Abdomen long, with a blackish band along the fore border of each segment, about thrice the length of the thorax. Wings cinereous ; three brownish dots along the costa, the first at the base of the radial vein ; veins black, testaceous at the base ; a discal areolet ; radial vein forked, the forks slightly curved downward ; first externo-medial vein not forked ; one veinlet between the third externo-medial vein and the subanal vein, opposite the base of the discal areolet. Length of the body $6\frac{1}{2}$ lines ; of the wings 14 lines.

9. *LIMNOBIA CONTINGENS*. *Mas.* Pallide lutea, capite nigro, thorace strigis duabus obliquis vittaque nigris, abdomine segmentorum marginibus apiceque nigris, alis pallide fuscis.

Male. Pale luteous, slender. Head black, shining. Thorax in front with a black stripe and two oblique black streaks. Abdomen thrice the length of the thorax, shining towards the base, black and shining towards the tip ; hind borders of the segments black. Wings pale brown ; veins black ; a discal areolet ; radial vein forked ; first externo-medial vein forked, with a petiole between its forks and the discal areolet ; one veinlet between the third externo-medial vein and the

subanal vein, joining the discal areolet near the base of the latter; halteres with black knobs. Length of the body 6 lines; of the wings 12 lines.

10. *LIMNOBIA EXCLUSA*. *Fœm.* Lutea, capite nigro, thorace litura trifurcata guttisque duabus posterioribus nigris, abdomine apice nigro, pedibus nigris femoribus basi luteis, alis limpidis fascia diffusa fuscescente antice nigra postice obsoleta.

Female. Luteous, shining. Head, palpi, and antennæ black. Head small, attached to the thorax by a very slender petiole. Palpi elongated. Antennæ moniliform, setaceous, minutely setulose, a little more than half the length of the thorax. Thorax with a trifurcate black mark and with two hinder black dots. Abdomen rather short, with a black tip. Legs black, stout; femora towards the base and coxæ pale luteous. Wings limpid; veins black; costa pubescent, black and incrassated from somewhat before the middle to the tip of the cubital vein; discal areolet long; radial vein and first externo-medial vein not forked; one veinlet between the third externo-medial vein and the subanal vein, joining the discal areolet near the base of the latter; axillary vein undulating; a brownish diffuse band across the base of the discal areolet, obsolete hindward, black towards the costa. Length of the body 4 lines; of the wings 8 lines.

11. *LIMNOBIA TRISIGNATA*. *Fœm.* Flava, capite nigricante, palpis apice nigris, abdomine fascia postica atra, pedibus nigris femoribus basi flavis, alis nigricantibus basi fascia media maculaque discali albis.

Female. Pale yellow. Head blackish. Palpi with black tips. Abdomen with a deep black band towards the tip, which is attenuated. Legs black, stout; femora at the base and coxæ pale yellow. Wings blackish, white towards the base, with a white middle band, and with a white discal spot towards the tip; veins black, pale yellow towards the base; discal areolet pentagonal; radial vein and first externo-medial vein not forked; second externo-medial vein much nearer to the first than to the third externo-medial vein; one veinlet between the third externo-medial vein and the subanal vein, joining the discal areolet at somewhat before the middle of the latter; axillary vein slightly undulating; halteres with brown knobs. Length of the body 6 lines; of the wings 12 lines.

Gen. TIPULA, *Linn.*

12. *TIPULA PALLIDA*. *Mas.* Pallide testacea, capite postico cinereo, thorace vitta cinerea interlineata postice albido-testaceo, abdomine lutescente basi pallido apice fusco, pedibus longissimis, alis subcinereis venis luteis albo binotatis.

Male. Pale testaceous; in structure like *T. infidens*. Head pale cinereous hindward. Antennæ not longer than the palpi. Thorax with an indistinct cinereous interlined stripe; hind part whitish testaceous.

Abdomen dull luteous, pale at the base, brown at the tip. Legs very long. Wings long, slightly cinereous; veins luteous, with two white marks, one on the veinlets near the base, the other on the veinlets in front of the discal areolet; stigma testaceous; halteres with brownish knobs. Length of the body 12 lines; of the wings 32 lines.

Gen. PACHYRHINA, *Macq.*

13. PACHYRHINA TENUIS. *Mas.* Flava, capitis vitta palpis apice antennis thoracis disco abdomineque nigris, abdomine fasciis quatuor angustis flavis fasciaque subapicali lata flavescente, pedibus fulvescentibus tarsis nigris, alis subcinereis.

Male. Pale yellow, slender. Head with a black discal stripe. Palpi black towards the tips. Antennæ black, except at the base. Disk of the thorax black, with the exception of a short oblique yellow streak on each side in front. Metathorax black. Abdomen black, with four narrow pale yellow bands; a broad yellowish subapical band. Legs slender, dull pale tawny; tibiæ darker than the femora; tarsi black. Wings slightly cinereous; veins black; stigma brown; halteres with blackish knobs. Length of the body 7 lines; of the wings 14 lines.

Fam. STRATIOMIDÆ, *Haliday.*

Gen. CLITILLARIA, *Meigen.*

14. CLITILLARIA RESPONSALIS. *Fam.* Nigra, antennis articulo 3^o intus albo, thorace cinereo tomentoso vitta dorsali maculisque quatuor nudis, abdomine vitta postica maculisque quatuor trigonis argenteis, femoribus lividis apice nigris, tibiis tarsisque posterioribus albidis apice nigris, alis cinereis, halteribus albidis.

Female. Black. Head with silvery cinereous tomentum in front and about the eyes. Antennæ nearly as long as the breadth of the head; third joint white on the inner side. Thorax covered with cinereous tomentum, excepting a dorsal stripe and two spots on each side. Abdomen with a short hindward silvery stripe, and with two triangular silvery spots on each side. Femora livid, except towards the tips; posterior tibiæ and tarsi whitish, with black tips. Wings cinereous; veins black; halteres whitish. Length of the body 5 lines; of the wings 8 lines.

This species is closely allied to *C. bivittata*, from which it may be distinguished by its smaller size, its broader antennæ, the narrower stripe and smaller spots of the thorax, and the wings without any blackish tinge.

Gen. STRATIOMYS, *Geoffr.*

15. STRATIOMYS ATRARIA. *Mas et Fam.* Atra, antennis basi fulvis,

scutello spinis piceis, abdominis lateribus rufescentibus, tibiis tarsisque fulvis apice nigris, alis cinereis basi luridis striga costali nigra, halteribus testaceis.

Male and Female. Deep black, dull. Antennæ tawny towards the base, much shorter than the breadth of the head. Scutellum with two piceous spines. Abdomen reddish along each side. Tibiæ and tarsi tawny, the latter with black tips. Wings cinereous, with a lurid tinge towards the base; a black streak along the middle part of the costa; veins black; halteres testaceous. *Female.* Head shining. Length of the body 4 lines; of the wings 7 lines.

16. STRATIOMYS PARALLELA. *Mas.* Nigra, antennis basi rufescentibus, thorace vittis quatuor, scutelli margine postico pectorisque maculis quatuor albidis, abdomine fulvo vitta dorsali lata nigra basi dilatata, genibus tarsisque fulvis, alis limpidis, halteribus albidis.

Male. Black. Head reddish on each side of the mouth. Antennæ with the first and second joints reddish; scape lanceolate, a little longer than the first and second joints together. Thorax with four whitish slender stripes; hind border of the scutellum whitish, with two whitish spines; pectus with two whitish spots on each side. Abdomen tawny, with a broad black dorsal stripe, which is dilated at the base on each side. Tarsi, except towards the tips and knees, tawny. Wings limpid; veins pale tawny; halteres whitish. Length of the body 6 lines; of the wings 9 lines.

Gen. SARGUS, *Fabr.*

17. SARGUS FORTIS. *Mas.* Niger, antennis testaceis, scutelli margine postico spinisque quatuor albis, pedibus albidis, tibiis tarsisque anticis nigricantibus, femoribus tibiisque posterioribus piceis, alis cinereis apice nigricantibus, halteribus albidis apice nigris.

Male. Black, shining; closely allied to *S. tenuis*. Antennæ pale testaceous; third joint round; arista black, very slender, about twice the length of the antennæ. Thorax a little narrower in front; scutellum prominent, with a white hind border and with four white spines. Abdomen rather longer than the thorax. Legs whitish; fore tibiæ and fore tarsi blackish; posterior femora and tibiæ piceous, except towards the base; posterior tarsi with black tips. Wings cinereous, blackish towards the tips, this hue darkest and most extensive along the costa; veins black, whitish at the base; halteres whitish, with black tips. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Gen. RUBA, *Walk.*

18. RUBA OPPONENS. *Mas.* Testacea, antennis nigris basi testaceis, abdomine nigro, tarsis anterioribus piceis, tarsis posticis nigris, alis nigricantibus postice fuscis, halteribus testaceis.

Male. Testaceous, with pale pubescence. Antennæ shorter than the

breadth of the head; scape black. Abdomen black, with whitish pubescence, rather longer and much broader than the thorax. Anterior tarsi piceous, except towards the tips; hind tarsi black. Wings blackish, brown hindward; veins black; halteres testaceous. Length of the body 3 lines; of the wings 6 lines.

Fam. TABANIDÆ, *Leach.*

Gen. PANGONIA, *Latr.*

19. PANGONIA CALIGINOSA. *Fam.* Piceo-nigra, capite subtus pectoreque albido pilosis, proboscide thoracis longitudine, antennis rufescentibus apice nigricantibus, alis nigricantibus maculis duabus discalibus cinereis.

Female. Piceous black. Head beneath and pectus thickly clothed with whitish hairs. Proboscis as long as the thorax. Palpi piceous. Antennæ reddish, lanceolate, curved upward, piceous at the base, blackish at the tips. Thorax with a line of black hairs along each side. Abdomen oval, longer and broader than the thorax; hind borders of the segments piceous. Wings blackish, cinereous towards the hind border, with two elongated paler cinereous discal spots; veins black; fore branch of the cubital vein slightly curved, forming a slightly obtuse angle at its flexure, from whence it emits a short branch. Length of the body 6 lines; of the wings 16 lines.

Gen. TABANUS, *Linn.*

20. TABANUS COHÆRENS. *Fam.* Piceus, antennis ochraceis apice nigris, abdomine fulvo apice nigricante segmentorum marginibus posticis vittaque testaceis, pedibus fulvis, tarsis posterioribus femoribusque anticis piceis, tibiis anticis apice tarsisque anticis nigricantibus, alis cinereis apud costam fuscescentibus.

Female. Piceous; closely allied to *T. serus*. Head, thorax, and pectus with hoary tomentum. Head with a slender piceous callus which is dilated in front. Antennæ ochraceous, piceous at the base, black towards the tips; third joint with a very small horn. Abdomen tawny, blackish towards the tip; hind borders of the segments testaceous, this hue most apparent on the hinder segments; a dorsal testaceous stripe, which is slightly dilated hindward, and is obsolete at the base and at the tip. Legs tawny; coxæ hoary; posterior tarsi, except at the base, and fore femora piceous; fore tibiæ towards the tips and fore tarsi blackish. Wings cinereous, brownish along the costa; veins black, tawny at the base; fore branch of the cubital vein almost straight, forming an obtuse and rounded angle at its flexure; halteres testaceous. Length of the body 7 lines; of the wings 14 lines.

21. TABANUS PAPOUINUS. *Mas.* Piceus, antennis rufescentibus apice nigris, thorace cinereo tomentoso, abdomine fusco basi fulvo segmen-

torum marginibus posticis cinereis, pedibus fulvis, tarsis piceis, alis cinereis striga costali fusca.

Male. Piceous. Head beneath and pectus with whitish tomentum.

Eyes rather broader than the thorax, divided, as in many other species, into large and small facets, the former reddish, the latter blackish. Antennæ reddish, piceous at the base, black towards the tips; third joint with an extremely small horn. Thorax with cinereous tomentum. Abdomen brown, conical, tawny towards the base; hind borders of the segments pale cinereous. Legs tawny; coxæ hoary; posterior tarsi piceous, tawny towards the base; fore tibiæ towards the tips and fore tarsi piceous. Wings cinereous, with a brown streak along the costa beyond the middle; veins black, piceous at the base; fore fork of the cubital vein almost straight, forming a fork at its flexure; halteres piceous. Length of the body 5 lines; of the wings 12 lines.

22. *TABANUS BREVIUSCULUS.* *Mas.* Fulvus, capite subtus pectoreque cinereo tomentosus, thorace antico vittis tribus cinereis, abdomine apice pedibus anticis tarsisque piceis, alis cinereis striga costali lurida.

Male. Tawny; in structure like the preceding species. Head beneath and pectus with cinereous tomentum. Eyes without the black line of minute facets along the hind border which distinguishes the preceding species. Proboscis black. Antennæ tawny. Fore part of the thorax with three cinereous stripes. Abdomen piceous towards the tip. Tarsi and fore legs piceous. Wings cinereous, with a lurid streak along the costa beyond the middle; veins black, tawny towards the base; fore branch of the cubital vein straight, slightly curved towards its base and towards its tip. Length of the body $4\frac{1}{2}$ lines; of the wings $11\frac{1}{2}$ lines.

Fam. ASILIDÆ, *Leach.*

Subfam. DASYPOGONITES, *Walk.*

Gen. DASYPOGON, *Fabr.*

23. *DASYPOGON INDECORUS.* *Mas.* Nigro-piceus, capite apud oculos subaurato, mystace albo minimo, thorace suturis subauratis maculis duabus lateralibus rufescentibus, abdomine petiolato segmentorum 2ⁱ et 3ⁱ marginibus posticis rufescentibus, femoribus tibiisque piceo-rufescentibus, alis cinereis apice nigricantibus.

Male. Piceous black. Head with white tomentum behind, slightly gilded in front along the eyes; front flat; mystax composed of very few slender white bristles. Proboscis and palpi black. Antennæ slender, linear, nearly as long as the breadth of the head. Thorax with the sutures slightly gilded; a reddish spot on each side at the base of the fore wing. Pectus with a silvery band on each side. Abdomen petiolated; hind borders of the second and third segments reddish. Legs reddish, smooth, shining, partly tinged with piceous; tarsi

blackish. Wings cinereous, blackish towards the tips; veins black; halteres dingy testaceous. Length of the body 6 lines; of the wings 12 lines.

Subfam. LAPHRITES, *Walk.*

Gen. LAPHRIA, *Fabr.*

24. LAPHRIA TIBIALATA. *Mas et Fœm.* Nigra, capite argenteo antice subaurato, antennarum articulo 3^o fusiformi, thoracis maculis lateralibus subaurato-albidis, abdomine purpurascente maculis lateralibus transversis argenteis, tibiis anticis et posticis subtus argenteo pilosis, alis cinereis apud venas fusciscentibus.

Male and Female. Black. Head silvery white, slightly gilded in front; mystax composed of a few black and white bristles; beard white, shining. Third joint of the antennæ fusiform, a little longer than the first and second. Thorax on each side with several whitish shining spots which are more or less gilded in some aspects. Abdomen purplish blue or purple; each segment with a transverse silvery spot accompanied by a bristle on each side. Legs greenish black, stout, bristly; coxæ silvery; fore tibiæ and hind tibiæ with silvery hairs beneath, except towards the base; pulvilli ochraceous. Wings cinereous, diffusely brownish about most of the veins; veins black; halteres pale tawny. Length of the body 9-10 lines; of the wings 19-20 lines.

25. LAPHRIA PLACENS. *Mas et Fœm.* Cyanea, capite albido, antennis nigris, abdomine fasciculis lateralibus albis, alis cinereis fasciis tribus nigris apud costam connexis, halteribus albis.

Male and Female. Dark blue. Head with shining whitish tomentum; mystax composed of a few white bristles; beard very small. Antennæ black; third joint slightly tapering, much longer than the first and second together. Pectus with cinereous tomentum. Abdomen linear, partly tinged with purple; each segment with a small tuft of white hairs on each side. Legs hardly stout, slightly bristly. Wings cinereous, with three black bands which are connected on the costa; third band apical, connected with the second on the hind border; veins black; halteres white. Length of the body 5 lines; of the wings 9 lines.

26. LAPHRIA PIPUNCULOIDES. *Mas.* Cyanea, facie alba, antennis abdomineque nigris, pedibus rufescentibus, tibiis tarsisque posticis nigris, alis cinereis, halteribus albidis.

Male. Blue, shining, not bristly. Head broader than the thorax, with shining white tomentum on the face, which is very narrow. Eyes flat in front. Proboscis black, very short. Antennæ black. Abdomen black, slightly broader hindward, about twice the length of the thorax. Legs reddish, slightly bristly; hind tibiæ and hind tarsi black. Wings cinereous; veins black, piceous at the base; halteres dingy whitish. Length of the body 4 lines; of the wings 7 lines.

Fam. BOMBYLIDÆ.

Subfam. THEREVITES, *Walk.*Gen. THEREVA, *Latr.*

27. *THEREVA* ?? *FUNEBRIS*. *Fam.* Nigra, non pilosa, capite luteo nitente, pectore halteribusque piceis, tarsis flavescens, alis nigricantibus.

Female. Black, dull. Head luteous, smooth, shining. Antennæ and palpi black. Pectus piceous, shining. Abdomen of equal breadth for more than half the length, tapering from thence to the tip. Tarsi pale dull yellowish, blackish towards the tips. Wings blackish, darkest along the costa; veins black; halteres piceous. Length of the body 5 lines; of the wings 10 lines.

This species hardly belongs to *Thereva*, but I have deferred separating it into a new genus.

Subfam. BOMBYLITES, *Walk.*Gen. ANTHRAX, *Fabr.*

28. *ANTHRAX* *APICIFERA*. *Mas.* Atra, antennis brevissimis articulo 3^o rotundo, abdomine apice albo, alis nigris spatio apicali obliquo inciso cinereo guttas duas nigras includente.

Male. Deep black; like *A. emittens* in structure. Head conical; eyes elongated. Antennæ very short; third joint round. Abdomen white at the tip. Legs very slender. Wings black, elongated, hyaline towards the tips; the outline of the black part oblique, forming some semidetached dots; two subapical black dots; veins and halteres black. Length of the body 3 lines; of the wings 8 lines.

Fam. EMPIDÆ, *Leach.*Gen. HYBOS, *Fabr.*

29. *HYBOS* *STIGMA*. *Mas.* Niger, tarsis fulvis, femoribus intermediis basi flavis, tibiis posticis setosis, alis cinereis apice fuscis, halteribus flavescens.

Male. Black, shining. Third joint of the antennæ elliptical, a little longer than the second joint; arista a little shorter than the third joint. Legs slender; tarsi tawny; middle femora pale yellow towards the base; hind tibiæ setose. Wings cinereous, brownish towards the tips, this hue darkest towards the stigma, which is large and black; veins black; halteres pale yellowish. Length of the body 2 lines; of the wings 4 lines.

Fam. DOLICHOPIDÆ, *Leach.*Gen. PSILOPUS, *Meigen.*

30. *PSILOPUS* *EXTENDENS*. *Fem.* Purpureo-cyaneus, proboscide pal-

pisque fulvis, antennis ferrugineis arista thorace longiore, thorace vitis tribus cupreis viridi marginatis, abdomine fasciis quatuor atris, pedibus nigris, femoribus luteis apice nigris, tibiis basi piceis, alis vitta costali lata fasciisque duabus subabbreviatis nigris. *Female.* Bright purplish blue; nearly allied to *P. varipennis*. Head in front and pectus with silvery tomentum. Proboscis and palpi tawny. Antennæ ferruginous; arista black, rather longer than the thorax. Thorax with three cupreous green-bordered stripes. Abdomen with four deep-black bands. Legs black; femora luteous, black towards the tips; tibiæ piceous towards the base; fore femora and fore tibiæ with long bristles; posterior tibiæ with short bristles. Wings limpid, with a broad blackish costal stripe which emits two irregular bands nearly to the hind border; veins and halteres black; fore branch of the præbrachial vein forming a curve near its base, hardly undulating from thence to its tip; discal transverse vein most deeply undulating. Length of the body $4\frac{1}{2}$ lines; of the wings 10 lines.

Gen. DOLICHOPUS, *Latr.*

31. DOLICHOPUS VICARIUS. *Fam.* Læte viridis, capite cyaneo, antennis fulvis, abdomine æneo-viridi suturis nigris plagis lateralibus argenteis, pedibus lutescentibus, femoribus posticis tibiisque posterioribus apice tarsisque posterioribus nigris, alis cinereis, halteribus lutescentibus.

Female. Bright green. Head bright blue; face silvery. Antennæ tawny; third joint short, conical; arista short. Thorax very setose. Abdomen æneous green, with silvery cinereous patches on each side; sutures black. Legs lutescent; hind femora and posterior tibiæ with black tips, the latter very setose; posterior tarsi black. Wings cinereous; veins black; præbrachial vein slightly bent exteriorly towards the cubital vein; halteres lutescent. Length of the body $1\frac{3}{4}$ line; of the wings $3\frac{1}{2}$ lines.

Fam. SYRPHIDÆ, *Leach.*

Gen. PARAGUS, *Latr.*

32. PARAGUS VENOSUS. *Fam.* Nigro-cyaneus, capitis vitta chalybæa, antennis nigris, abdomine plagis quatuor lateralibus albidis segmento 1^o livido, tibiis basi albis, metatarsis subtus rufescentibus, alis cinereis, halteribus albis.

Female. Blackish blue. Head with a chalybeous stripe between the eyes. Antennæ black; third joint oval, as long as the second; arista not longer than the third joint. First abdominal segment livid; second and third segments with a whitish patch on each side hindward. Tibiæ white towards the base; metatarsi reddish beneath. Wings cinereous; veins black, clouded with blackish; halteres white. Length of the body $3\frac{1}{2}$ lines; of the wings 8 lines.

33. *PARAGUS LUCTIFERUS*. *Fæm.* Niger, scutello pectoreque ferrugineis, abdomine cyaneo strigis quatuor lateralibus transversis punctisque duobus apicalibus albidis, tarsis halteribusque fulvis, alis cinereis.

Femalè. Black, dull. Head shining. Scutellum and pectus dull ferruginous. Abdomen dark blue, elongate oval, slightly shining, with two transverse whitish streaks on each side and with two apical whitish points. Tarsi tawny. Wings cinereous; veins black; halteres tawny. Length of the body 5 lines; of the wings 10 lines.

34. *PARAGUS INCISURALIS*. *Fæm.* Cyaneus, capite thoraceque nigro pubescentibus, antennis pedibusque nigris, segmentorum abdominalium marginibus posticis utrinque canis, tibiis basi subtus fulvis, alis nigris gutta subapicali maculisque tribus marginalibus cinereis, halteribus albis.

Femalè. Dark blue, shining. Head and thorax with black pubescence. Head pilose in front; hairs black. Antennæ and legs black. Abdomen elliptical, much broader than the thorax; hind borders of the segments with hoary pubescence on each side. Tibiæ tawny at the base beneath. Wings black, with an elongated cinereous subapical dot, and with three triangular cinereous spots on the hind border; veins black; halteres white. Length of the body 5 lines; of the wings 11 lines.

Gen. *AZPEYTIA*, n. g.

Mas. *Corpus* latum, crassum. *Caput* antice subproductum. *Oculi* pubescentes. *Antennæ* breves; articulus 3^{us} longiconicus; arista nuda. *Scutellum* latissimum, margine subretuso. *Pedes* robusti. *Alæ* longæ.

Male. Body broad, thick. Head forming a frontal protuberance on which the antennæ are seated; epistoma slightly prominent. Eyes pubescent, connected on the vertex. Proboscis short. Antennæ short; third joint elongate conical, full twice the length of the second; arista bare, full twice the length of the third joint. Scutellum very broad, with a slightly retuse border. Abdomen longer than the thorax. Legs robust. Wings long; radial and cubital veins ending separately on the border; cubital vein much curved hindward opposite the middle of the subapical areolet; transverse præbrachial vein oblique, placed beyond the middle of the discal areolet; subapical areolet closed by a slightly undulating transverse vein, which is abruptly curved when it approaches the cubital vein.

35. *AZPEYTIA SCUTELLARIS*. *Fæm.* Nigra, subnitens, thorace plagis duabus lateralibus aurato pilosis, scutello halteribusque piceis, abdomine fasciis duabus interruptis albis, tibiis basi flavescentibus, alis fuscescenti-cinereis spatio costali interiore fusco.

Femalè. Black, slightly shining. Head clothed with short black hairs. Proboscis piceous. Thorax with a small patch of gilded hairs on each side in front of the wing; scutellum piceous, paler towards its border, which is fringed with short pale hairs. Abdomen with two

white interrupted bands. Tibiæ pale yellowish towards the base, this hue extending to nearly half the length of the hind tibiæ. Wings brownish cinereous, dark brown along the costa from the base to beyond the middle; veins black; halteres piceous. Length of the body 7 lines; of the wings 14 lines.

Fam. MUSCIDÆ, Latr.

Subfam. TACHINIDES, Walk.

Gen. SARALBA, n. g.

Mas. Corpus angustum, subcylindricum. Caput thorace paulo latius. Oculi nudi. Proboscis acuta. Palpi graciles, subclavati. Antennæ breves, subgraciles; articulus 3^{us} fusiformis, 2^o duplo longior. Abdomen basi subcompressum, thorace fere duplo longius. Pedes robusti. Alæ angustæ.

Allied to *Ocyptera*. *Male*. Body narrow, nearly cylindrical. Head a little broader than the thorax; frontalia linear; epistoma slightly prominent. Eyes bare. Proboscis acute. Palpi slender, subclavate. Antennæ rather slender, about half the length of the face; third joint fusiform, twice the length of the second; arista slender, more than twice the length of the third joint. Abdomen with many short bristles, slightly compressed towards the base, nearly twice the length of the thorax. Legs stout, setose. Wings narrow; præbrachial vein forming a curve at its flexure, joining the cubital vein at the tip of the wing; discal transverse vein slightly undulating, parted by less than half its length from the border, and by much less than its length from the flexure of the præbrachial vein.

36. SARALBA OCYPTEROIDES. *Mas.* Nigra, capite pectoreque argenteis, frontalibus atris linearibus antice aurato marginatis, palpis testaceis, thorace fasciis duabus cinereis subauratis, abdomine nigricanti-cinereo spatio basali et segmentorum marginibus pallide cinereis vitta dorsali nigra interrupta, femoribus posterioribus basi flavescens, alis cinereis dimidio basali nigricante.

Male. Black. Head silvery white; frontalia deep black, linear, with gilded borders in front where the eyes diverge from them; facialia without bristles. Palpi pale testaceous. Thorax with two cinereous slightly gilded bands; second band abbreviated; sides slightly bristly. Pectus silvery. Abdomen semihyaline, blackish cinereous; borders of the segments and the whole of the basal part pale cinereous; a black dorsal line, interrupted on the fore border of each segment. Posterior femora yellowish towards the base, this hue most extended on the hind femora. Wings cinereous, blackish on half the breadth from the costa; veins and halteres black; alulæ lurid, with blackish borders. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Subfam. DEXIDES, Walk.

Gen. RUTILIA, Desv.

37. RUTILIA PECTORALIS. *Fem.* Cærulea, viridi-aurato nitens, capite

argenteo, frontalibus atris, palpis antennisque fulvis, thorace vittis quatuor interruptis nigris, pectore ferrugineo, abdomine atro basi subtus ferrugineo fasciis tribus interruptis cæruleis postice excavatis, tibiis subtus femoribusque ferrugineis, alis cinereis venis ferrugineo marginatis.

Closely allied to *R. glorificans*. *Female*. Cerulean blue, with golden-green reflexions. Head silvery white about the facialia and about the epistoma; frontalia deep black, widening in front. Palpi and antennæ tawny. Thorax with four slender interrupted black stripes; inner pair much abbreviated hindward; outer pair abbreviated in front and hindward. Pectus ferruginous, excepting two patches of the ground hue on each side. Abdomen deep black, ferruginous at the base beneath, with three interrupted bands of the ground hue, which are excavated and tinged with cupreous along their hind borders. Legs black; tibiæ beneath, femora and coxæ ferruginous. Wings cinereous, tinged with ferruginous along the costa and about the veins; veins black; halteres ferruginous. Length of the body 9 lines; of the wings 18 lines.

Subfam. SARCOPHAGIDES, *Walk.*

Gen. SARCOPHAGA, *Meigen.*

38. SARCOPHAGA PERPUSILLA. *Mas et Fœm.* Nigra, capite argenteo, frontalibus atris, thorace vittis quatuor albidis parallelis bene determinatis, abdomine cinereo tessellato, alis cinereis, halteribus albidis. *Male and Female*. Black. Head silvery white; frontalia deep black, linear. Thorax with four well-defined parallel whitish stripes; the outer pair connected on the hind border of the scutellum. Pectus cinereous. Abdomen tessellated with cinereous. Wings cinereous; veins black; halteres whitish. Length of the body $2\frac{1}{2}$ -3 lines; of the wings 5-6 lines.

Subfam. MUSCIDES, *Walk.*

Gen. PYRELLIA, *Desv.*

39. PYRELLIA FUMIPENNIS. *Mas.* Læte purpurea, cyaneo varia, capite palpis pedibus halteribusque nigris, antennis fulvis, alis nigricanti-cinereis. *Male*. Bright purple, with deep-blue reflexions. Head, proboscis, palpi, and legs black. Antennæ tawny; arista black. Wings blackish cinereous; veins and halteres black; præbrachial vein forming a curve at its flexure, slightly bent inward near its tip; discal transverse vein hardly bent inward, parted by little more than half its length from the border, and by nearly its length from the flexure of the præbrachial vein; alulæ dingy cinereous. Length of the body 4 lines; of the wings 7 lines.

Subfam. HELOMYZIDES, *Fallén*.Gen. HELOMYZA, *Fallén*.

40. HELOMYZA OPTATURA. *Fem.* Lutescens, capite alido, abdomine maculis duabus lateralibus subapicalibus apiceque nigris, alis *limpidis vitta costali exteriori maculam albam includente fasciæque nigris.*

Female. Pale luteous, smooth, shining. Head and thorax with stout black bristles. Head whitish, excepting the vertex. Antennæ less than half the length of the face; third joint elongate conical, about twice the length of the second; arista black, plumose. Abdomen elliptical, shorter and narrower than the thorax; hairs short, black; a black spot on each side near the tip, which is black. Wings limpid, with a black stripe which begins at a little beyond one-third of the length, extends to the tip, occupies more than half the breadth from the costa, emits a broad band nearly to the hind border, and includes a quadrate white costal spot; veins black, pale luteous towards the base; discal transverse vein straight, parted by half its length from the border, and by about its length from the præbrachial transverse vein. Length of the body 5 lines; of the wings 12 lines.

41. HELOMYZA ORTALIOIDES. *Mas.* Nigra, capite albo, frontalibus piceis, antennis fulvis, thorace vittis quinque scutello halteribusque albis, abdominis segmentis alido marginatis, femoribus tibiisque anticis tarsisque albidis, alis albis fasciis quatuor deviis nigris.

Male. Black, smooth, shining. Head and thorax with stout black bristles. Head white; frontalia piceous, slightly tapering in front; face transversely and slightly rugulose towards the epistoma. Proboscis pale yellowish. Palpi tawny. Antennæ tawny, nearly half the length of the face; third joint slightly tapering, full twice the length of the second; arista black, plumose. Thorax with five white stripes, one dorsal and four lateral; scutellum white. Abdomen elliptical, shorter and narrower than the thorax; hairs short, black; hind borders of the segments whitish. Tarsi, fore tibiæ and fore femora whitish, the latter blackish-shaded. Wings white, with four irregular black bands; first band narrow near the base; second broad, connected in the middle with the third, which emits a costal streak to the tip; fourth abbreviated in front, dilated, and connected with the third hindward, emitting an exterior streak to the border; veins black, white at the base; discal transverse vein nearly straight, parted by less than one-third of its length from the border, and by much less than its length from the præbrachial transverse vein; cubital and præbrachial veins slightly undulating; halteres white. Length of the body $4\frac{1}{2}$ lines; of the wings 10 lines.

This species appears to connect *Helomyza* with *Poticara*.

42. *HELOMYZA STELLIPLENA*. *Mas.* Nigra, capite antico palpisque albidis, antennis piceis, thorace vittis quatuor cinereis, abdomine piceo segmentis albedo marginatis, tarsis albidis, alis nigris punctis guttisque plurimis strigisque quatuor transversis albis, halteribus albis.

Male. Black, dull. Head whitish and shining in front. Palpi whitish. Antennæ piceous, a little shorter than the face; third joint linear, whitish at the base, more than twice the length of the second; arista plumose. Thorax with four cinereous stripes. Abdomen piceous, elongate oval, a little narrower but hardly longer than the thorax; hind borders of the segments whitish; tarsi whitish. Wings black, blackish hindward, with numerous white points and dots; two transverse white costal streaks, one beyond the middle, the other subapical; two short irregular white transverse lines between the discal transverse vein and the border; veins black; discal transverse vein straight, parted by half its length from the border, and by very much more than its length from the præbrachial transverse vein; alulæ cinereous; halteres white. Length of the body $3\frac{1}{2}$ lines; of the wings 7 lines.

GEN. SERACA, *Walk.*

43. *SERACA ABBREVIATA*. *Fæm.* Testacea, thorace vittis tribus scutellique apice pectoreque vittis quatuor nigris, abdominis dimidio postico nigro apice testaceo, femoribus posticis piccis, alis nigris spatio postico maculaque subapicali cinereis.

Female. Testaceous. Head with black bristles. Antennæ much less than half the length of the face; third joint longer than the second; arista bare. Thorax with three black stripes; scutellum with a black tip. Pectus with two black stripes on each side. Abdomen fusiform, a little longer and narrower than the thorax; apical half black; tip testaceous, acuminate. Hind femora piceous. Wings black, cinereous on a little more than half the length from the base, and on a little more than half the breadth from the hind border; a cinereous spot on the hind border towards the tip; veins black; discal transverse vein straight, parted by half its length from the border, and by more than its length from the præbrachial transverse vein; halteres pale testaceous. Length of the body 5 lines; of the wings 10 lines.

GEN. TENDEBA, n. g.

Mas. *Corpus* robustum, non setosum. *Frons* plana; facies subimpressa. *Palpi* parvi. *Antennæ* brevissimæ; articulus 3^{us} rotundus, minimus; arista subpubescens. *Scutellum* conicum, productum. *Abdomen* longi-ovatum, thorace brevius et angustius. *Pedes* robusti, nudi. *Alæ* latiusculæ.

Male. Body robust, without hairs and bristles. Head as broad as the thorax; front flat; face slightly impressed; mouth very small. Palpi small. Antennæ extremely short; third joint round, extremely small; arista minutely pubescent. Thorax with a prominent conical scu-

tellum. Abdomen elongate oval, shorter and much narrower than the thorax. Legs stout, bare. Wings rather broad; subcostal vein ending at somewhat before half the length of the costa; radial vein ending at some distance from the tip of the wing; cubital vein ending at the tip; præbrachial vein hardly bent forward; hinder veins obsolete; discal transverse vein straight, parted by nearly twice its length from the border, and by more than twice its length from the præbrachial transverse vein.

This genus is allied to *Orygma* and to *Cœlopa*, and its structure indicates that it also has burrowing habits and that its flight is weak.

44. TENDEBA TESTACEA. *Mas.* Pallide lutea, pubescens, alis limpida costa exteriore apiceque fusciscentibus.

Male. Pale luteous, minutely pubescent. Head a little paler than the thorax. Wings limpid, tinged with brown along the exterior part of the costa and about the tips; veins black, pale luteous at the base. Length of the body $2\frac{1}{2}$ lines; of the wings 6 lines.

Subfam. ORTALIDES, *Haldiday*.

Gen. LAMPROGASTER, *Macq.*

45. LAMPROGASTER BISPINOSA. *Mas.* Testacea, frontalibus et facialibus nigro-piceis, scutello bispinoso, abdomine purpureo basi testaceo, alis cinereis apud costam fulvescentibus, vena transversa nigricante nebulosa.

Male. Testaceous, with black pubescence. Head whitish about the eyes; frontalia and facialia blackish piceous; face with a deep cavity on each side for the antenna. Antennæ less than half the length of the face; third joint fusiform, more than twice the length of the second; arista bare. Thorax with a few black bristles on each side; scutellum with two stout spines. Abdomen purple, short oval, testaceous towards the base, shorter and broader than the thorax. Wings cinereous, with a tawny tinge along the costa; veins tawny; discal transverse vein oblique, slightly bent inward towards the hind end, parted by hardly one-fourth of its length from the border, and by very much more than its length from the præbrachial transverse vein, which is blackish and clouded. Length of the body 7 lines; of the wings 14 lines.

46. LAMPROGASTER OCHROMYOIDES. *Mas.* Ochracea, capite argenteo frontalibus nigris, abdominis dimidio apicali piceo, tibiis tarsisque nigris, alis cinereis venis fusco marginatis.

Male. Dull ochraceous, not pubescent. Head silvery white; frontalia black, linear. Eyes bare. Proboscis very short. Palpi long, subclavate. Antennæ nearly as long as the face; third joint linear, rounded at the tip, thrice the length of the second; arista black, bare. Thorax with a few black bristles on each side. Abdomen oval, a little

longer than the thorax; apical half piceous. Legs very robust; femora with minute black spines beneath; tibiæ and tarsi black. Wings cinereous; veins black, bordered with brown, ochraceous towards the base; præbrachial vein abruptly curved towards the cubital vein, which it joins at some distance from the tip of the latter; discal transverse vein straight, parted by one-fourth of its length from the border, and by more than its length from the præbrachial transverse vein; alulæ very large, dingy whitish, ochraceous-bordered. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

This species may form a new genus. It differs from *Lamprogaster* in the structure of the mouth and of the wing-veins. The latter character indicates that its flight is powerful. The transverse suture of the thorax is as complete as that of the *Tachinides*, and it resembles that subfamily in the large size of the alulæ.

Gen. ACHIAS, *Fabr.*

47. ACHIAS BRACHYOPHTHALMA. *Fam.* Testacea, vertice ochraceo fascia atomaria nigra antice excavata, facie albida piceo marginata strigis duabus lateralibus nigris, antennis fulvis, thorace vittis quatuor abbreviatis piceis, scutello nigro, abdomine segmentorum marginibus posticis styloque apicali piceis, tibiis tarsisque nigris, alis cinereis vitta costali fusca lurido varia.

Female. Testaceous, broad, thick. Head a little broader than the thorax; vertex ochraceous, with a black speckled band which is excavated in front; face whitish, bordered with piceous; facialia very broad; two black exterior lanceolate streaks. Eyes very prominent. Antennæ tawny; third joint linear, more than twice the length of the second; arista plumose. Thorax with cinereous tomentum and with four piceous stripes, of which the inner pair are most abbreviated; scutellum black. Abdomen oval, hardly longer than the thorax, with a slender apical piceous style; hind borders of the segments piceous. Tibiæ and tarsi black. Wings cinereous, with a brown partly lurid costal stripe; veins black; discal transverse vein almost straight, parted by one-fourth of its length from the border, and by much more than its length from the oblique black-clouded præbrachial transverse vein. Length of the body 6 lines; of the wings 12 lines.

This species exhibits the transition between *Achias* and *Lamprogaster*, if it does not obliterate the distinction between the two genera.

48. ACHIAS VENUSTULA. *Mas.* Fulva, capite testaceo macula rotunda nigra, oculis extantibus, abdomine viridi cupreo purpureoque micante basi subtusque testaceo, tarsis nigris, alis limpidis vena transversa discali fusco nebulosa.

Male. Tawny. Head pale testaceous, a little broader than the thorax, with a round black spot between the eyes; face deeply impressed on

each side for the reception of the antennæ; epistoma prominent. Eyes very prominent. Antennæ nearly as long as the face; third joint lanceolate, four times the length of the second; arista plumose. Pectus pale testaceous. Abdomen green, tinged with cupreous and with purple, pale testaceous beneath and at the base, a little broader and longer than the thorax. Legs pale yellow; tarsi black. Wings limpid; veins black, pale testaceous towards the base; discal transverse vein straight, clouded with brown, parted by less than one-sixth of its length from the border, and by much more than its length from the oblique clouded præbrachial transverse vein; halteres pale testaceous. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Gen. PLATYSTOMA, *Latr.*

49. PLATYSTOMA BREVIS. *Mas.* Nigra, brevis, crassa, capite apud oculos lineis duabus transversis guttisque duabus albidis, thorace callis humeralibus albidis vittis tribus cinereis postice obsolete, abdominis segmentis albedo marginatis, tarsis albis, tibiis anticis subdilatatis, alis albidis maculis plurimis transversis fasciisque duabus nigricantibus.

Male. Black, broad, short, stout. Head whitish about the eyes; hind border of the vertex and fore border of the front and two dots between the eyes whitish; face shining; epistoma slightly retuse, whitish-bordered. Antennæ much shorter than the face; third joint nearly linear, about twice the length of the second, which is piceous; arista slightly plumose. Thorax with two whitish humeral calli and with three slender cinereous stripes, which are obsolete hindward. Abdomen oval, a little shorter and narrower than the thorax; hind borders of the segments whitish. Legs short, stout; tarsi white; fore tibiæ slightly dilated and fringed, with a whitish protuberance on the inner side. Wings whitish, with numerous blackish transverse spots which form incomplete bands; subapical band and apical band entire, the former including the discal transverse vein; veins black; discal transverse vein straight, parted by one-third of its length from the border, and by twice its length from the præbrachial transverse vein; halteres whitish. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

50. PLATYSTOMA INSCRIPTA. *Mas.* Nigricans, capite guttis latera- libus cinereis fascia nigra, antennis rufis arista alba, thorace vittis quatuor angulosis cinereis, pectore vittis sex cinereis, abdominis segmentis cano marginatis apice rufescente, pedibus flavis tibiis nigro bimarginatis, alis albidis guttis plurimis nigricantibus, halteribus albidis.

Male. Blackish. Head with cinereous dots along each side between the eyes, whitish behind; a black shining band between the antennæ; face short, with cinereous dots; epistoma prominent. Antennæ red, shorter than the face; third joint round, longer than the second, black above in front; arista white, stout, full thrice the length of the

third joint. Thorax with four cinereous zigzag partly connected stripes. Pectus with six incomplete cinereous stripes. Abdomen a little shorter than the thorax, with a hoary band on each segment; tip reddish, shining. Legs yellow; tibiæ with two black bands; tarsi black towards the tips. Wings whitish, with very numerous blackish dots, some of which form three incomplete exterior bands; veins black, pale yellow at the base; discal transverse vein straight, very oblique, parted by less than one-fourth of its length from the border, and by much more than its length from the præbrachial transverse vein; halteres whitish. Length of the body 4 lines; of the wings 8 lines.

51. *PLATYSTOMA DEVOCATA*. *Mas.* Nigra, capite albido macula furcata gutta maculisque duabus anterioribus nigris, palpis albis, antennis albidis basi supra nigris, thorace vittis quinque cinereis, scutello abdominisque segmentis albido marginatis, tarsis albis, alis nigricantibus apice cinereis fasciis guttularibus albis, halteribus albidis.

Male. Black, dull. Head whitish; a black spot on the vertex, forked in front, and a black dot above the base of the antennæ; face with a black spot on each side. Palpi white. Antennæ whitish, black above towards the base, much shorter than the face; third joint conical; arista plumose. Thorax with five cinereous stripes, and with a whitish callus on each side; scutellum with a whitish border. Abdomen oval, shining, a little shorter and narrower than the thorax; hind borders of the segments whitish. Femora with whitish tips; tarsi white, with black tips. Wings blackish, cinereous towards the tips, with many white dots which form three incomplete bands; one complete exterior white band; veins black; discal transverse vein straight, parted by one-fourth of its length from the border, and by much more than its length from the præbrachial transverse vein; halteres whitish. Length of the body $2\frac{1}{2}$ lines; of the wings 5 lines.

52. *PLATYSTOMA DIMINUTIVA*. *Fæm.* Nigro-cinerea, capite antennisque rufescentibus, abdomine stylo tenui apicali, tibiis pallide flavis, tarsis basi albis, alis nigricantibus fasciis guttularibus albidis.

Female. Cinereous black. Head reddish, a little broader than the thorax; face short; epistoma flat. Proboscis retracted. Antennæ reddish, shorter than the face; third joint linear; arista bare, very slender, a little longer than the third joint. Abdomen narrower and a little longer than the thorax, with a slender apical style. Legs blackish; tibiæ pale yellow, with black tips; tarsi white towards the base. Wings blackish, with numerous minute whitish dots which form incomplete bands; veins black; discal transverse vein curved outward, parted by less than one-third of its length from the border, and by nearly twice its length from the præbrachial transverse vein. Length of the body 2 lines; of the wings 3 lines.

Gen. DACUS, *Fabr.*

53. DACUS SPECULIFER. *Mas.* Niger, capite luteo guttis quatuor nigris, thorace vittis duabus approximatis cinereis, callis vittis duabus lateralibus scutelloque flavis, abdomine fascia flavescente, pedibus luteis, alis limpidis strigis duabus basalibus plagaque maxima quadriguttata nigricantibus, halteribus albidis.

Male. Black. Head pale luteous, with two black dots on each side between the eyes; face short, with a black dot on each side. Antennæ piceous, much longer than the face; third joint linear, much longer than the second; arista slender, bare. Thorax with two nearly contiguous cinereous stripes; humeral calli, two hindward lateral stripes, four pectoral calli, and scutellum yellow. Abdomen short oval, shorter and a little broader than the thorax, with a yellowish band before the middle. Legs pale luteous. Wings limpid, with two blackish basal streaks, of which the hind one extends to the hind border, and the fore one is connected with a very large blackish patch; this occupies more than two-thirds of the costa, is dilated twice to the hind border, and contains two limpid dots and two exterior limpid points; veins black; discal transverse vein oblique, parted by one-fourth of its length from the border, and by rather less than its length from the oppositely oblique præbrachial transverse vein; halteres whitish. Length of the body $4\frac{1}{2}$ lines; of the wings 9 lines.

54. DACUS BIARCUATUS. *Mas.* Niger, capite fulvo guttis quatuor nigris, thorace callis strigis duabus scutelloque flavis, pedibus piceis tarsis flavis, alis albidis strigis duabus basalibus plagaque maxima strigam emittente fuscis, halteribus flavescantibus.

Male. Black. Head tawny, shining, with a black dot on each side of the vertex, and a larger black dot on each side of the face. Antennæ slender, piceous, much longer than the face; third joint linear, as long as the first and second together; arista very slender. Thorax with four yellow calli; two humeral; one near the base of each wing, extending to the pectus; a yellow streak on each side hindward; scutellum yellow, with two minute protuberances on the hind border. Abdomen elongate oval, not shorter and hardly narrower than the thorax. Legs piceous; tarsi yellow, darker towards the tips; anterior tibiæ partly yellow. Wings whitish, lurid along the basal part of the costa; two brown basal streaks, one proceeding to the hind border, the other contiguous to a very large brown patch, which is excavated at the base, joins the hind border, extends along the costa to the tip of the wing, and emits a streak to the border behind the tip; veins black; discal transverse vein undulating, parted by one-fourth of its length from the border, and by a little less than its length from the oblique præbrachial transverse vein; halteres yellowish. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

55. *DACUS LATERALIS*. *Mas.* Niger, capite thorace vittis quatuor pectoreque vittis duabus flavis, abdominis spatio medio testaceo vitta nigra, pedibus halteribusque flavis, femoribus posterioribus nigricanti fasciatis, alis nigris basi cinereis.

Male. Black. Head pale yellow. Antennæ black. Thorax with four yellow stripes; inner pair much shortened in front. Pectus with two yellow stripes. Abdomen oval, compressed towards the tip, a little broader but not longer than the thorax; middle part dingy testaceous, with a black stripe. Legs yellow; posterior femora with a broad blackish band. Wings black, cinereous towards the base, the latter hue prevailing most along the hind border; veins black; discal transverse vein straight, parted by much less than its length from the border, and by twice its length from the præbrachial transverse vein; halteres pale yellow. Length of the body $3\frac{1}{2}$ lines; of the wings 6 lines.

56. *DACUS VARIALIS*. *Fæm.* Nigro-cyaneus, capite nigro facie flava, antennis fulvis, abdomine fasciis duabus albidis, pedibus piceis tarsis posterioribus albidis, alis cinereis gutta subcostali apiceque nigricantibus vena discali transversa nigricanti nebulosa, halteribus albis.

Female. Blackish blue. Head black, with whitish tomentum behind and about the eyes; face yellow; epistoma piceous. Proboscis piceous. Palpi yellow. Antennæ tawny, a little longer than the face; third joint slightly tapering, four times longer than the second; arista bare, slender. Pectus with whitish tomentum. Abdomen fusiform, much longer than the thorax, with two whitish bands, tapering towards the tip; oviduct exerted. Legs piceous, white at the base beneath; femora paler towards the tips; posterior tarsi whitish, piceous towards the tips. Wings cinereous, blackish towards the tips; a blackish spot at the end of the subcostal vein; veins black; discal transverse vein blackish-clouded, slightly curved inward, parted by half its length from the border, and by somewhat less than twice its length from the præbrachial transverse vein; halteres white. Length of the body 5 lines; of the wings 9 lines.

Gen. *ORTALIS*, *Fallén*.

57. *ORTALIS CONTIGUA*. *Fæm.* Nigra, palpis albis, antennis piceis subtus albidis, thorace cyaneo, tarsis albis, alis albis plaga basali fasciisque tribus nigris, fascia 1^a strigam albam costalem includente, 3^a excavata, halteribus albis.

Female. Black, shining. Head dull, whitish about the eyes. Palpi white. Antennæ piceous, whitish beneath, nearly as long as the face; third joint linear, twice the length of the second; arista plumose. Thorax dark blue. Abdomen conical, shorter and narrower than the thorax. Tarsi white, with black tips. Wings white, with a basal black patch and with three black bands; first band very broad, containing a white

costal streak ; second of equal breadth ; third irregular, apical, excavated, paler than the others ; veins black ; discal transverse vein straight, parted by more than half its length from the border, and by much more than its length from the præbrachial transverse vein ; halteres white. Length of the body 2 lines ; of the wings 4 lines.

58. *ORTALIS SEMIVITTA*. *Fœm.* Nigra, capite rufo, antennis rufescentibus, pedibus piceis tarsis fulvis, alis albis vitta costali extus dilatata guttam albam includente fasciaque exteriore strigam costalem emittente nigris, halteribus albidis.

Female. Black, shining. Head red, whitish about the eyes. Antennæ reddish, as long as the face ; third joint lanceolate, four times the length of the second ; arista very minute, pubescent. Abdomen elongate oval, acuminate, a little longer than the thorax. Legs piceous ; tarsi tawny. Wings white, with a black costal stripe, which widens from the base to half the length, where it concisely terminates ; a white costal dot near the end of the stripe ; an exterior black band, parallel to the end of the stripe, emitting a costal streak to the tip ; veins black ; discal transverse vein straight, parted by less than one-fourth of its length from the border, and by a little more than its length from the præbrachial transverse vein ; halteres white. Length of the body $2\frac{1}{2}$ lines ; of the wings 4 lines.

Gen. *TRYPETA*, *Meigen*.

59. *TRYPETA DIVERSATA*. *Fœm.* Pallide testacea, abdomine ovato brevi, alis nigris longis vitta postica nigricanti subnebulosa lituraque costali cinereis.

Female. Pale testaceous. Head as broad as the thorax ; vertex with some black bristles ; epistoma slightly prominent. Antennæ much shorter than the face ; third joint linear, about twice the length of the second ; arista bare. Thorax with black bristles on each side. Abdomen oval, much shorter and a little broader than the thorax. Fore tibiæ with black bristles. Wings black, long ; a cinereous stripe along the hind border, partly and slightly clouded with blackish ; a minute cinereous costal mark at a little beyond the middle ; veins black ; discal transverse vein straight, parted by hardly half its length from the border, and by much less than its length from the præbrachial transverse vein. Length of the body $2\frac{1}{2}$ lines ; of the wings 7 lines.

60. *TRYPETA BREVVITTA*. *Fœm.* Cinereo-testacea, thorace vittis duabus fuscis, abdomine piceo lanceolato vitta abbreviata alba, pedibus albido-testaceis, alis nigris postice cinereis, halteribus albidis.

Female. Pale cinereous testaceous ; whitish testaceous beneath. Head a little narrower than the thorax, with some black bristles. Antennæ much shorter than the face ; third joint linear, much longer than the second ; arista plumose, with short hairs. Thorax with two slender brown stripes, which are remote from each other ; some black bristles

along each side. Abdomen piceous, lanceolate, longer than the thorax, with a whitish stripe, which does not extend to the tip. Legs whitish testaceous. Wings black, mostly cinereous along the hind border; veins black; discal transverse vein straight, parted by one-fourth of its length from the border, and by a little more than its length from the præbrachial transverse vein; halteres whitish. Length of the body 3 lines; of the wings 6 lines.

Subfam. LEPSIDES, *Walk.*

Gen. CALOBATA, *Fabr.*

61. CALOBATA TIPULOIDES. *Mas.* Nigra, gracillima, abdomine fusco subcompresso segmentis cinereo marginatis 1° et 2° postice nigro marginatis, femoribus posterioribus piceis albedo marginatis, tibiis tarsisque anticis albis, alis nigricantibus basi fasciisque tribus cinereis.

Male. Black, very slender. Head full as broad as the thorax; face silvery white; epistoma very prominent. Antennæ a little longer than the face; third joint linear, twice the length of the second; arista slender, very little longer than the third joint. Abdomen brown, very slender, slightly compressed, much narrower than the thorax, and nearly twice its length; hind borders of the first and second segments black; fore borders of the segments cinereous; apical appendages attenuated. Legs slender; posterior femora piceous, with a whitish band beyond the middle; fore tibiæ and fore tarsi white. Wings blackish, cinereous at the base, and with three cinereous bands; third band subapical, broader than the others; veins black; discal transverse vein straight, parted by much more than its length from the border, and by more than twice its length from the præbrachial transverse vein. Length of the body 6 lines; of the wings 8 lines.

Subfam. PSILIDES, *Walk.*

Gen. PSILA, *Meigen.*

62. PSILA? CALOBATOIDES. *Mas et Fæm.* Testacea, capite postico attenuato, antennis basi nigro notatis, thorace vitta nigricante abbreviata, pedibus longiusculis, alis limpidis apice nigricantibus. *Mas.* Abdomine clavato. *Fæm.* Abdomine fusiformi.

Male and Female. Testaceous, very slender. Head as broad as the thorax, elongated hindward. Antennæ pale testaceous, not more than half the length of the face, with a black protuberance above at the base; third joint linear, twice the length of the second; arista black, plumose. Thorax with a blackish stripe, which does not extend to the scutellum, the latter with two long black bristles. Abdomen longer than the thorax. Legs slender, rather long. Wings limpid, blackish towards the tips; veins black; discal transverse vein straight, parted by less than one-fourth of its length from the border, and by much more than its length from the præbrachial transverse vein;

halteres pale testaceous. *Male*. Abdomen clavate. *Female*. Abdomen fusiform, keeled and attenuated at the tip. Length of the body $4\frac{1}{2}$ –5 lines; of the wings 8–9 lines.

63. *PSILA?* *CRUCIATA*. *Mas*. Pallide lutea, capite lituris quatuor nigris, thoracis disco antico nigro strigas duas emittente, abdomine longo cylindrico, pedibus longiusculis, tibiis tarsisque nigris, alis limpidis fusco bifasciatis apice fuscescentibus.

Male. Pale luteous, slender. Head black between the eyes, and with a black spot above the base of the antennæ; face with two black dots near the epistoma. Antennæ nearly as long as the face; third joint linear, four times as long as the second; arista slender, very minutely pubescent. Fore disk of the thorax black excepting the humeral calli, emitting two black streaks hindward. Abdomen cylindrical, much more slender than the thorax, and nearly twice its length. Legs rather long; tibiæ and tarsi black. Wings limpid, brownish towards the tips, with two brown bands; first band including the præbrachial transverse vein, abbreviated hindward; second including the discal transverse vein, abbreviated in front, bordering the apical brownish part; veins black, pale luteous towards the base, parted by one-fourth of its length from the border, and by its length from the præbrachial transverse vein; halteres pale. Length of the body $5\frac{1}{2}$ lines; of the wings 10 lines.

64. *PSILA?* *BASALIS*. *Mas et Fæm*. Testacea, verticis disco thoracis vittis duabus abbreviatis tibiisque basi piceis, abdomine piceo basi testaceo, alis cinereis striga costali transversa fasciaque subapicali puncta dua includente fuscis latis, macula costali maculaque apicali albis.

Male and Female. Testaceous, slender. Head with a few black bristles; disk of the vertex piceous. Antennæ almost as long as the face; third joint linear, four times the length of the second; arista plumose. Thorax with two piceous stripes, which are abbreviated hindward; some long black bristles on each side. Abdomen piceous, testaceous towards the base, longer and narrower than the thorax, linear in the male, fusiform in the female. Legs pale testaceous; tibiæ piceous towards the base. Wings cinereous, with a broad brown streak proceeding from the costa to the disk, and with a broad brown subapical band which contains two cinereous costal points, a white costal spot dividing the streak from the band and a white apical spot; veins black, testaceous towards the base; discal transverse vein straight, parted by hardly one-fourth of its length from the border, and by nearly twice its length from the discal transverse vein; halteres pale testaceous. Length of the body $3\frac{1}{2}$ –4 lines; of the wings 7 lines.

65. *PSILA?* *VITTIFFERA*. *Mas*. Picea, capite testaceo, thorace vittis quatuor piceis, pedibus halteribusque albido-testaceis, alis nigris basi cinereis.

Male. Piceous, slender. Head testaceous, with some black bristles. Antennæ pale testaceous, shorter than the face; second joint black above; third elongate conical, longer than the second. Thorax with some black bristles; sides and pectus pale testaceous, each of the former with two piceous stripes. Abdomen linear, with a few short black apical hairs, a little longer and narrower than the thorax. Legs whitish testaceous; fore femora with some black bristles. Wings black, cinereous towards the base, this hue extending most along the hind border; veins black; discal transverse vein straight, parted by half its length from the border, and by almost twice its length from the præbrachial transverse vein; halteres whitish testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

Gen. STYMBARA, n. g.

Mas. *Corpus* gracile. *Antennæ* epistoma fere attingentes; articulus 3^{us} linearis, 2^o quadruplo longior; arista brevissime pilosa. *Thorax* elongatus. *Abdomen* lineare, thorace paulo brevius et angustius. *Alæ* longissimæ, venis subcostali et mediastinali conjunctis, vena radialis valde undulata, vena cubitali subundulata.

Male. Body slender. Head and thorax with a few bristles. Head full as broad as the thorax; face vertical. Proboscis short. Palpi moderately long. Antennæ nearly as long as the face; third joint linear, about four times the length of the second; arista with very short hairs. Thorax elongate; scutellum rather large. Abdomen linear, a little shorter and narrower than the thorax. Wings very long; subcostal and mediastinal veins united; subcostal vein ending at rather beyond one-third of the length of the wing; mediastinal vein ending at somewhat beyond the middle; radial vein forming three curves, abruptly bent to the costa at a little beyond three-fourths of the length; cubital vein very slightly undulating exteriorly; discal transverse vein straight, oblique, parted by less than half its length from the border, and by less than its length from the præbrachial transverse vein.

66. STYMBARA VAGARIA. *Mas.* Pallide testacea, abdomine basi pedibus halteribusque albidis, alis cinereis guttis marginalibus indistinctis pallidioribus.

Male. Pale testaceous, whitish beneath. Abdomen towards the base and legs whitish. Wings cinereous, with indistinct paler dots along the costa and along the hind border; veins black; halteres whitish. Length of the body $2\frac{1}{2}$ lines; of the wings 7 lines.

The specimen here described is injured, and its colour and markings are somewhat indefinite.

Gen. PIOPHILA, *Fallén.*

67. PIOPHILA? DISJUNCTA. *Fæm.* Nigra, capite maculis duabus chalybæis subtus flavescente, antennis piceis, pedibus flavis, tibiis

tarsisque anticis nigris, alis sublimpidis venis halteribusque flavescens.

Female. Black, shining. Head and thorax with some black bristles. Head yellowish beneath; disk of the vertex and of the face chalybeous. Antennæ piceous, nearly reaching the epistoma; third joint linear, elongate. Abdomen elongate oval, hardly longer than thorax. Legs yellow; fore tibiæ and fore tarsi black. Wings nearly limpid; veins and halteres yellowish; discal transverse vein straight, parted by less than its length from the border, and by much more than its length from the præbrachial transverse vein. Length of the body $1\frac{1}{2}$ line; of the wings $2\frac{1}{2}$ lines.

Subfam. OSCINIDES, *Fallén.*

Gen. CHLOROPS, *Meigen.*

68. CHLOROPS? CONCLUSATA. *Mas.* Nigro-fusca, capite ferrugineo, antennis fulvis, thorace pectoreque cinereo tomentosis, abdominis segmentis albidis marginatis, pedibus cinerascens, alis cinereis, halteribus albidis.

Male. Blackish brown. Head ferruginous, with a few black bristles. Antennæ dull tawny; arista long, slender. Thorax and pectus with cinereous tomentum. Abdomen a little shorter than the thorax; hind borders of the segments whitish. Legs dingy cinereous. Wings cinereous; veins black; discal transverse vein straight, parted by nearly its length from the border, and by more than its length from the præbrachial transverse vein; halteres whitish. Length of the body $1\frac{1}{2}$ line; of the wings 3 lines.

Subfam. GEOMYZIDES, *Fallén.*

Gen. DROSOPHILA, *Fallén.*

69. DROSOPHILA PINGUIS. *Mas et Fæm.* Testacea, segmentorum abdominalium marginibus pedibusque pallidioribus, alis cinereis. *Mas.* Abdomine guttis sex nigris. *Fæm.* Abdomine guttis quatuor nigris.

Male and Female. Testaceous. Head and thorax beset with long stout bristles. Antennæ much shorter than the face; third joint elliptical, about twice the length of the second. Abdomen elliptical, not longer than the thorax; hind borders of the segments pale testaceous. Legs pale testaceous, with black bristles. Wings cinereous; veins black, testaceous towards the base; discal transverse vein straight, parted by less than its length from the border, and by much more than its length from the præbrachial transverse vein. *Male.* Third, fourth, and fifth abdominal segments with a black dot on each side. *Female.* Fourth and fifth abdominal segments with a black dot on each side. Length of the body 2 lines; of the wings 3 lines.

70. DROSOPHILA DORSALIS. Pallide testacea, thoracis vitta abbre-

viata scutellique guttis duabus nigris, alis limpidis venis albidis vena costali nigra.

Pale testaceous. Head and thorax with black bristles. Antennæ much shorter than the face; third joint conical; arista plumose. Thorax with a black stripe, which is abbreviated hindward; scutellum with a black dot on each side of the tip. Wings limpid; veins whitish; costal vein black; discal transverse vein straight, parted by much less than its length from the border, and by very much more than its length from the præbrachial transverse vein. Length of the body $2\frac{1}{2}$ lines; of the wings $4\frac{1}{2}$ lines.

Gen. MILICHIA, *Meigen*.

71. MILICHIA MINUTA. *Mas.* Nigra, abdomine argenteo subtus piceo thorace valde latiori, alis cinereis.

Male. Black. Head with short black bristles. Eyes large. Antennæ black, much shorter than the face; third joint round; arista simple, short. Abdomen bright silvery above, piceous beneath, much broader and a little longer than the thorax. Wings cinereous; veins and halteres black; discal transverse vein straight, parted by nearly its length from the border, and by twice its length from the præbrachial transverse vein. Length of the body $1\frac{1}{4}$ line; of the wings 2 lines.

Subfam. HYDROMYZIDES, *Fallén*.

Gen. NOTIPHILA, *Fallén*.

72. NOTIPHILA UNILINEATA. *Fæm.* Fusca, capite apud oculos albedo, thorace vittis quinque cinereis, abdomine fasciis late interruptis vittaque cinereis, tibiis et tarsorum articulis apice genibusque cinereis, alis cinereis apud costam apicalem obscurioribus, halteribus testaceis.

Female. Brown. Head and thorax with black bristles. Head whitish about the eyes. Antennæ brown, much shorter than the face; third joint linear, about half the length of the second; arista plumose. Thorax with five cinereous stripes. Pectus cinereous. Abdomen with a cinereous stripe, and with widely interrupted cinereous bands on the hind borders of the segments. Knees, and tips of the tibiæ and of the joints of the tarsi cinereous. Wings dingy cinereous, darker along the apical part of the costa; veins black; discal transverse vein parted by half its length from the border, and by more than twice its length from the præbrachial transverse vein; halteres testaceous. Length of the body $2\frac{1}{2}$ lines; of the wings 4 lines.

73. NOTIPHILA CARBONARIA. *Mas.* Cinereo-nigra, antennis rufis apice nigris, tibiis piceis, alis nigris postice nigricanti-cinereis.

Male. Cinereous black, with black bristles. Antennæ red, black towards the tips; third joint conical; arista plumose. Abdomen elongate oval, a little longer than the thorax. Tibiæ piceous. Wings

black, irregularly blackish cinereous towards the hind border; veins and halteres black; discal transverse vein straight, parted by nearly its length from the border, and by very much more than its length from the præbrachial transverse vein. Length of the body 2 lines; of the wings 3 lines.

Gen. DISCOMYZA, *Meigen*.

74. DISCOMYZA TENEBROSA. *Mas.* Nigricanti-picea, capite piceo gutta testacea, antennis nigris basi testaceis, pectore pedibusque albis, femoribus tibiisque nigro fasciatis, alis nigricantibus apud costam nigris costa valde convexa.

Male. Blackish piceous, shining. Head piceous, with a testaceous dot in front; underside and pectus white. Antennæ black, shorter than the face, testaceous at the base; third joint conical; arista plumose. Abdomen not longer than the thorax. Legs white; femora and tibiæ with black bands. Wings blackish, black along the costa, which is very convex; veins black; discal transverse vein straight, parted by more than its length from the border, and by nearly twice its length from the præbrachial transverse vein. Length of the body $1\frac{1}{2}$ line; of the wings $2\frac{1}{2}$ lines.

Descriptions of some New Species of Dipterous Insects from the Island of Salwatty, near New Guinea. By FRANCIS WALKER.

[Read March 3, 1864.]

Fam. MYCETOPHILIDÆ, *Haliday*.

Gen. MYCETOPHILA, *Meig.*

1. MYCETOPHILA OBSCURATA. Nigra, nitens, ore coxisque albidis, antennis basi flavescens, thorace subcompresso, alis cinereis apud costam nigricantibus.

Black, shining; mouth whitish; antennæ filiform, yellowish towards the base; thorax slightly compressed; legs rather long; coxæ whitish; hind tibiæ with short slender spines; hind tarsi very minutely setulose. Wings dark cinereous, blackish along the costa; veins black; radial vein ending at two-thirds of the length of the wing; cubital ending at a little in front of the tip; subapical forked before the middle; subanal and anal veins distinct, the former not forked. Length of the body 2? lines; of the wings 4 lines.

The specimen here described is mutilated; it may form a new genus.

Fam. TIPULIDÆ, *Haliday*.Gen. LIMNOBIA, *Meig.*

2. LIMNOBIA FILIFORMIS. *Mas.* Lutescens, antennis nigris gracillimis corporis dimidio paulo longioribus, abdomine fasciis duabus dimidioque apicali nigris, pedibus nigris longis gracillimis, alis fuscis angustis.

Male. Pale luteous, shining, slender. Head and antennæ black; the latter curved upward, filiform, very slender, more than half the length of the body. Abdomen with black bands on the hind borders of the first and second segments; apical half black. Legs dark ochraceous, long, very slender; femora and tibiæ towards the tips and tarsi blackish. Wings blackish cinereous; veins black; a discal areolet; radial vein forked; first externo-medial vein not forked; one veinlet between the third externo-medial vein and the subanal vein, joining the discal areolet at a little before the middle of the latter. Length of the body $5\frac{1}{2}$ lines; of the wings 12 lines.

Gen. PACHYRHINA, *Macq.*

3. PACHYRHINA COLORATA. *Fæm.* Lutea, palpis apice nigricantibus, antennis nigris basi luteis, thorace vittis tribus maculisque posticis quatuor nigris, abdomine fasciis tribus et triente apicali atris, femoribus anticis basi luteis, femoribus posticis lutescentibus apice nigris, alis subcinereis apice nigricantibus.

Female. Bright luteous. Palpi blackish towards the tips. Antennæ black, setose, luteous at the base. Thorax with three deep black stripes and with four hindward black spots; middle stripe broader in front, much longer than the others. Abdomen with three narrow deep black bands which are convex in front; apical third part deep black, chalybeous at the tip; oviduct luteous. Legs black, stout; fore femora luteous towards the base; posterior femora dingy luteous, black towards the tips. Wings slightly cinereous; tips with a blackish tinge; veins black, pale yellow at the base; stigma blackish brown. Length of the body 9 lines; of the wings 16 lines.

Gen. GYNOPLISTIA, *Westw.*

4. GYNOPLISTIA INSOLITA. *Fæm.* Nigra, capite antico ferrugineo, antennis late pectinatis, abdomine fasciis quatuor apiceque luteis, femoribus luteis apice nigris, tibiis albo fasciatis, alis cinereis vitta costali nigra maculis tribus posticis nigricantibus.

Female. Black. Head ferruginous in front. Antennæ broadly pectinated, ferruginous at the base. Abdomen with four luteous bands on the fore borders of the segments; second band narrower than the first, broader than the third; fourth very narrow; tip and oviduct luteous. Legs stout; femora luteous, with black tips; tibiæ with a broad white band near the base. Wings cinereous, with three diffuse

blackish spots along the hind border; a black costal stripe, broadest towards the base and towards the tip, contiguous in the middle to a black dot; veins black. Length of the body 8 lines; of the wings 14 lines.

Fam. ASILIDÆ, *Leach.*

Subfam. ASILITES, *Walk.*

Gen. OMMATIUS, *Ill.*

5. OMMATIUS CANUS. *Mas.* Nigro-piceus, capite pectoreque albidis, facie subaurata, abdomine cinereo segmentis albedo marginatis apice nigro nitente, femoribus postice halteribusque albidis, alis cinereis apice nigricantibus.

Male. Piceous black. Head and pectus with shining whitish tomentum. Head broader than the thorax; face slightly gilded; mystax composed of a few white bristles. Eyes flat in front. Proboscis and antennæ black. Thorax with cinereous-bordered sutures. Abdomen cinereous; hind borders of the segments whitish; tip black, shining. Legs black; femora whitish on the hind side except towards the tips; hind femora whitish on both sides. Wings cinereous, blackish at the tips; veins black; halteres whitish. Length of the body 5 lines; of the wings 8 lines.

Fam. MUSCIDÆ, *Latr.*

Subfam. TACHINIDES, *Walk.*

Gen. EURYGASTER, *Macq.*

6. EURYGASTER FINGENS. *Fœm.* Anthracina, capite subaurato frontibus piceis facialibus setosis, antennis piceis articulo 3^o longissimo, thorace antico cinereo, abdomine maculis duabus apicalibus elongatis albidis, alis cinereis apud costam basalem subnigricantibus.

Female. Coal-black, broad, bristly. Head pale gilded cinereous; frontalia piceous, linear; facialia beset with bristles; epistoma not prominent. Eyes bare. Antennæ piceous, extending to the epistoma; third joint linear, rounded at the tip, eight times the length of the second; arista longer than the third joint. Thorax with cinereous tomentum in front where two slender black stripes are apparent. Abdomen a little broader but not longer than the thorax, with an elongated whitish spot on each side at the tip. Wings cinereous, slightly blackish in front towards the base; veins black; præbrachial vein forming a right angle at its flexure, curved inward from thence to its tip, which is nearly contiguous to the cubital vein at some distance in front of the tip of the wing; discal transverse vein slightly bent inward near its base, parted by much less than its length from the border, and by nearly its length from the flexure of the præbrachial vein; alulæ dingy whitish. Length of the body 3½ lines; of the wings 7 lines.

Subfam. ORTALIDES, *Haliday*.Gen. POTICARA, *Walk.*

7. POTICARA BIARCUATA. *Fem.* Nigra, capite aurato vertice rubro frontalibus atris, antennis luteis, pectore abdomineque nigro-viridibus, femoribus flavis apice nigris, alis nigris striga basali maculis tribus costalibus striga postica exteriore maculisque duabus subapicalibus albidis.

Female. Black. Head gilded yellow, nearly as broad as the thorax; vertex deep red; front deep black; face broad, with an ochraceous mark towards the front. Antennæ luteous, not more than half the length of the face; third joint slightly tapering, full twice the length of the second; arista very delicately setulose. Thorax dull. Pectus greenish black, shining. Abdomen blackish green, fusiform, much narrower but hardly longer than the thorax. Femora, excepting the tips, and fore coxæ yellow. Wings black, in structure like those of *P. triarcuata*; a small whitish streak near the base of the costa; three triangular whitish costal spots, of which the first is very small; a whitish oblique streak beyond the middle of the hind border, and two whitish triangular spots near the tip of the latter; veins and halteres black. Length of the body 5 lines; of the wings 12 lines.

The structure of the head in this genus indicates its affinity to *Achias*; it is also allied to *Dacus* and to *Lamprogaster*.

Gen. ACHIAS, *Fabr.*

8. ACHIAS DACOIDES. *Mas.* Obscure rufa, capite flavescente dilatato fasciis duabus vittisque sex nigris, antennis piceis basi fulvis, thorace vittis tribus nigris scutello fulvo metathorace fascia albida, abdomine piceo petiolato vitta pallidiore, pedibus nigris tarsis posticis femoribusque flavis, alis cinereis vitta costali fusca, halteribus flavis apice nigris.

Male. Dark red. Head dingy yellowish, much dilated, broader by half than the thorax; two black bands on the vertex; face with two black stripes; two oblique black stripes on each side, each of the first pair forked towards the facial stripe, and thus including a small triangular yellowish dot. Antennæ piceous, tawny at the base, not extending to the epistoma; third joint tapering, full four times the length of the second; arista setulose. Thorax with three black stripes; scutellum tawny; metathorax with a whitish band. Pectus partly covered with cinereous tomentum. Abdomen petiolated, elliptical, piceous, with a paler stripe and with cinereous tomentum, much narrower and rather longer than the thorax. Legs black; femora yellow, black at the base; hind tarsi yellow, black towards the tips. Wings cinereous, with a brown costal stripe; veins black, pale yellow towards the base; discal transverse vein hardly bent inward, parted by one-fourth of its length from the border, and by more than its length

from the præbrachial transverse vein, which is oblique; halteres pale yellow, with black knobs. Length of the body 6 lines; of the wings 13 lines.

Gen. *PLATYSTOMA*, *Latr.*

9. *PLATYSTOMA IMPINGENS*. *Fæm.* Nigro-cinerea, capite albo vertice fronteque luteis vittis duabus lateralibus nigris, thorace vittis tribus canis duabusque lateralibus cinereis guttis duabus lateralibus nigris, abdomine lateribus basi tibiisque posterioribus rufescentibus, alis albidis guttis plurimis fasciisque quatuor exterioribus fuscis, halteribus testaceis.

Female. Cinereous black. Head white, narrower than the thorax; vertex and front dull luteous; face elongated, tinged with pale yellow; a broad black shining stripe on each side. Antennæ piceous, not half the length of the face; third joint piceous, about four times the length of the second, which is red; arista plumose. Thorax with three hoary stripes and with two intermediate cinereous stripes; a black dot on each of the two outer stripes. Abdomen oval, much shorter and narrower than the thorax, with some short hoary hairs, which are mostly on the hind borders of the segments; sides dull reddish towards the base. Legs black; posterior tibiæ dark reddish, except towards the tips. Wings whitish, with numerous brown dots towards the base, and with four exterior brown bands; first band irregular, partly composed of dots; second slightly guttular in front, connected on the hind border with the third, which is connected in the middle with the irregular subapical fourth band; veins black; discal transverse vein straight, parted by one-fourth of its length from the border, and by very much more than its length from the oblique præbrachial transverse vein; alulæ white; halteres testaceous. Length of the body 6 lines; of the wings 12 lines.

Gen. *DACUS*, *Fabr.*

10. *DACUS TURGIDUS*. *Mas.* Niger, capite flavo punctis duobus macula fasciaque nigris, antennis fulvis, thorace vittis quatuor halteribusque flavis, abdomine subpetiolato fascia flava, pedibus piceis femoribus sordide flavescentibus basi albidis, alis limpidis vittis duabus nigricantibus costa extus valde dilatata.

Male. Black. Head yellow, with two black points on each side between the eyes, and a black middle spot, which is forked hindward; face with a black band in front. Antennæ tawny, little more than half the length of the face; third joint elongate conical, about twice the length of the second; arista plumose. Thorax with four yellow stripes; outer pair extending to the base of each wing, and thence bent across each side of the pectus; inner pair extending along each side of the metathorax. Abdomen fusiform, subpetiolated, much longer and narrower than the thorax, with a yellow band on the fore border of the second segment. Legs piceous; fore femora dingy

yellowish, slightly shaded with piceous; posterior femora whitish towards the base. Wings limpid, with two blackish stripes, one costal; the other mostly contiguous to the hind border, terminating by the discal transverse vein; costa much dilated exteriorly; veins black; discal transverse vein oblique, nearly straight, parted by one-sixth of its length from the border, and by a little less than its length from the præbrachial transverse vein, which is unusually long; halteres pale yellow. Length of the body 5 lines; of the wings 11 lines.

This species has some affinity to the genus *Poticara*.

11. *DACUS DETRUDENS*. *Mas.* Purpureo-cyaneus, frontalibus nigris, facie fulva nigro fasciata, palpis nigris apice fulvis, antennis piceis basi fulvis, thorace vitta cinerea, abdomine subcompresso, pedibus piceis tibiis posticis basi subtus albidis, alis cinereis, halteribus albis.

Male. Purplish blue; nearly allied to *D. varialis*. Head and pectus with cinereous tomentum. Head a little broader than the thorax; frontalia black, widening in front; face tawny, with a black band near the epistoma, which is prominent. Proboscis and palpi black, the latter tawny towards the tips. Antennæ piceous, a little longer than the face, tawny towards the base; third joint linear, full four times the length of the second; arista bare, slender. Thorax with a cinereous stripe. Abdomen linear, sessile, slightly compressed, much narrower and longer than the thorax. Legs piceous; hind tarsi whitish beneath towards the base. Wings cinereous, slightly darker towards the costa; veins black; discal transverse vein nearly straight, blackish-clouded, parted by hardly half its length from the border, and by a little more than its length from the præbrachial transverse vein; halteres white. Length of the body $4\frac{1}{2}$ lines; of the wings 8 lines.

Gen. *SOITA*, n. g.

Mas. *Corpus* longum, gracile. *Caput* setis duabus incrassatis arcuatis. *Oculi* nudi. *Antennæ* facie longiores; articulus 3^{us} linearis, 2^o quadruplo longior. *Thorax* elongatus. *Abdomen* lineare, subcompressum, thorace valde longius. *Pedes* antici breves, tenues; postici longi, femoribus subincrassatis, tibiis spinosis.

Male. Body long, slender, shining, minutely pubescent. Head hardly broader than the thorax, with a few bristles, two of which on the fore part of the vertex are incrassated and curved; face short, vertical; epistoma hardly prominent. Eyes bare. Proboscis and palpi short. Antennæ longer than the face; third joint linear, four times the length of the second; arista with very short hairs. Thorax elongated, with a few bristles on each side. Abdomen linear, slightly compressed, much narrower and very much longer than the thorax. Fore legs short, slender, with slightly setose femora; middle legs moderately long; hind legs much longer, with slightly incrassated femora and spinose tibiæ. Wings moderately broad; subcostal vein ending at the middle of the costa; radial vein ending at some distance from the

tip of the wing; discal transverse vein straight, parted by one-fourth of its length from the border, and by very much more than its length from the præbrachial transverse vein.

12. *SOITA PSILOIDES*. *Mas.* Pallide lutea, tibiis anticis femoribus halteribusque pallide testaceis, alis cinereis apud venas subluridis vena transversa discali fusco nebulosa.

Male. Pale luteous, with black bristles. Femora and fore tibiæ pale testaceous. Wings cinereous, slightly lurid along the veins; veins black, pale luteous towards the base; discal transverse vein clouded with brown hindward; halteres pale testaceous. Length of the body 5 lines; of the wings 8 lines.

Subfam. HYDROMYZIDES, *Fallén.*

Gen. NOTIPHILA, *Fallén.*

13. *NOTIPHILA ORTALIOIDES*. *Mas.* Nigra, thorace piceo tomentoso, tarsis piceis, alis nigris lituris quatuor interioribus parvis quatuorque exterioribus majoribus transversis albis.

Male. Black. Head and thorax with some black bristles. Eyes bare. Antennæ as long as the face; third joint linear, much longer than the second; arista plumose. Thorax with piceous tomentum. Tarsi piceous. Wings black, with eight white marks; four marks minute, near the base; four exterior, larger, transverse; discal transverse vein straight, parted by half its length from the border, and by very much more than its length from the præbrachial transverse vein. Length of the body $1\frac{3}{4}$ line; of the wings 3 lines.

Facts relative to the Movements of Insects on Dry, Polished, Vertical Surfaces. By JOHN BLACKWALL, F.L.S.

[Read Nov. 17, 1864.]

(Abstract.)

As objections continue to be urged against the opinion that flies and other insects of various species are enabled to move on the vertical surfaces of highly polished bodies by the emission of an adhesive fluid from the numerous hair-like papillæ distributed over the inferior surface of their pulvilli, the statement of a few plain facts for the consideration of dissentients, and especially of those who still advocate the hypothesis that flies, in such instances as those referred to above, are supported in their movements mainly by the pressure of the atmosphere, may, perhaps, be deemed deserving of attention.

Without the slightest intention to undervalue the importance of microscopic researches into the organization of the parts in question, I may be permitted to remark that the careful observation of phenomena and judiciously selected and skilfully conducted experiments afford equal if not superior advantages with regard to the determination of the function they perform; and that the two methods of investigation should be pursued contemporaneously, and, as far as opportunities will admit, in combination.

Having clearly ascertained by repeated inspections of the pulvilli of flies under the microscope, both in a state of action and repose, that a vacuum cannot possibly be formed between them and smooth surfaces to which they are applied, unless the papillæ with which they are provided separately contribute to produce such an effect, it was immediately perceived that a decisive test of the truth or fallacy of this conjecture might be obtained by means of the air-pump, and the result of its application was to demonstrate, not only that flies can traverse the upright sides and the interior surface of the dome of an exhausted receiver while their physical energy is unimpaired, but also to establish the important fact that individuals occasionally remain fixed to the sides of the glass after they have entirely lost the power of locomotion, a circumstance which admits of only one explanation, namely, that an adhesive fluid is emitted from the extremity of their papillæ. The sole suggestion hitherto advanced, which has even the appearance of at all affecting the validity of the conclusion thus arrived at, is that the specific gravity of flies is so low that a very slight degree of adhesive power is sufficient to sustain them in the position they occupy; but, low as it undoubtedly is, it greatly exceeds that of atmospheric air, and it is evident that the efficiency of the adhesive agency to support them on a polished vertical surface *in vacuo*, thus conceded, must be ample to enable them to move on the glass of our windows in perfect security, under ordinary circumstances, without the adventitious aid of atmospheric pressure; the question of specific gravity, therefore, may be safely eliminated as being of no moment in any attempt to solve this interesting physiological problem.

The argument so much relied upon by opponents is, that if flies retained their position on polished vertical surfaces by means of an adhesive fluid emitted from the hair-like papillæ on the inferior surface of their pulvilli, they would, after remaining long in one situation, be unable to quit it by any muscular effort they

could employ without seriously injuring those delicate parts, in consequence of the tenacity that the fluid would acquire by desiccation; whereas it is well known that their movements are not in the least impeded by this circumstance. Plausible as this reasoning is, it appears to be based on the erroneous supposition that the properties of the fluid resemble those of animal-glue or vegetable-gum, an assumption which is at variance with all the particulars that have been ascertained in connexion with the phenomenon; in fact, the fluid merely assumes a gelatinous consistency on exposure to the atmosphere, and is readily removed from the pulvilli, when redundant, by the customary mode of cleansing those organs employed by insects, which it could not possibly be were it of the tenacity implied by the foregoing conjecture.

That flies are unable to walk on polished vertical surfaces when breathed upon till the aqueous vapour expelled from the lungs is copiously condensed thereon is an acknowledged fact; but it does not appear to be known that when thus treated they cannot even retain the position they occupy, whether they make any visible effort to do so or not, a circumstance that seems to be quite inexplicable on the hypothesis that they are supported by the agency of atmospheric pressure, but which admits of a satisfactory explanation on the principle of a solvent fluid acting upon a gelatinous and moderately adhesive animal secretion; and these remarks apply to numerous species of insects, and also to spiders provided with scopulæ; but the latter, when they perceive their footing to be insecure, frequently attach themselves to the spot by emitting from their spinners a little of the viscid material of which their silken lines are formed that possesses the property of being insoluble in water.

In spring, summer, and autumn house-flies may frequently be seen adhering so firmly to the upright surface of the glass of windows that they are incapable of extricating themselves though they make every exertion to accomplish that object, yet, when breathed upon till the aqueous vapour exhaled is condensed about them, they speedily fall from the spot to which they were previously attached so strongly. Now that this remarkable affection of the house-fly cannot be caused solely by a low state of atmospheric temperature, as it has been surmised, is evident from the circumstance that it often occurs in the hottest period of the year; in the months of July and August 1864, upwards of twenty instances of this curious fact were noticed; it must be ascribed,

therefore, either to feebleness resulting from some other cause, or to an increase in the adhesiveness of the fluid secretion emitted from the papillæ in the act of climbing. If it should still be insisted upon that the phenomenon is the result of atmospheric pressure, it behoves the advocates of that hypothesis to explain in what manner a little condensed vapour causes the liberation of insects that are unable to accomplish the act by their own unaided efforts. That an organ deemed to be capable of so entirely expelling the air from the space between its extremity and smooth surfaces with which it is brought in contact as to produce a vacuum, should yet be incompetent to effect the exclusion of so dense a fluid as water, does certainly appear to be in the highest degree improbable*.

The promptness and celerity of the movements of flies in an inverted position, or with their backs downwards, on highly polished surfaces, and the certainty with which their hold is immediately secured when they alight upon them, would seem to preclude the possibility of the employment of muscular force on such occasions adequate to the instantaneous expulsion of the air between their delicate climbing apparatus and the plain on which they move, to the extent required for the formation of an efficient vacuum; but every difficulty is at once obviated by admitting that a minute quantity of moderately adhesive fluid, which acquires a gelatinous consistency on exposure to the atmosphere, is emitted from the organs of sustentation. Unexceptionable evidence that such actually is the case has been obtained by observing that the extremity of each papilla becomes cauterized when subjected to the action of finely pulverized nitrate of silver; and that insects, when traversing a vertical surface of glass, leave upon it a visible and enduring trace of their path, for the better perception of which a lens having a high degree of magnifying power should be employed.

Though perfectly satisfied that the conclusion deduced by me from the experiment with the air-pump rests on too secure a basis to be subverted, yet a desire to remove all apparent difficulties which may be thought to militate against the view that I have promulgated of the means by which numerous species of insects and spiders, and even some reptiles, are enabled to move on dry,

* The adhesion of flies to the glass of windows and to other surfaces, towards the end of summer and in autumn, is usually caused by the growth from the interior of the body of a parasitic fungus (*Sporendonema muscæ*, Fries; *Empusa muscæ*, Cohn).—G. B.

polished, vertical surfaces, must serve as my excuse for obtruding once more on the attention of naturalists a subject that has been the occasion of so much controversy.

Further Note on a Skeleton of *Dinornis robustus*, Owen, in the York Museum. By THOMAS ALLIS, Esq., F.L.S.

[Read Nov. 17, 1864.]

In my paper on the *Dinornis* read before the Society on the 16th of June, I stated that the three dorsal vertebræ immediately above the sacrum were normally ankylosed; when we mounted the skeleton we found that was not the case, and we separated all these vertebræ. It was so long since I had employed myself in comparative osteology, that I had forgotten that to have these bones ankylosed is only the normal condition of birds which possess the power of flight; having discovered the mistake, I feel it a duty to acknowledge and rectify it. We also found that we have the first phalanx of the left middle toe; we thought we wanted every bone of that toe: we further found that all the phalanges of the left outer toe, as well as part of the condyle to which they were articulated, have lost the whole of their periosteum, in consequence of their exposure to atmospheric change and influence from their near approach to the external circumference of the sand-drift in which the bird was entombed. I stated that the only figure of the *Dinornis* to which we had access gave the bird but two sternal ribs. Professor Owen informs me that that had been corrected in vol. iv. (pl. 46) of the 'Zoological Transactions.'

In the report of my former paper I am made to say, "that the middle cervical vertebræ had suffered from exposure above the surface of the ground." What I said, or meant to say, was, that they were so high in the sand-drift as to be within reach of the deleterious influence of the atmosphere; while the other parts of the skeleton were at a sufficient depth to be secured from its influence, with the exception of the left toe before alluded to. Had the vertebræ been above the surface, it would have been impossible for so many detached bones to have been preserved in the regular succession in which we find them; the nine cervical vertebræ we have, are evidently the lowest nine in the series.

In the cavities of the sacrum we found a good deal of impal-

pable sand, and there can be no doubt that the beautiful state in which most of the bones are found is mainly owing to the extreme fineness of the sand in which they were imbedded.

For the acceptance of the Society I send three more photographs; one showing the right side of the *Dinornis* as mounted; another showing the left side, together with a full-sized Ostrich; and another of the Cassowary, the Emu, and the Rhea. The Rhea is the only bird in the group agreeing with the *Dinornis* in the number of sternal ribs; the Emu and Cassowary have four each, and the Ostrich five; but in the side of the Ostrich shown on the photograph there are only four,—the dorsal rib, to which the fifth should have been attached, terminates in a point, and has no articulatory surface at the end; the sternum is equally without any articulatory surface to receive it; in the other side the bird has the normal number of five sternal ribs.

Brief notice of results obtained by Experiments with Entozoa.

By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S.

[Read Dec. 1, 1864.]

1. *Tænia echinococcus*.—Eight separate worm-feedings with fresh *Echinococcus*-larvæ administered to five different dogs gave only negative results. In one instance the experimental animal, to which I had made three separate administrations, was unfortunately liberated by some ill-disposed person the evening prior to the day fixed for ascertaining the result. This dog had been sixteen weeks under observation.

2. *Tænia serrata*.—Three administrations of full-grown larvæ (*Cysticercus pisiformis*) to three separate dogs gave positive results in two instances; the third experiment being partly negatived. In all cases the administration of imperfectly developed larvæ to the same animals produced no tapeworms. The results of a fourth experiment, in three separate worm-feedings, with the dog which had been liberated, could not, of course, be ascertained.

3. *Tænia marginata*.—The administration of fresh eggs of this tapeworm to a monkey failed to develop any examples of the *Cysticercus tenuicollis*.

4. *Tænia cucumerina*.—In like manner the ova of this highly characteristic species administered to several cockroaches (*Blatta orientalis*) yielded only negative results.

5. *Fasciola hepatica*.—The deposition of the eggs of the com-

mon liver-fluke in water led to the formation of incompletely developed embryos within the space of ten weeks. At the furthest stage observed the embryos were ovoid, slightly constricted here and there, some of them displaying traces of a rudimentary eye-spot.

6. *Ascaris osculata*.—Eggs, with commencing yelk-segmentation, placed in "fresh" water developed into free embryos in less than three weeks; while those deposited in salt water required a period of six months for the completion of their development. At the expiration of twenty months the largest examples did not exceed $\frac{1}{40}$ th of an inch in length.

Eggs of this nematode with segmented yelks, also eggs containing embryos, and likewise many free embryos were administered to two dogs without producing a positive effect. The same result followed their introduction into the intestinal canal of frogs and various fishes. In the case of one gold-carp, however, numerous empty egg-shells were found, testifying to the escape of the embryonic contents.

7. *Ascaris marginata*.—Immersion of the eggs of this species led to the completion of their embryonic development within the chorion at the expiration of a period of four months; nevertheless nearly seventeen months elapsed before the embryos quitted their shells.

8. *Ascaris lumbricoides*.—In this species the deposition of the ova in fresh water gave no satisfactory result. At the expiration of three months the eggs had, from some unascertained cause, lost their vitality. The egg-contents had not completed their embryonic formation.

9. *Ascaris megalcephala*.—In this closely allied form, intra-chorional embryonic development was fully perfected within the space of three months after immersion; and in less than five months many of the embryos were found to have quitted their shells.

10. *Oxyuris vermicularis*.—Eggs of the thread-worm containing the characteristic tadpole-shaped embryos failed to liberate their contents either in water, in decaying fruit, or in other vegetable matters, although retained in these media for several months. The experiments were several times repeated, but, in all cases, the ova perished. In like manner, the administration of the eggs of this species, with their contained embryos, in one case to a monkey, and in another to a goat, yielded only negative results.

11. *Strongylus armatus*.—As in the case of the common human

Ascaris, the eggs of this parasite perished in less than four months after their immersion in water. During the interval the jar had been upset and most of its contents lost.

12. *Prosthecosacter inflexus*.—The ova of this viviparous species continued to develop their contents after deposition in water, the embryos displaying signs of growth during a period of several weeks subsequent to their escape from the chorionic envelope.

A List of Diurnal Lepidoptera collected by Mr. WALLACE in the Eastern Archipelago. By W. C. HEWITSON, Esq., F.L.S.

[Read Dec. 15, 1864.]

THE very valuable collections of Satyridæ, Erycinidæ, Lycænidæ, and Hesperidæ amassed by the indefatigable industry of Mr. Wallace having been transferred to my keeping, I am happy to comply with his wishes by compiling a list of the species, with notice of all their varieties and localities.

Fam. SATYRIDÆ.

Gen. DEBIS, *Boisduval*.

DEBIS ISANA, *Kollar, in Hugel's Reise*, pl. 16. figs. 3, 4. Java.

DEBIS EUROPA, *Fabricius*.—Java.

Var. ARETE, *Cramer*, ♂. Bouru; Macassar; Amboyna.

Females with the transverse band of the anterior wing broader, more irregular, and less clearly defined on its outer border than in the figures of *Cramer* and *Hübner*. Bourou.

DEBIS ARCADIA, *Cramer*, pl. 116. Bali; Sumatra.

DEBIS MEKARA, *Moore*. Sumatra.

Gen. CYLLO.

CYLLO LOWII, *Doubleday & Hewitson, Gen. Diurn. Lep.* pl. 61. fig. 4. Sarawak; Sumatra.

CYLLO AMABILIS, ♀, *Boisduval, Voy. Astrolabe*, pl. 2. figs. 1, 2.

Male with the transverse band of the anterior wing ochreous yellow. Bouru; New Guinea; Dorey; Amboyna.

Var. *Male and female*. With the transverse band narrower; the eyes on the underside of the posterior wing much larger. Ceram.

CYLLO CONSTANTIA, ♀, *Cramer*, pl. 133. Dorey; Amboyna.

Male. Above differs from the female only in having the transverse band more rufous and nearer to the apex, the underside darker, with the eyes of the posterior wing much larger and more distinct.

Var. *Male*. With the transverse band much narrower, ill-defined, and clouded. Amboyna; Mysol.

Var. *Male*. With the transverse band obscured and scarcely seen; the eyes on the underside of the posterior wing smaller. Aru; Batchian; Salwatty.

CYLLO LEDA, *Linnaeus*.

C. Banksia, *Fabr.* *C. Helena*, *Westwood*. *M. Vamana*, *Ambasara*, *Bela*, *Sugudana*, *Varaha*, *Gokala*, and *Suradeva*, *Horsf. & Moore, Cat. Lep. E. I. C.* pp. 223, 224. *C. Atrax*, *Erichsonia*, and *Boisduvalia*, *Felder*.

Specimens (males) resembling the figures 3 & 4, *Oreas marmorea Leda* (*C. Helena*, *Westw.*), of Hübner's *Sammlung*, which I believe represent the male. From Bouru, Timor, Batchian, Ceram, Waigiou. Females of the above with the wings truncate, paler, and more ochreous on both sides, resembling Cramer's fig. A. pl. 292. From Bouru, Batchian, and Gilolo.

Specimens of both sexes resembling figs. 1, 2, *Oreas marmorea Leda*, of the same plate of Hübner's *Sammlung*. From Timor, Flores, Sumatra, and Singapore.

Specimens of both sexes resembling fig. B of Cramer, pl. 292. From Amboyna, Tondano, and Java.

One specimen (male) exactly resembling the first-described (Hübner's *Samml.* figs. 3, 4) on the upperside, and on the underside as much like the other figures 1 & 2 of the same plate but without any of the ocelli. From Tondano.

Specimens of *Suradeva*, Moore, from Java and Malacca.

I feel sure that any one who will sit down with a large series of *Cyllo Leda* and *C. Banksia* before him, and unprejudiced by what has been done before, must come to the same conclusion which I have done, that they and their endless varieties are one and the same species. I cannot find any line of demarcation by which to make a satisfactory separation. Both of them vary in contour from the triangular anterior wing with its pointed apex and straight outer margin to the same wing truncated at the apex and projected in some cases to a point below the apex. Both have and are also without the ocelli of the underside, which has hitherto been the chief characteristic of *Cyllo Leda*. I believe that *C. amabilis* and *C. Constantia* might be better placed as varieties of this species.

Gen. CÆLITES, *Westwood*.

CÆLITES EPIMINTHIA, *Westwood*, in *Doubleday & Hewitson's Gen. Diurn. Lep.* p. 368.

Gen. RAGADIA, *Westwood*.

RAGADIA CRISIA, *Hübner, Zutr. figs. 675, 676*. Sumatra; Java; Sarawak; Singapore.

Gen. ERITES, *Boisduval*.

ERITES MADURA, *Horsfield, Cat. Lep. E. I. C. p. 5*. figs. 8, 8a.

Var. *Male and female*. With five ocelli on the anterior wing, one large and four small. Sumatra; Singapore.

Var. *Male and female*. With the five ocelli of the anterior wing small and of equal size. Singapore; Sarawak.

This genus differs very slightly from *Euptychia*.

Gen. MYCALESIS, *Hübner*.

MYCALESIS DORICUS, ♀, *Boisduval; Hewitson, Ex. But. iii*. Mycalesis, ii. figs. 7-10. Males with the anterior wing uniform dark brown. Waigiou; Aru.

Var. *Male*. With the orange band on the anterior wing as in the female. New Guinea; Mysol; Dorey.

Var. *Male*. Of a paler brown; the lower ocellus of the anterior wing bordered with yellow above as well as outwardly; the outer half of the posterior wing orange-yellow, and like that of the female without the brown border. The underside much paler, almost white. Aru.

MYCALESIS MUCIA, *Hewitson, Ex. But. iii*. Mycalesis, ii. figs. 11, 12. Aru.

MYCALESIS MESSENE, *Hewitson, Ex. But. iii*. Mycalesis, ii. figs. 8, 9. Morty; Gilolo; Ternate; Batchian.

MYCALESIS CYAMITES, *Boisduval, Voy. Astrolabe, p. 152*. New Guinea; Dorey.

MYCALESIS MEHADEVA, ♂, *Boisduval, Voy. Astrolabe, p. 151*. Dorey.

Var. *Male*. With the ocellus of the anterior wing obscured by black. New Guinea; Mysol.

Var. *Male*. With more than half of the anterior wing black; the underside much darker and beautifully tinted with purple. Waigiou.

Female paler brown; the anterior wing with two ocelli, one near the apex scarcely seen, the other surrounded by a large spot of orange; posterior wing with more than the outer half orange, with one ocellus as in the male; the underside paler, without any of the lilac tint of the male. New Guinea.

MYCALESIS REMULIA, *Cramer, pl. 237*. Amboyna; Ceram; Mysol; Bouru; Waigiou; Salwatty; Batchian; Gilolo; Ternate; Morty Island.

MYCALESIS ASOPHIS, ♂, *Hewitson, Ex. But. iii*. Mycalesis, iv. figs. 20, 21. New Guinea; Waigiou; Mysol.

Var. *Male*. With the wings all dark brown; the posterior wing with four ocelli. Salwatty.

Female larger, paler brown; both wings rufous brown to the middle, much paler beyond the middle, the ocelli larger; the posterior wing

with four, five, or six ocelli, three or four of which are small and obscure. New Guinea; Aru; Mysol.

MYCALESIS PHIDON, ♂, *Hewitson, Ex. But.* iii. Mycalesis, iii. fig. 16. New Guinea; Aru; Mysol; Waigiou.

Female like the male, except that it is larger and of a much paler brown, and that the posterior wing has five ocelli. New Guinea.

MYCALESIS DEXAMENUS, *Hewitson, Ex. But.* iii. Mycalesis, iii. figs. 17, 18 (not 19). Tondano.

Var. Female. Without the black eye-like spot of the anterior wing; the underside much darker. Tondano.

MYCALESIS DORA, *Hewitson.*

Mycalesis Deianira, ♂, *Hewitson, Ex. But.* iii. Mycalesis, iii. fig. 13. Tondano.

Female. Like the male, except that it is larger, more obscure, with the whole of the posterior wing rufous brown. Sulla.

I have renamed this species, *Deianira* spelt "*Dejanira*" having been used before.

MYCALESIS DINON, ♀, *Hewitson, Ex. But.* iii. Mycalesis, iii. fig. 31.

Mycalesis Dexamenus, var., *Hewitson, Ex. But.* iii. Mycalesis, iii. fig. 19. Macassar.

I believed this species to be only a variety of *Dexamenus* until I obtained the male in Mr. Wallace's collection; the sexes are both alike.

MYCALESIS MAIANEAS, *Hewitson, Ex. But.* iii. Mycalesis, v. figs. 27, 28. Malacca; Sarawak.

MYCALESIS MYNOIS, *Hewitson, Ex. But.* iii. Mycalesis, v. figs. 29, 30. Timor.

MYCALESIS ANAPITA, *Horsfield & Moore, Cat. Lep. E. I. C.* p. 232. Sumatra; Sarawak.

MYCALESIS DINICHE, ♂, *Hewitson, Ex. But.* iii. Mycalesis, iv. fig. 23. Sumatra; Singapore; Sarawak.

Female. Like the male, but larger and much paler.

MYCALESIS MANIPA, *Boisduval, Voy. Astrolabe*, p. 150.

Mycalesis Daidis, *Hewitson, Ex. But.* iii. Mycalesis, iv. fig. 22. Bouru; Ceram; Sulla.

Female. Like the male, except that it is larger and has a distinct transverse band at the middle, and the outer margin much paler and the small ocelli more distinct.

MYCALESIS JOPAS, *Hewitson, Ex. But.* iii. Mycalesis, iv. fig. 24. Macassar; Tondano; Sulla.

MYCALESIS HESIONE, ♂, *Cramer*, pl. 11. 362. Macassar; Timor; Bouru; Sumatra; Sarawak; Flores; Morty.

Female. Like the male, except that it is a little larger and of a pale brown.

MYCALESIS LALASSIS, *Hewitson, Ex. But.* iii. Mycalesis, vi. fig. 35.
Amboyna; Singapore; Gilolo; Flores; Sulla.

MYCALESIS MINEUS, *Linn., Cramer.*

♂. *M. Justina, Cram. Pl.* 326. ♀. *M. Drusia, Cram. Pl.* 84. Macassar; Sumatra; Singapore.

The butterfly which I have described under the name of *M. Lalassis* may be only a variety of this species. I have thought it best to confine *M. Mineus* to the description of Linnæus, who says that the underside of the anterior wing has two ocelli, rather than allow it, as Godart does, to have four or five. It is true that when restricted to two ocelli these have sometimes two or three more minute immature ocelli attached to them. Except in *M. Polidecta* (the aberrant species of this genus) it will be best to allow but little variation for the ocelli.

MYCALESIS MEGAMEDE, *Hewitson, Ex. But.* iii. Mycalesis, iii. fig. 14.
Macassar; Gilolo; Batchian; Ternate; Sumatra; Malacca; Java.

Var. *Male*. With the underside pale, rufous, the ocelli larger and very black, the fifth ocellus of the anterior wing conspicuously large. Sulla.

This species may be readily known from all those most nearly allied to it by the undulated underside.

MYCALESIS OROATIS, *Hewitson, Ex. But.* iii. Mycalesis, vi. figs. 38, 39.
Java.

MYCALESIS NALA, *Felder, Wien. Ent. Monats.* (1859) iii. p. 403.

Mycalesis Mamerta, Horsfield & Moore, Cat. Lep. E. I. C. Museum, p. 231 (not *Mamerta* of *Cramer*).

MYCALESIS MNASICLES, *Hewitson, Ex. But.* iii. Mycalesis, v. figs. 32, 33.
Sumatra.

Gen. HYPOCYSTA, *Westwood.*

HYPOCYSTA OSYRIS, *Boisduval; Felder, Wien. Ent. Monats.* iv. pl. 3.
New Guinea; Aru; Mysol.

HYPOCYSTA HÆMONIA, *Hewitson, Ex. But.* iii. Satyridæ, fig. 1. Aru.

HYPOCYSTA HYGEA, *Hewitson, Ex. But.* iii. Satyridæ, figs. 2, 3. New Guinea; Aru; Dorey; Salwatty.

HYPOCYSTA HECAERGE, *Hewitson, Ex. But.* iii. Satyridæ, figs. 4, 5.
New Guinea.

Gen. ACROPHTALMIA, *Felder.*

ACROPHTALMIA ARTEMIS, *Felder, Wien. Ent. Monats.* v. p. 305. Batchian; Gilolo; Morty; Menado; Sulla.

Gen. YPHTHIMA, *Hübner.*

YPHTHIMA BALDUS, *Fabricius, Ent. Syst.* iii. p. 323. Singapore; Sumatra.
-Var. With the underside much paler. Macassar.

- YPHTHIMA FASCIATA, *Hewitson, Trans. Ent. Soc.* 3rd series, ii. p. 287. Sumatra.
- YPHTHIMA LORYMA, *Hewitson, Trans. Ent. Soc.* 3rd series, ii. pl. 18. figs. 16, 17. Macassar; Sarawak.
- YPHTHIMA PANDOCUS, *Horsf. & Moore, Cat. Lep. E. I. C. Museum*, p. 235 = *Hewitson, Trans. Ent. Soc.* 3rd series, ii. pl. 18. fig. 12. Java; Sarawak; Macassar.
- YPHTHIMA PHILOMELA, *Hübner, Zutr.* figs. 83, 84. Malacca.
- YPHTHIMA APHNIUS, *Godart, Enc. Méth.* p. 551; *Hewitson, Trans. Ent. Soc.* 3rd series, ii. pl. 17. figs. 8, 9. Timor.
- YPHTHIMA SEPYRA, *Hewitson, Trans. Ent. Soc.* 3rd series, ii. pl. 17. fig. 10. Batchian; Gilolo.
 Var. With the underside of the posterior wing white, slightly undulated with rufous brown. Flores.
- YPHTHIMA ARCTOUS, *Fabricius.* Aru.
- YPHTHIMA AMPHITHEA, *Ménétries, in Schrenck's Amur-Lande*, pl. 3. fig. 10. Sula.

Fam. ERYCINIDÆ.

Gen. ZEMEROS, *Boisduval.*

- ZEMEROS FLEGYAS, *Cramer.* From Java.
 Var. *Female.* With a broad transverse band of five conical spots beyond the middle of the wing. Malacca; Sarawak.
- ZEMEROS EMESOIDES, *Felder, Wien. Ent. Monats.* Band iv. p. 396. Malacca; Sumatra; Sarawak.

Gen. SOSPITA, *Hewitson.*

- SOSPITA STATIRA, *Hewitson, Ex. But.* iii. figs. 9-12. Mysol; Waigiou.
 Var. *Female.* Above with the transverse band of the anterior wing broader; the outer margin of the posterior wing broadly rufous orange. Below with the posterior wing of a bright rufous orange. Salwatty.
- SOSPITA SEGECIA, *Hewitson, Ex. But.* ii. pl. 46. figs. 4-6. Aru; Mysol.
- SOSPITA WALLACEI, *Hewitson, Ex. But.* iii. figs. 7, 8. Mysol.
- SOSPITA ECHERIUS, *Stoll*, pl. 31. figs. 1, 1a, 1b. Macassar.
 Var. *Male.* Much larger and darker, the bands on the wings scarcely seen.
Female with the transverse bands of the anterior wing broader, whiter, and nearer together. Menado.
 Var. S. (Abisara) Kausambi, *Felder, Wien. Ent. Monats.* Band iv. p. 397. Malacca; Sumatra; Singapore; Sarawak.
- There is a great difference in size between large examples of *S. Echerius* and *S. Kausambi*, but there is no other distinction.

SOSPITA SAVITRI (Abisara Savitri), *Felder, Wien. Ent. Monats.* Band iv. p. 397.

Sospita Susa, *Hewitson, Ex. But.* vol. ii. pl. 46. fig. 2. Sumatra; Singapore.

Gen. TAXILA, *Doubleday.*

TAXILA DRUPADI.

Emesis Drupadi, *Horsfield, Cat. Lep. E. I. C. Museum*, pl. 2. figs. 3, 3 a. Malacca; Sumatra; Singapore.

TAXILA ORPHNA, ♂, *Hewitson, Ex. But.* vol. ii. pl. 45. fig. 7.

Emesis Orphna, *Boisduval, Sp. Gen. Lep.* pl. 21. fig. 4.

Female. Above rufous-brown; anterior wing with the outer half carmine, crossed near the apex by a large orange spot. Below, as in the male. Sumatra; Singapore; Sarawak.

Var. Female. With a larger portion of the anterior wing carmine, the orange near the apex, the nervures and outer margin of the posterior wing carmine. Singapore.

TAXILA TELESIA, ♂, *Hewitson, Ex. But.* vol. ii. pl. 45. figs. 1, 2. Sumatra; Sarawak.

Female. Above, anterior wing carmine, marked by rays of dark brown: the base pale brown, crossed near the apex by a band of orange-yellow. Posterior wing rufous brown. Below, as in the male. Sumatra; Sarawak.

TAXILA TENETA, *Hewitson, Ex. But.* vol. ii. pl. 45. figs. 3, 4. Sarawak.

TAXILA PULCHRA, *Hewitson, Ex. But.* vol. iii., Taxila, ii. figs. 8-10.

Argynnis pulchra, Guérin, Voy. Coquil. pl. 16. figs. 2, 3. Waigiou.

TAXILA DECORATA, *Hewitson, Ex. But.* vol. iii., Taxila, ii. figs. 11-13. Aru; Dorey; Mysol.

Var. Male. Darker; the band of the anterior wing narrower, clouded. Dorey.

TAXILA THUISTO, *Hewitson, Ex. But.* vol. iii. pl. 45. figs. 5, 6. Sumatra; Singapore.

On the "Tsetse" Fly of Tropical Africa (*Glossina morsitans*, Westwood). By JOHN KIEK, M.D., F.L.S.

[Read Dec. 15, 1864.]

HAVING travelled in regions infested by the fly whose bite is reputed so deadly to cattle, I venture to bring before you a brief *résumé* of what is known regarding it, adding such observations as my own experience has suggested. I do so the more readily

as of late the statements brought forward regarding it have been called in question by men of science.

In 1850 Gordon Cumming drew attention to this subject*. He says that the natives tried to dissuade him from going further in the direction of the "Limpopo," telling him that he would lose all his cattle by a fly called the "Tsetse." In this region, I may remark, Captain Harris had, in 1837, marked on the map a "country abounding in flies destructive to cattle." Regardless of the double caution, Gordon Cumming advanced, and gives the following as his experience:—"The next day one of my steeds died of the 'Tsetse.' He had been bitten under the mountain-range lying to the south of the fountain. The head and body of the poor animal swelled up in a most distressing manner before he died; his eyes were so swollen that he could not see, and in darkness he neighed for his comrades who stood feeding before him."

Major Vardon next gave his experience. He had hunted about the same time and in the same region as Gordon Cumming. His statements regarding the fly are much more precise; and to him we are also indebted for the first specimens brought to Europe, which enabled Professor Westwood to describe the insect and determine its affinities†. Major Vardon further performed a most interesting experiment. Aware of the existence in certain districts of the Bechuana country of plants poisonous to cattle (such as the "Koñwhane," a species of *Lasiosiphon*), and suspecting that some such herb might be the cause of the mischief ascribed by the natives to the fly, he put the matter to the test by riding his horse into a "Tsetse"-infested part, without dismounting or allowing the animal to feed; the result was the death of the horse.

In a letter to Professor Westwood (*loc. cit.*) he says, "I fancy it is not met with south of the tropic of Capricorn; it is usually found on hills, plains being free from it. I have ridden up a hill and found the "Setse" increasing at every step, till at last forty or fifty would be on my horse at once. The specimens you saw cost me one of the best of my stud. He was stung by some ten or a dozen of them, and died in twenty days."

Mr. Oswell, one of the discoverers of Lake Ngami, and one of the first to reach the marshy regions of Central Africa on the Upper Zambezi, records what he observed regarding the "Tsetse"

* Five Years of a Hunter's Life in the Far Interior of South Africa, ii. pp. 210, 227.

† Proceedings of the Zoological Society of London, Dec. 10, 1850, and Ann. Nat. Hist. 2nd ser. x. p. 138.

in a communication made to the Entomological Society*. Here we find noticed almost every point which has yet been brought forward. It is stated that the fly is strictly localized, and not known to shift its ground; that during the heat of the day it is active, but does not bite by night, and that the natives then pass cattle without loss through "fly country." Mr. Oswell believes that three or four flies are sufficient to kill a full-grown ox. Similar appearances were found by him in the bodies of twenty oxen which died after being bitten. These were a watery and wasted state of the flesh; stomach and intestines healthy; heart, liver, and lungs—sometimes all, invariably one—diseased, the substance of the heart in particular being soft; the blood diminished in quantity, albuminous and thick, not staining the hands when plunged into it.

Mr. Oswell states that while man, the goat, and wild animals are bitten with impunity, as also calves sucking milk, other domestic animals perish; the symptoms being swelling of the eyelids, a watery discharge from the eyes, and considerable enlargement of the sublingual glands.

Dr. Livingstone, who accompanied Messrs. Oswell and Murray to Lake Ngami, and with the former experienced the fly on their way to the Makalolo country, makes frequent mention of the "Tsetse" in his 'Missionary Travels.' He amplifies and confirms what had been before stated, adding much to our knowledge of its habits and distribution. He mentions that the ass is not affected by the bite; and although the sucking calf lives, the dog fed on milk dies.

On one occasion Dr. Livingstone suffered a loss of forty-three of his oxen, and believes that not a score of flies were ever upon them. As an instance of the sharply-defined habitat of this fly, he gives that of the "Chobe," a stream fifty yards wide, on the north bank of which his cattle grazed in safety on pastures free from fly, while the south side was infested and had proved fatal, and this while the "Tsetse" was seen adhering to flesh carried across the stream in canoes.

Dr. Livingstone's most important observation is the connexion between the fly and large game, especially the buffalo and elephant, and its absence from parts where these do not exist, pointing to a possible means of ridding a country from this curse.

Other travellers in the south have encountered this fly, and all bring home the same tale.

* Transactions of the Entomological Society of London.

Captain Burton met with "Tsetse" between Tanganyika and the coast*; and the native name given to it by him very closely resembles that in use on the Rovuma river, where we found it abundant. Specimens, however, from the Lake regions are not to be found in the British Museum.

In reference to this I have been kindly favoured with the following note from Captain Burton:—

"I certainly sent the 'Tsetse' to the British Museum, and saw it there in 1860. The only proof that the fly in question (by which I was often stung) kills cattle, especially cows, is the universal report of the natives of different and distant tribes. One of our cows died in Unyamwezi, and all who saw her declared it was the fly's poison. I have told all I know about it in the 'Lake Regions.'"

(Signed) "R. F. BURTON."

During the Zambezi Expedition, the "Tsetse" fly has been met with by us on many occasions and at distant parts. It was first seen on the Zambezi at Lupata, a hilly and well wooded district 150 miles from the coast. To the north-east between the Zambezi and Shire it is very abundant. In some parts of the Batoka country, near the Victoria Falls, it was again found; also at the junction of the Chobe; and in immense numbers on the south bank, not far from the confluence of the Kafue.

On the Rovuma river in south latitude 10° it is met with eight miles from the coast, and extends along its banks for 115 miles, the furthest point explored; here we found it named "Chipanga;" "Kipanga" being that given to it at Kilwa, according to Capt. Burton. Wherever met with over this wide area of Tropical Africa south of the equator, the habits of this fly as recorded are the same.

It frequents open forest and well-wooded country, being absent from extensive grass plains. In the morning while the dew hangs on the grass, and before the heat of the rising sun has warmed the air, the "Tsetse" is dull and sluggish, resting on the under side of some leaf or blade of grass; when forced to take wing they may then be easily caught.

Even at nine o'clock they are not very active, and fly about with a peculiar buzzing sound; with the heat of the day they become a real annoyance to the traveller, constantly biting him on the hands, face, or neck, dextrously evading a blow, and again alighting on the very spot from which they have been driven. If permitted, they will gorge themselves with blood and become

* Lake Regions of Central Africa.

unable to fly to a distance. On man, the effects are not more than follow an ordinary mosquito bite, redness, swelling, and local irritation remaining for about an hour, varying in amount according to the state of the individual. In itself the bite is not so severe as that of the larger *Tabanidæ*.

By night I have never been bitten by "Tsetse," nor do they fly about after sunset. They are most numerous and troublesome in the hot sultry weather before rains.

When once the attention has been directed to the fly, it cannot again be overlooked, although, from its common and insignificant appearance, others might easily be confounded with it by those who have not before experienced it. There is therefore more danger of its geographical range being exaggerated than underestimated. Wherever I have found this fly, it has been accompanied by the buffalo or elephant; the native dog and goat are the only domestic mammals I have found in a country infested by it. Yet the English dog from the Cape is reported to have died like horses and cattle on entering the region, a difference perhaps due to breed.

The few instances I have known of oxen taken into "fly" country form no exceptions to the common experience, although, on their showing the first symptoms, they were slaughtered by us to save the flesh, which, when the animal is far gone, becomes uneatable even to savages who love butcher's meat and devour leopards, snakes, and unclean animals.

Although always found in company with large game, the fly does not follow it everywhere; other circumstances, still unknown, check its universal distribution.

Between Sesheke and Linyanti there is plenty of game, yet the fly is limited to certain narrow spots, and in like manner between Sesheke and the Victoria Falls. So are these falls shut out from the south by only a narrow belt of "fly" land, which may be crossed at night.

As much of what we know on these points rests on native information, I would remark that where the person obtaining it enjoys the confidence of the people and can speak with them in a common language, without depending on interpreters, native testimony on matters of fact is quite as good as European.

The Makalolo are a people from infancy accustomed to tend cattle, possessing a thorough knowledge of the most fattening pastures to be sought, and noxious herbs to be avoided. Their only wealth consists in cattle, which they number by thousands.

All affirm that on entering certain localities by day the oxen die shortly afterwards: this they have proved, not in the small numbers of twenty or forty noticed by Europeans, but in herds consisting of hundreds; whether in great or small numbers they have found the result alike. They have further learned that these deadly places may be crossed with safety by night if sufficiently narrow to allow of the cattle being driven through before sunrise. This has been tested by Europeans and found also correct; further, that goats remain unaffected; and sheep suffer in a less degree than oxen.

From observing a fly constantly present in these deadly parts, the natives have drawn the natural inference that it is the cause of the loss: nor indeed can I suggest a better theory; the fly is the only thing constant in all such parts, and absent from others with which we are acquainted. The fact that the sucking calf lives, while the mother dies, at once suggests the idea of some poisonous herb; Major Vardon's experiment, however, makes us doubt this; and the dog and cow both die, whose food is so unlike.

On the other hand, we find the confines of the fly and the disease exactly correspond; also when the fly is dormant no mischief ensues. The fly avoids human excrement, so the natives told us, and we have found it true, and they say that cattle have been passed by day through fly country when smeared with a composition containing this. Native doctors have an herb to which they attribute a similar effect, but even they never assert that it will save all; only a small per cent. of the cattle exposed is the most they claim.

It has been suggested that lung-sickness, African distemper, or some such disease is the cause of death. Is it likely that a number of intelligent men, all of whom had previously been acquainted with these diseases, should have failed to recognize them again? Besides, they differ manifestly from the "Tsetse" disease in being contagious and spreading from one place to another and from one animal to another, whereas only those bitten by the fly die; and no danger has been apprehended, or experienced, by such cattle mixing with others.

As to what that disease is I can say almost nothing. I have seen the animals become languid, lose flesh, droop the ears, swell at the eyes, which gave a discharge, the coat began to stave: as to the bites, they simply showed the smallest swelling, and a little moisture on the hair around. On dissection (the animals being killed when these first symptoms appeared) the flesh had in some

degree lost its firmness, and the lungs at base were engorged. The first symptoms appear commonly within four days, but this varies with the number of flies and the season of the year. Natives report that cattle bitten die in greatest numbers before the rains, or when they set in, and that some animals will linger on until then; that having passed a fly country you do not know the full amount of loss until the rainy season has begun.

The number of flies sufficient to kill an ox has been variously estimated: Vardon speaks of ten or a dozen; Mr. Oswell of three or four; Livingstone thinks that not a score of flies were on his oxen. In the absence of direct experiment, this of course is guess-work; it only shows that a small number prove sufficient.

In most Tsetse countries, the traveller is not usually beset with more than two or three at a time; in the course of the heat of the day these might produce a number of bites, besides falling in with fresh flies as one advanced. But they are sometimes found in much greater numbers. On the south side of the Zambezi, near the confluence of the Kafue, while walking along the river bank in search of game, under shady flat-topped acacias, I heard a buzzing sound, and saw a cloud of insects coming towards me. Supposing them a swarm of bees, I ran off, while they followed. On looking back I found it was only "Tsetse;" so, arming myself with a leafy branch, I kept them off and continued my journey; they accompanied me for some distance however. I have never again seen them congregate in this manner; and, curiously enough, on this occasion, and on this only, did I obtain two of what may be the male insect; these bear the proportion to the females of 1:30, judging by the numbers then caught.

The systematic description of the "Tsetse" and its allies having been minutely entered into by Professor Westwood, I shall only add a brief description of the parts composing the mouth or biting apparatus. This consists of four pieces, of which two are lateral setose palpi, for the protection of the proboscis and its contained style. The lateral palpi are equal in length to the horny proboscis, which they embrace when at rest, but are thrown forward in a line with the body of the insect when in the act of sucking. They are of a deep brown colour, almost black at the tips, concave and finely hairy inside, outside convex and furnished with dark setæ, stronger and more numerous at the apex.

What in the common fly is a soft fleshy proboscis, becomes in the genus *Glossina* a straight, horny, chestnut-coloured bristle, smooth and polished, the apex slightly dilated and rounded, the

base expanded into a large horny body of cordate form. The upper surface of this proboscis is grooved nearly to its distal extremity, and contains a slender glassy style, equal to the groove in length, which may be raised from its protecting sheath. This style is the biting instrument; it is convex above, deeply concave beneath, and cut off obliquely at the point; the margins are slightly waved, and near the base furnished with a series of minute pedunculate hairs. Where it joins the proboscis, near the base of the lobed dilated swelling, the edges approximate and form a tube.

In the description of *Glossina longipalpis*, Wied., given by Mocquart, it is suggested that within the grooved style there probably exists a tongue or second part. This Professor Westwood has figured, which in fact has no existence in the "Tsetse."

It has been suggested that the horny dilatation at the base of the proboscis may contain some very strong poison, or a gland for its secretion; on dissection I find in it nothing but a series of large muscular bundles arising from a common tendon attached to the grooved body of the proboscis, some of the muscular bundles embracing and attached at the other end to the membranous œsophagus or continuation of the grooved style.

When in the act of biting, the insect throws forward the two hairy palpi and raises the grooved style from the upper surface of the proboscis, which at the same time is turned backwards; then, by forcing the head down on the animal, the style is inserted,—no doubt in this assisted by the powerful muscular arrangement at its base.

The irritation which follows the bite in man shows that some irritant matter is at the same time injected (although no organ for its secretion has yet been detected), the object of which is no doubt to cause a local congestion, and thus facilitate the sucking of blood. The accidental effects of this, which in animals among whom the "Tsetse" naturally lives produces no after result, in the domestic animals before-named proves fatal.

On new Tubicolous Annelids, in the Collection of the British Museum. Part 2. By W. BAIRD, M.D., F.L.S.

[Read December 1, 1864.]

[PLATE V.]

GENUS *TEREBELLA*, *Linn.* (*Montagu*).

1. *TEREBELLA FLABELLUM*, *Baird*. Pl. V. figs. 1 & 2.

The animal is as yet unknown, but the tubes are sufficiently remarkable to merit a description. The specimens, which have been deposited in the collection of the British Museum, vary in size, the largest being about 6 inches in length, and about the circumference of an ordinary goose-quill. They are cylindrical in form, tapering gradually from the summit to the base; the upper portion being the narrower. They are composed of a thin membranous substance internally, covered externally with numerous fragments of shells, corals, and pieces of horny zoophytes. The most characteristic feature, however, in the structure of this tube is the fan-shaped expansion of filaments at its upper orifice. This orifice is circular, and has on its dorsal surface a projecting lip or kind of hood (fig. 2), which extends beyond the mouth for a short distance, whilst from its ventral side springs another lip or hood (fig. 1), which quickly expands into a fan-shaped tuft of horny-looking filaments. This tuft is composed of several branches, each of which divides dichotomously into stiff but somewhat flexible filaments, spreading out horizontally to the length of an inch or more. These filaments are nodulous, and seem to possess a glutinous secretion, by means of which they are able to attach small shells, &c. to their surface.

Hab. These tubes, to the number of six, were collected during Sir J. Clarke Ross's Antarctic Expedition—two of them being registered in our collection as from *Narcon* Island. (Mus. Brit.)

2. *TEREBELLA BILINEATA*, *Baird*. Pl. V. figs. 3 & 4.

Animal with three pairs of branchiæ, composed of simple cirriform filaments (fig. 3). They are not arborescent, having no trunk or main branch from which the others spring, but are inserted in tufts of single filaments on the three first segments of the body, on each side. The tentacula are composed of numerous, rather long filaments, hollowed in the centre, and waved or undulated along the edge. In the specimens we have preserved in the collection, most of these have unfortunately fallen off. The bristle tufts are continued to the end of the body, and are about 36 in number. The segments of the body are rather deeply

striated across, and the surface is somewhat granular in appearance. The body is thickest about the centre, and tapers suddenly from that to the inferior extremity. When alive, the animal is marked with two fine stripes or lines running longitudinally down along the dorsal surface beautifully tinged with purple.

The case or tube which this animal constructs (fig. 4), and which it inhabits, is of an irregular form, and consists of a thin transparent membrane, densely coated externally with numerous rough fragments of stones and shells, with some beautiful foraminifera mixed, coarsely cemented together and exhibiting a very rude appearance.

The total length of the animal is about 3 inches, and that of the longest tube is about 4 or $4\frac{1}{2}$ inches.

Hab. Falkland Islands. Collected by Mr. W. Wright. (Mus. Brit.)

Genus *SABELLA*, *Linn.* (*Savigny*).

1. *SABELLA BIPUNCTATA*, *Baird*.

Worm rather slender, somewhat flattened, slightly tapered towards the posterior extremity.

Branchial fans large, about one-third the length of the body; of a dark purple colour towards the base, where the filaments are all united by a web for a short distance. Each filament is marked on the smooth rachis at regular distances with two small round purple spots. There are five pairs of these spots on each filament, the first being near the base and the last a short distance from the apex. The filaments are all rather densely and closely ciliated on one side. The two tentacula are smooth and setaceous, short, stout, and sharp pointed at the apex. The collar is slightly lobed; and the upper part of the body, on the ventral surface, a little below the head, is stained with a rather broad dark purple mark, and along each side of the body, at the base of each foot, is a small spot of the same colour. The thorax has ten pairs of setigerous feet, and the purple spots at their bases are much larger than those at the base of the feet belonging to the abdominal segments. In one specimen (which I cannot see differs specifically from the others in other respects) the setigerous feet are twelve pairs in number and the body is somewhat broader.

The tube which the animal constructs, and in which it lives, is narrow, about the circumference of a swan-quill, long, round, and consists of a toughish membrane covered with a rather thick, smooth coat of mud.

The length of the animal is about 3 inches; that of the tube about $4\frac{1}{2}$ inches.

Hab. Island of St. Thomas, West Indies. Collected by M. Sallé. (Mus. Brit.)

2. *SABELLA NIGRO-MACULATA*, Baird. Pl. V. figs. 5 & 6.

Worm rather short, broad and stout, tapering slightly near the posterior extremity (fig. 5).

The branchial fan consists of numerous short filaments united near the base by a web, and about the fourth part of the length of the body. They are of a dark brown colour spotted with white on the rachis, are densely ciliated on one side with long stout cilia, and on the rachis, which is smooth, there are at regular distances about twenty other very short filaments, set in pairs (fig. 6). Near the base of the filament spring a pair longer and broader, and near the middle of its length another pair of the same kind. The collar is deeply lobed and of a dark purple colour. The body throughout its whole length is spotted with numerous dark purple or nearly black dots of various sizes, but largest on the superior extremity. The thorax possesses seven pairs of setigerous feet. The two smooth filaments are short and flat, and sharp pointed at the apex. The tube in which the animal lives is rounded, and is composed of a toughish membrane covered outwardly with a smooth coat of mud.

The length of the animal is about $2\frac{1}{2}$ inches; that of the tube nearly double the length.

Hab. Island of St. Vincent, West Indies. From the Rev. Lansdowne Guilding's Collection. (Mus. Brit.)

3. *SABELLA OCCIDENTALIS*, Baird. Pl. V. figs. 7 & 8.

Worm slender, of a cylindrical form, slightly tapering towards the posterior extremity (fig. 7).

Branchial fan composed of about sixteen filaments on each side. The filaments are densely ciliated on one side; the cilia of a yellow colour for most part, interspersed at short distances with black cilia, generally disposed in pairs, or in clusters of three, and rather stouter than the others. The rachis is smooth, but dotted along one side with numerous very small black spots (fig. 8). The filaments are all united near their base by a web, which is of a dark purple colour. The two smooth filaments are short, and sharp pointed at the apex. The collar is narrow and slightly bilobed. The thorax has seven pairs of setigerous feet. We possess no tubes belonging to the specimens.

Hab. Island of St. Vincent, West Indies. From the Collection of the Rev. Lansdowne Guilding. (Mus. Brit.)

4. *SABELLA GROSSA*, Baird.

Worm remarkably thick, short and solid-looking, of a uniform dark olive colour, and about the same dimensions anteriorly as posteriorly.

The branchial filaments of the only specimen we possess have unfortunately been destroyed, but the peduncle upon which they were placed remains, and exhibits a spiral twist like that represented in M. Milne-Edwards's figure of *Sabella unispira* in Cuvier's 'Animal Kingdom' (Crochard edition, t. 4. fig. 1a). The collar is everted, thick, and bilobed. The thorax possesses eight pairs of setigerous feet. The smooth (?) tentacles are wanting; the specimen, which has been for a good many years in the Museum Collection, being in only tolerable preservation. There is no tube belonging to the specimen. Length of animal (without branchiæ) about 4 inches, breadth about 7 or 8 lines. In general appearance it resembles *S. melania* of Schmarda from Jamaica.

Hab. Island of St. Helena. From the Collection made during the voyage of H.M.S. 'Chanticleer.' (Mus. Brit.)

5. *SABELLA GRANDIS*, Baird.

Worm of a rather square or quadrilateral shape, tapering slightly to the extremity, which terminates in a sharp point. Length (without branchiæ, which unfortunately have been lost) about $6\frac{1}{2}$ inches.

Collar rather broad and deeply bilobed. Thoracic feet seven pairs. Segments belonging to them smooth, not grooved on the upper dorsal surface. Body of a dark brown colour on the back, rather yellow underneath or on the ventral surface. Feet numerous, about 100 in number. Peduncles large, well developed. Anterior and posterior divisions separated by a groove, in the centre of which are situated the feet. Along the dorsal surface, with the exception of the seven first or thoracic segments, there runs a deep groove dividing each segment into two halves. The setæ of the feet appear in many instances to be enveloped in a membranous little bag, which, falling off, allows the setæ to project. These are short, slender, smooth, setaceous, and very sharp pointed.

The case in which the worm lives is somewhat larger than the animal itself, and is a round and leathery-looking tube covered over externally with a thin coat of mud.

Hab. Coast of New Zealand. From the Collection of Sir A. Smith, M.D. (Mus. Brit.)

Description of a New Variety of *Lepidonotus cirratus* parasitic in the Tube of *Chætopterus insignis*. By W. BAIRD, M.D., F.L.S.

[Read December 15, 1864.]

IN the last volume of the 'Linnean Transactions' I described a new species of *Chætopterus* as British, and, at p. 485, Mr. Williams of Beaumaris, in his notes upon this Annelide, mentioned that generally speaking a species of *Lepidonotus* (*Polynoë*) was found by him living parasitic in the tubes of that animal. In a short note I mentioned that the parasitic worm was a variety of *L. cirratus*. I now beg to lay before the Society a fuller description of it.

LEPIDONOTUS CIRRATUS. Var. *parasiticus*, Baird.

Body about $1\frac{1}{2}$ inch long, and at the widest part, including the setæ of the feet, 6 lines in breadth. It is slightly narrower near the anterior extremity. The scales are fifteen pairs. They cover the whole body, increase in size as they descend from the head, near which they are small, nearly circular in form; afterwards they become reniform and are covered with innumerable very small rough points, which are scarcely visible without the assistance of a glass of low power. The external edge is ciliated, or fringed with short clavate hairs. The head is concealed by the upper pair of scales. Eyes four in number; the upper pair wider apart than the lower. Of the three antennæ, the central or odd one is setaceous, suddenly terminating in a long, slender, sharp point, and beset with rather numerous short clavate hairs. The lateral pair are shorter than the central one, setaceous, smooth, the lower half conical in form, stout, marked across with a double purple streak, and, like the other, terminating suddenly in a long slender white point. Palpi very stout, especially near the base, setaceous, terminating more gradually in a point, and quite smooth. Tentacular cirri setaceous, and like the central antenna terminating suddenly in a long slender point, and beset with short clavate hairs, but with no enlargement or swelling near the apex. These organs are all short, and nearly of equal length, though the palpi are somewhat the longest and much the strongest. The cirri of the second pair of feet are smooth and setaceous; all the others are longer, setaceous, ringed with black below the apex, but without any swelling or enlargement there, terminating in a slender sharp point and beset with short clavate hairs. The caudal cirri are short. The feet are thirty-seven pairs in number. The dorsal

branch gives off a tuft of dark-coloured spines, generally covered with sordes, but when placed under the microscope are slender, with a smooth stalk, but finely denticulate for some way down from the apex, on both edges. The ventral branch is conical, rather sharp pointed, and gives off a tuft of yellow bristles. These are longer and stronger than those of the dorsal branch, and are strongly denticulate for some distance from the point. This variety differs from the typical form of *cirratus* in being altogether broader in shape; in being narrower at the anterior extremity than the posterior, the reverse of which is the case in *cirratus*; and in the cirri not being swollen or enlarged a little below the apex.

It is found inhabiting the tube or case of living *Chætopteri*. Mr. J. Williams, of Beaumaris, to whom I am indebted for the specimens, finds them nearly constantly in the case of the *Chætopterus insignis* at low water. In his letter to me he says, "it is generally found crouching on the lower segments of the body of the *Chætopterus*, and the earliest indication of the death of that annelide is the exit of the parasite from the tube."

Hab. Menai Straits, near Beaumaris. J. Williams. (Mus. Brit.)

On *Dicellura*, a new genus of Insects belonging to the Stirps *Thysanura*, in the order *Neuroptera*. By A. H. HALIDAY, A.M., F.L.S.

[Read January 21, 1865.]

THE genus is founded on an undescribed insect allied to *Campodea ambulans*, L. (sp. *Podura*) in general appearance and habits, but distinguished especially by having (in place of the pair of many-jointed filaments which terminate the abdomen in that species) a forceps like that which characterizes the Stirps *Labidura* in the same order. *Dicellura solifuga* appears to have a pretty extensive range in latitude, having been found, firstly, by Mr. Lucas in Algeria; afterwards at Paris, by the same author, who has received it also from the neighbourhood of Toulon; while the writer has found it in different parts of Central and Southern Italy. The institution of a family Dicelluridæ is suggested to comprize the two genera named, and distinguished from the remaining circumscribed group of *Lepismidæ* by the binary number of posterior appendages, the exarticulate tarsus, the simply falcated

maxillæ, without exterior lobe ("galea") or palpus; and, as to internal organization, above all, by the want of Malpighian vessels.

Nicoletia terrestris, L. (sp. *Lepisma*) may be a connecting link, resembling *Campodea* in the form of body, equally scaleless and bleached, and having the internal lobe of the maxilla pectinated somewhat alike; but, in this view, the internal anatomy of *Nicoletia* remains to be investigated. From Poduridæ the proposed family differs no less by the oral organs, than by the essentially many-jointed antennæ, the full normal number of abdominal segments developed, the consequent direction of the terminal appendages, and the elongated tarsus, armed with a pair of equal unguiculi.

On Animal Individuality from an Entozoological point of view.

By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S.

[Read June 1, 1865.]

WHEN Dr. Carpenter in the first instance, and Professor Huxley subsequently, promulgated their original and philosophic views respecting the question of animal individuality, they virtually established a general proposition regarding the constitution of the "zoological individual," which forms an admirable stand-point by whose aid we may interpret the significance and relations of a series of life-phenomena which must otherwise have long remained misunderstood and, consequently, also undervalued.

The general proposition here referred to was formally embodied in the announcement that the "zoological individual" comprises the sum-total of the phenomena displayed by all the products of a single ovum, or, to employ Prof. Huxley's own words, "the *individual* animal is the sum of the phenomena presented by a single life."

Physiologists have long since maintained that the human frame, during its life-period, is represented by several epochs, each of which is absolutely distinctive and separable in so far as actual matter or tissue is concerned, but inseparable and almost indistinctive as regards mere appearances, whether external or internal. In other words, during man's growth we have a definite succession of life-phases which are analogous to, if not in any sense homologous with, the distinctive and peculiar temporary forms of life so notably characteristic of certain of the lower animal types.

Taking, as it were, a bird's-eye view of the whole zoological

series, these temporary life-phases display every degree of distinctiveness from the almost imperceptible up to the separable, free, individual-like being for the designation of which Prof. Huxley has felicitously proposed the term "zoöid." All these phases are now known to be phenomena of growth, metamorphosis, and gemmation, there being no such thing as "alternate generation" in the truest sense of this phrase*.

Applying these principles to the interpretation of the phenomena of entozootic life, some very curious results appear to be attainable when we come to deal with the more complicated forms. Starting, however, with a species where the individual is represented by simple, non-metamorphosed life-phases, we necessarily encounter the almost indistinctive conditions of ordinary growth. Thus I select, in the first instance, the so-called *Trichina spiralis*, whose life-phenomena (according to the synoptical method initiated in my work on Entozoa) may be tabulated as follows:—

ZOOLOGICAL INDIVIDUAL (*Trichina spiralis*).

- a. Ovum in all stages.
- b. Intra-uterine embryo.
- c. Free embryo or migrating larva.
- d. Resting or sexually immature larva.
- e. Expectant or sexually distinctive *Trichina* (often encysted).
- f. Free, sexually mature intestinal *Trichina*.

Now, although the various larval stages above indicated bear a general resemblance to the adult *Trichina*, we have, even here, some faint traces of "epochs" which, were they only rather more strongly pronounced, would enable us to draw lines of demarcation. In some instances the life-epoch may be homologically identical with a temporary bud, but it may also comprise a multitude of *gemmæ*. Each such successive life-epoch, whether distinctive or indistinctive, separable or inseparable, I propose to call a *biotome*; and when two or more such life-divisions are recognizable, I propose to call them "secondary" or "tertiary" biotomes, as the case may be. I would observe that the term "biotome" is not designed to supersede the term "zoöid," but rather to limit the

* Since this passage was written, I have received an important communication from Professor Leuckart, in which he states that he has reared sexually mature free Nematoids, of the genus *Rhabditis*, from *Ascaris nigrovenosa*. If this be the case, we have here, for the first time, a true alternation of generation, or, to say the least, a true sexual dimorphism in animals (Nachrichten von der Königl. Gesellschaft der Wissensch. zu Göttingen, No. 8, April 19, 1865, p. 227).

latter to an individualized, free, constituent portion of the "biotome." The propriety of this arrangement will, I think, appear in the sequel. Let us, therefore, in the next place, glance at the life-phases of one of the cestodes. Those of *Tænia serrata* may be tabulated thus:—

ZOOLOGICAL INDIVIDUAL (*Tænia serrata*).

a. Ovum in all stages	} Primary "biotome."
b. Six-hooked embryo, boring larva, or proscölex	
c. Resting larva, scolex, or <i>Cysticercus pisiformis</i>	
d. Sexually immature tapeworm in all stages ...	} Secondary "biotome."
e. Mature tapeworm-colony, strobile, or <i>Tænia</i> ...	
f. Segment, free-joint, or <i>proglottis</i> (zooid)	

According to Prof. Huxley's views, in the above "individual" the stages *a*, *b*, *c*, *d* would collectively represent the first life-phase or "protozooid," whilst the final phase, *f*, would be the "deuterozooid." I have, indeed, with Professor Huxley's approval, so represented them in my introductory treatise on Entozoa; but, recently, I have not been able to satisfy myself that the nomenclature in question meets all the requirements of the case. In my view, the six-hooked embryo is as much an individualized form as the *Cysticercus*-stage, whilst the latter is as much a life-phase as the *proglottis* itself. Why therefore may we not here recognize three zooids (proto-deutero-trito-zooids), instead of two only, after the manner suggested by Prof. Huxley? If this view be accepted, our *Tænia serrata*, in its full zoological individuality, would be represented by two biotomes, the primary one comprising two individualized phases (the proscölex and scolex, or protozooid and deuterozooid), and the secondary one comprising a practically indefinite number of individualized forms or tritozooids. In the one case the independent life-phases are the result of metamorphosis, but in the other they are the product of gemmation. Let us next see how the matter stands in regard to one of the Trematodes, say, for example, the common liver-fluke (*Fasciola hepatica*), which may be tabulated as follows:—

ZOOLOGICAL INDIVIDUAL (*Fasciola hepatica*).

a. Ovum in all stages	} First "biotome."
b. Ciliated free-swimming embryo	
c. Non-ciliated larva (nurse, germ-sac, sporocyst, <i>redia</i>) ...	} Second "biotome."
d. Active, migrating, tailed larva (<i>cercaria</i>)	
e. Encysted, resting larva (<i>pupa</i>)	} Third "biotome."
f. Sexually mature fluke (<i>fasciola</i>)	

This is probably a fair representation of the ordinary fluke individual (*Fasciola hepatica*), in which species the entire life-phases have not as yet been thoroughly identified. It is quite certain that the life-phases are never less numerous or complicated than is here indicated; whilst Pagenstecher's researches tend to prove that, under certain climatal conditions, the number of larval forms may vary considerably. In other words, the fluke individual does not comprise any definite number of "zooids," although the kinds of zooids are limited. In the present case I recognize three "biotomes." The first includes only one temporary, independent life-phase; this is the ciliated animalcule, which, in my view, possesses sufficient individualized life to entitle it to be recognized as a "protozoid." The second "biotome" may in some cases comprise only a solitary, simple sporocyst or germ-sac (deuterozoid); but an almost indefinite multiplication of new and independent germ-sacs, as well as other more highly organized "nurse-formations," may also be developed from the primary sporocyst (secondary and tertiary "deuterozooids"). This reminds us of the practically indefinite number of zooids (proglottides) which the second "biotome" of the Cestode gives rise to; but here there is analogy, and not homology. The third "biotome" embraces a large but variable number of "tritozooids" (*cercariæ*), an equal number (whatever that may be) of "tetartozooids" (*pupæ*), and therefore, also, a similar number of "pempzooids" (flukes).

Whether the views here promulgated be accepted or not, I have, I trust, made it sufficiently clear that the fluke-individual may comprise, in its life-cycle, a great and varying number of life-phases, each of which may or may not possess equivalent (and, necessarily, very limited) zoological value. The variability of the character of these life-phases is shown by the sporocysts (deuterozooids), which are not only unequal to one another in bulk, but also in organization, the higher forms (*redia*) developing a rudimentary digestive apparatus. Apparently the *redia* is not, in all cases, an essential feature of Trematode larval life. Putting together the whole possible and independent life-phases, and placing their numerical development within the lowest limits, our ordinary fluke-individual would, I reckon, comprise about 370 "zooid" formations, those of the second "biotome" being produced by the well-known process of internal gemmation, whilst those of the third "biotome" are the result of a simple yet prolonged metamorphosis.

I conceive that Dr. Pagenstecher's apparently well-established proposition (that "only such Trematode larvæ as are capable of arriving at sexual maturity are furnished with special appendages") gives strength to my views regarding the recognizable epochs in the fluke-individual's life, and points to the line of origin, continuity, and definiteness of the third "biotome" which I have recognized on totally independent grounds. There is about the same relative amount of individualized being in the caterpillar, pupa, and imago states of the Insect as there is in the cercaria, pupa, and fluke conditions of the Trematode; but the "epoch" of the one embraces the whole life of the "zoological individual," whilst in the other it represents only a section or "biotome" of the life-cycle. If the term "zoid" be not allowable for the separate metamorphosed life-phases, as well as for true gemmæ, some other distinctive nomenclature must be substituted. I would like to see it retained to designate the semi-individualized, separable life-phase, without regard to its mode of genesis.

Practically, other curious results arise out of the foregoing considerations. For example, a single sheep may harbour 1000 flukes. Each fluke carries, I believe, at least 10,000 eggs. Each egg may give rise to 370 zooids. It thus appears that, if all the conditions were favourable, a single fluke might originate between three and four millions of individualized life-forms; whilst the solitary sheep itself would, under the same circumstances, be the means of producing at least 3,000,000,000 fluke-zooids! Happily no such result as this can possibly occur in nature, since a multitude of "interfering agencies" places the "favourable conditions" in a comparatively insignificant minority. However, the balance of parasitic forms from all cattle-sources is sufficient to destroy thousands of sheep annually, to say nothing of the wounds inflicted on millions of small mollusks, into whose bodies the "zooids" penetrate.

Reverting to the Cestodes, the results attainable from particular species are, in some respects, still more striking. Let us separately examine the "zoological individuals" of *Tænia cœnurus* and *Tænia echinococcus*. The life-phases of the former may be tabulated as follows:—

ZOOLOGICAL INDIVIDUAL (*Tænia cœnurus*).

- | | |
|--|--------------------|
| a. Ovum in all stages | } First "biotome." |
| b. Six-hooked embryo, boring larva, or <i>proscölex</i> ... | |
| c. Resting, polyccephalous larva (<i>Cœnurus cerebralis</i>) | |

- | | |
|--|---------------------|
| d. Sexually immature tapeworm | } Second "biotome." |
| e. Mature tapeworm-colony, or strobile | |
| f. Segment, free-joint, or <i>proglottis</i> | |

At first sight, this representation appears to be the same as that of the *Tænia serrata*, already given. It is, in truth, zoologically equivalent, but the component life-phases are both structurally and numerically different. The "resting larva" of *Tænia serrata* consists of a single free scolex, whilst the resting larva of *T. cœnurus* comprises a multitude of conjoined, inseparable *scolices*. In the one case the scolex is a true "zooid," in the other it is the merest fraction of a "zooid." In the case of *Tænia serrata* one single egg, under the most favourable conditions, can only lead to the development of one tapeworm; but, under like circumstances, the single egg of *Tænia cœnurus* may lead to the formation of at least 300 tapeworms. This is accomplished when the *Cœnurus* of the sheep's brain is transferred to the stomach of the dog, and all the scolex-heads with which it is furnished become developed into tapeworms. If we call to our aid an estimate of the "zooids," the result is much more markedly significant. On the plan of interpretation previously adopted, the "zoological individual" of *Tænia serrata* (allowing 500 *proglottides* for the strobile) would only yield us 503 "zooids" (as I have defined them); but in the case of *Tænia cœnurus* this representation would certainly give us as many as 1,500,000 "zooids." Then, as regards the total number of eggs produced by all the final "zooids" collectively, we should, in the case of *Tænia serrata* (allowing each *proglottis* to contain 5000 ova), obtain the comparatively small total of 2,500,000 eggs; whilst in the case of *Tænia cœnurus*, the progeny of a single germ would collectively give out no less than 7,500,000,000 ova! Lastly, let us glance at the possible results derivable from a consideration of the "zoological individual" of *Tænia echinococcus*, which may be tabulated after the same fashion:—

ZOOLOGICAL INDIVIDUAL (*Tænia echinococcus*).

- | | |
|---|---------------------|
| a. Ovum in all stages | } First "biotome." |
| b. Six-hooked embryo, boring larva, or proscœlex ... | |
| c. Resting, acephalocystic larva (<i>hydatid</i>) | |
| d. Sexually immature tapeworm | } Second "biotome." |
| e. Mature tapeworm-colony, or strobile | |
| f. Segment, <i>proglottis</i> , or free-joint..... | |

Here, again, the representation is as simple as obtained either in the case of *Tænia serrata* or in *Tænia cœnurus*; but, in point of numerical and structural detail, the life-phases are remarkably different. In this case the "resting larva," as in *Cœnurus*, is

furnished with a multitude of "heads," the latter being the so-called echinococci or scolices developed in a rather more complete form than obtains in the case of *Cœnurus cerebralis*. In fact, the so-called "heads" are almost separable "phases," being attached to the maternal larva by slender pedicles only. They are, indeed, frequently found detached; but then it is questionable if they have not already parted with their vitality. In this view I cannot call them "zooids"; but the daughter-hydatid formations, which are developed within or without the original maternal hydatid, are quite deserving of such distinction. The latter are separable, organized life-phases, each of which, like its parent, may develop a multitude of echinococci; so that, under favourable conditions, there is practically no limit to the number of "heads" which may be generated by a proliferating hydatid; consequently, also, there is practically no limit to the number of tapeworms liable to be developed from the same source. The tapeworms in this case, however, have only three joints capable of arriving at sexual maturity, and only one of these is mature at one and the same time. Whether or no these *Tæniæ* are susceptible of indefinite proglottis-multiplication, after the fashion of ordinary tapeworms, is a point on which I am, at present, uninformed; it is probable, however, that the joints follow the ordinary law of successional development. In either case our computation of the number of zooids and eggs capable of arising from a single germ needs not be affected by this consideration. Taking an average case of hydatid development, and assuming the existence of conditions favourable to the complete development of the entire progeny, a single germ of *Tænia echinococcus* might, without any exaggeration, give us between five and six million separate life-phases or "zooids," from which, under like circumstances, there would result not less than 150,000,000,000 ova! In this calculation I do not take into account the probability of any one tapeworm developing more than three successive sexually mature segments, and I allow for each proglottis (tetartozooid) 10,000 eggs. For each hydatid I allow 10,000 scolices, though one large acephalocyst may develop ten times that number. As many as a thousand hydatids, or more, may be developed in a single "host"; but echinococcus-heads are not usually present in more than a limited number of the daughter vesicles. Were they less "cribbed, cabined, and confined" than is usually the case, no doubt their power of developing the so-called "heads" would be correspondingly increased. As it is, we may truly say, "*Quantitas sufficit.*"

Remarks on the best Methods of displaying *Entozoa* in Museums.

By T. SPENCER COBBOLD, M.D., F.R.S., F.L.S.

[Read June 1, 1865.]

THE Council of the Royal College of Surgeons having afforded me an opportunity of remodelling their collection of internal parasites, I have, while thus engaged, introduced a few novelties in the mode of mounting the specimens, and I have ventured to think that a brief notice of them might be usefully placed on record.

Some years' experience with the practical working of museums has satisfied me that for the secure and permanent closure of spirit preparations no plan surpasses the old Hunterian method; but in cases where it is desired to remove the specimens for temporary examination or redissection, the employment of any particular kind of jar becomes a mere matter of taste. The wide glass-stoppered jars are unsightly, inconvenient, and expensive; nevertheless they are preferable to the common medicine-phials now employed in the British Museum. Retaining the Hunterian plan in so far as mere closure is concerned, I would invite attention to the following points:—

1. Except in cases where the specimens are large and bulky, it is always advisable to attach the objects to sheets of mica. The employment of mica is in itself no novelty, but it has been usual to suspend the mineral in the jar with the specimen attached. This is not necessary. It should always be fixed to the sides of the jar, which may easily be done by making the mineral plate a little wider transversely than the corresponding diameter of the jar. The elasticity of the mica, if not too thin, will ensure fixity. I introduced this method ten years ago, and on this principle mounted a series of *Entozoa* in the Anatomical Museum of the Edinburgh University. The form of the jar may vary, but it is essential that the aperture be nearly of the same diameter as the body of the vessel; otherwise, on introducing the specimen, the mica sheet will be injured by too great a strain upon its elasticity. For my own part, I prefer that form of jar first recommended by Prof. Goodsir. In this case (as shown by the preparations on the table) the rim and aperture resemble those of an ordinary hyacinth-glass. This leaves a circular shelf on which Mr. Goodsir used to place a bridge of stout whalebone, and by means of suspensory threads the mica and specimens were attached in the ordinary manner. I have long ceased to adopt this plan. As regards affixing, in the case of complete specimens, it is highly desirable

that their position should be made to correspond with the attitudes which they assume in nature.

2. In the case of Hydatids, and in instances where it is desired to show a large mass of parasites, I have occasionally reversed the above method. Thus, in place of a vertically disposed sheet of mica, I introduce a circular diaphragm of the same substance, its diameter slightly exceeding the width of the jar. The mica should be stout; otherwise the weight of the spirit (on the jar being moved or carelessly inverted) will be sure to displace the diaphragm. It should be carried about two-thirds of the way down the bottle, and be fixed in an obliquely transverse position. The specimens are thus suitably displayed at or near the centre of the vessel. It is unnecessary to fix them to the mica; but, if desired, they may be retained in their place by a second or superimposed diaphragm. Ordinarily this is not advisable.

3. Where the parasites are very minute, yet still sufficiently visible to the naked eye to be worthy of museum display, a thin, square, oblong or circular plate of mica may be applied and fixed to the vertical sheet, including the objects after the fashion of ordinary microscopic preparations. This seemingly simple method, however, required great care and patience; for, in place of using cement, it is necessary to fix the two mica plates together by means of fine thread. In doing this the operator is liable to displace or distort the specimens; but when once accomplished without disturbance, there is no fear of subsequent injury. This method is eminently suitable for the display of Oxyurides, Sphæru-lariæ, and other minute Nematodes, which in our pathological collections are usually seen lying at the bottom of the vessels enclosing them. In some instances, as obtains in the British Museum, I have seen the specimens enclosed in a second vessel or glass tube, the one swinging within the other in a very slovenly manner*.

4. In certain cases where none of the above-described methods are altogether satisfactory, I have introduced another plan which I am particularly desirous of bringing under the Society's notice.

* The Entozoa within our national collection are both numerous and valuable. At present, however, the bottles containing them are lodged within a glass case, the latter being itself placed in a dark passage leading to the so-called "insect-room." The specimens have been skilfully catalogued; but, for want of space, they are huddled together without any definite or systematic arrangement. For the furtherance of the interests of science they are practically unavailable. It is earnestly hoped that Dr. Baird's efforts to secure a proper apartment for their exhibition may yet meet with success.—T. S. C.

It refers to the employment of various-sized watch-glasses. They are affixed to the vertical sheets of mica, and the specimens are introduced into their concavities; each glass being fastened to the mica by threads passed through two or more holes previously drilled at its circumferential margin. I find two holes sufficient, one on either side; but greater fixity and security may be obtained by boring more apertures at equidistant intervals. This adds, however, to the expense and risk of breakage. The holes should freely admit the passage of an ordinary needle. This plan is eminently suitable for the display of small flukes, *Cysticerci* (of the "measle" kind), and minute *Hydatids*.

5. A few years ago I initiated the employment of carmine, aniline, and other pigments in the preparation of Entozoa for museum purposes, and I am glad to be able to state that the specimens thus first treated still retain their colouring almost unimpaired; at least, this is the case with those saturated with carmine. For microscopic purposes, these pigments had long previously been employed both here and on the Continent. Some of the magenta-dyed preparations have stood very well, where the carbolic-acid solution had been sufficiently strong to fix the colour. The specimens preserved in the Museum of the Middlesex Hospital, however, hardly offer a fair criterion of the durability of this latter pigment, since the preparations have been all along exposed to a strong sun-light. In a large collection the use of carmine should not be excessive, but in particular instances (as, for example, in the encapsuled condition of *Trichina spiralis*) its employment cannot be too highly recommended.

[The above remarks were illustrated by the exhibition of specimens of *Hydatids*, *Cysticerci*, *Amphistomata*, *Sphæruleariæ*, *Trichinæ*, *Spiropteræ*, and *Cœnuri*, prepared by the author for the Museum of the Royal College of Surgeons.]

Contributions towards a Monograph of the Species of *Annelides* belonging to the *Aphroditacea*, containing a List of the known Species, and a Description of some new Species contained in the National Collection of the British Museum. By W. BAIRD, M.D.

[Read June 1, 1865.]

"Animalium molluscorum in mari degentium vix centesimam partem bene novimus. Tanta autem est Naturæ in eorum forma et fabrica varietas, et tanta non modo inter genus et genus, sed inter generum extremas quoque species plerumque discrepantia, ut vel exercitatissimi in his sæpe

dubii hæreant quonam hoc vel illud noviter repertum ex hac classe animal referant, quove nomine adpellent.”—*Pallas. Miscell. Zool.* p. 72.

AMONGST the *Aphroditacea* are several *Annelides* which are remarkable for their size and beauty. The genus *Aphrodita*, from which the family derives its name, was created by Linnæus to contain the brilliantly shining and splendidly iridescent-haired worm, commonly known by the name of the Sea-Mouse, and several other allied species which now form the types of distinct genera. Of these MM. Audouin and Milne-Edwards enumerate 6, and Grube 7; but later authors have so increased the number of species belonging to these, that Kinberg, a Swedish naturalist, and one of the most recent writers on the subject of the *Annelides*, has found it convenient to form almost each of the older genera into distinct families. In this paper I propose adopting his arrangement, as well as his terminology.

MM. Audouin and Milne-Edwards, and most succeeding authors, describe the animals belonging to the *Aphroditacea* as possessing *five* antennæ—one, single, in the centre, which they call the median antenna, or *antenne impaire*, two others (one on each side) which they denominate the intermediate, and two others, which they call the external. In addition to these organs connected with the head, are a pair of antenna-like organs which terminate the first pair of feet, instead of a fascicle of bristles, and which they describe by the name of the ventral cirri of the first pair of feet. Kinberg looks upon the single antenna in the centre as being a *tentacle* or feeler; the intermediate antennæ he considers the *true antennæ*; and the external ones he calls *palpi*; whilst the ventral cirri of the first pair of feet are denominated the *buccal cirri*.

Family I. APHRODITIDÆ.

(*Aphroditacea, Kinberg.*)

The family *Aphroditidæ* may be thus characterized:—Animals of an ovate or oblong form, convex on the back, with a distinct head in the form of a lobe, on the sides of which are situate one pair of eyes, and from the centre of which springs a small tentacle; underneath it there is a granular facial tubercle; no antennæ; two palpi, springing from the base of the head-lobe; buccal cirri short, tentacular cirri long; jaws cartilaginous, not very distinct; branchiæ indistinct; elytra 15 pairs, occurring on the 2nd, 4th, 5th, 7th, and all alternate segments of the body to the 25th, on the 28th, and 32nd.

The family thus characterized will now be restricted to four genera, all of which have strict relations with each other.

The genus *Aphrodita*, as now restricted, will contain those species in which the eyes are sessile, which have the back covered with a thick coat of felty hair, and in which the bristles issuing from the feet are all simple.

The genus *Hermione* will contain those species in which the eyes are peduncled, which have no, or only a very thin, covering of felty hair on the back, and in which the bristles of the feet are of two kinds—those on the dorsal branch being barbed like an arrow, and those on the ventral branch bidentate.

The genus *Aphrogenia* contains such species as have the eyes sessile, which have no felty covering on the back, and in which the bristles of the dorsal branch of the feet are uncinatè, not barbed, and those of the ventral branch bidentate.

The genus *Lætatonice* will contain those species which have the eyes peduncled; which have a felty covering on the back; and in which the bristles of the dorsal branch of the feet are densely barbed, and those of the ventral branch semipennate.

The known species belonging to the family are not numerous, only nine or ten having as yet been described; but, in determining the species contained in the national collection in the British Museum, some new forms have occurred to me which I think it is desirable should be described and placed on record.

GENUS I. APHRODITA*, *Linnæus*.

Halithea (part) (*Halithea* simplices), *Savigny*.

Eyes sessile; back covered with a thick, close felt of matted simple hair and membrane; setæ of ventral feet very numerous and iridescent, and, as well as all the other bristles, simple, not barbed or toothed.

Sp. 1. APHRODITA ACULEATA, *Linnæus*.

This is the well-known Sea-Mouse, occurring in most of the seas of Europe. It is mentioned under various names by many of our earlier British writers, Mouffet, Sibbald, Molyneux, Dale, &c., as common on our own shores. Linnæus, who first gave it

* *Aphrodite* (*Ἀφροδίτη*) is the Greek name for Venus. Linnæus, who first established the genus, named it *Aphrodita*. Many succeeding authors, considering the termination to be not strictly classical, write it *Aphrodite*; but as the former is merely the Doric method of spelling the word, and as it is therefore not strictly incorrect, I adopt the Linnæan name.

its scientific name, called it, in the 1st edition of the 'Fauna Suecica,' 1746, *Aphrodita nitens*; but in the 10th edition of the 'Systema Naturæ,' 1758, he changed the specific name and called it *Aphrodita aculeata*, a name which he repeated in the 2nd edition of the 'Fauna Suecica,' 1761, and which has been adopted by all succeeding authors up to the present time. According to the strict law of priority, we ought perhaps to revert to the first-published name of the species, and name it for the future *Aphrodita nitens*; but in this instance I agree with the illustrious Pallas, who upon this very subject thus writes:—"III. Linnæus, qui primus generi nostro *Aphroditæ* nomen indidit, in prioribus 'Systematis Naturæ' editionibus hanc solam speciem, nomine *A. nitentis*, recensere solebat; eodemque eam titulo in 'Faun. Su.' ed. 1, n. 1284, in 'Mus. Adolpho-Frid.' vol. i. p. 43, inque 'Amœnitat. Acad.' vol. i. p. 326 habet. In 'Systematis Naturæ,' decima editione vero *A. aculeatæ* nomine eam distinxit, quod in altera Faunæ editione, n. 2199, servavit, et quo etiam ego, novandi minime cupidus, tantisper hic utar."—*Miscell. Zool.* p. 78.

The Sea-Mouse is so well known that it is unnecessary here to describe it. It has, from its brilliant iridescent colours, been the admiration of all observers. "The *Aphrodita aculeata*," says Linnæus, "reflecting the sunbeams from the depths of the sea, exhibits as vivid colours as the peacock itself, spreading its jewelled train." Cuvier, in his 'Règne Animal,' says that from its sides spring "bundles of flexible bristles, shining brilliantly with all the splendour of gold, and changing into all the hues of the rainbow. They do not yield in beauty either to the plumage of the humming-bird or to the most brilliant of the precious stones." "L'or, l'azur, le pourpre, le vert," say MM. Audouin and Milne-Edwards, in their 'Hist. Nat. du Littoral de la France,' p. 33, "se nuancent à leur surface de mille manières, et ces couleurs, souvent irisées, se trouvent dans une harmonie parfaite avec les reflets chatoyans et successifs des anneaux de leur corps. L'aile du Papillon n'a pas reçu une plus brillante parure que ces vers cachés au fond des eaux, et enfoncés quelquefois dans un limon noir et boueux."

There are many specimens in the collection of the British Museum, varying from 7 or 8 inches to 1 inch in length.

It is common in the coralline region, on almost all our British coasts, on the coast of France, on those of Holland, Sweden, Norway, N. America, and even, it is said, in the Baltic and Mediterranean. (Mus. Brit.)

Sp. 2. APHRODITA SERICEA.

Halithea sericea, Savigny, *Syst. Annelid.* p. 19.

This is looked upon as a rather doubtful species by Audouin and Milne-Edwards, and Grube considers it as in all probability only a smaller variety of *A. aculeata*. The splendidly iridescent hairs, however, are wanting in this species, instead of which these appendages are white, while the spines on the dorsal branch of the feet are of a fine green. Savigny gives no habitat for this species, and no author has recorded its appearance since his time. A specimen, however, exists in the Paris Museum.

Sp. 3. APHRODITA BOREALIS, Johnston in *Ann. Nat. Hist.* vol. iv. p. 370, t. 10. fig. 1-13, and *Catalogue of British Non-parasitical Worms in the British Museum*, p. 104, tab. 10. f. 1-13.

This is a very small species, and we have only one specimen existing in the collection of the British Museum. It certainly belongs to the restricted genus *Aphrodita*, and has been considered by Grube to be synonymous with Risso's *Halithea aurata* from the South of Europe. Risso's description, however, is so vague and unsatisfactory, that I find it impossible to identify it with any species I have yet seen.

The *A. borealis* is a native of the seas of Scotland, having been taken by Dr. Johnston in Berwick Bay. (Mus. Brit.)

Sp. 4. APHRODITA ALTA, Kinberg, *Ofversigt af Kongl. Vetenskaps-Akademiens Förhandlingar*, 1855, p. 381; *Fregatten Eugénies Resa*, p. 2, tab. 1. fig. 1, 1 A-1 H.

Kinberg states the size of this species to be 27 millim. long; and he mentions that the hairs of the ventral branch of the feet are short and white.

It was taken in the South Atlantic, near Rio Janeiro, at a depth of from 20 to 30 fathoms.

Sp. 5. APHRODITA LONGICORNIS, Kinberg, *l. c.* p. 382; *Fregatt. Eugen. Resa*, p. 4, tab. 1. fig. 3, 3 B-3 F.

This species differs from the last in having the hairs on the ventral branch of the feet of a brassy-green hue, and in the tentacle on the cephalic lobe being very long. Kinberg mentions the size to be that of the *A. aculeata*, and says it was taken in the South Atlantic Ocean, off the mouth of the River Plate.

Sp. 6. APHRODITA AUSTRALIS, sp. nov.

Body ovate oblong, $3\frac{1}{2}$ to 4 inches long, and from $1\frac{3}{4}$ to 2 inches broad, narrower posteriorly, convex on the back, which is covered with a thick felty substance, consisting of a thinnish membrane and numerous fine hairs matted together, concealing the elytra;

head-lobe small, rounded; tentacle very short; palpi of considerable length, yellowish. Feet-bearing segments of body 42, feet 42 pairs, biramous, ventral branch strong and much corrugated, obtusely rounded at extremity, inferior cirrus rather strong and of considerable size. Bristles of this branch strong, of a bronzed colour, simple, disposed in two fascicles, of which the inferior are short and lighter coloured, the superior much stronger and not numerous. Upper or dorsal branch of feet furnished with two fascicles of bristles; the lower consisting of very numerous, simple, and slender hairs, presenting, as in *A. aculeata*, an iridescent fringe along the sides, but not nearly so beautiful as in the European species, being more of a bronzed metallic hue. The upper fascicle of bristles penetrate the felty covering, and lie down on the back. They are very long, each being at least 14 lines in length. They are of a pale colour with a slightly metallic hue, become slender at the extremity, and are simple. The dorsal cirri are stout, setaceous, and white. The ventral surface of the animal is brownish-coloured and rough, with very numerous, small points or projections.

This species resembles very much the European species *A. aculeata*, and is evidently the Australian representative of our common Sea-Mouse. We have two specimens in the collection, one from Port Lincoln, collected and presented by Mr. George French Angas, and another (in bad condition, unfortunately) from Van Dieman's Land.

Hab. Australian Seas. (Mus. Brit.)

Genus II. HERMIONE, *Blainville, Dict. Sc. Nat. art. Vers.*
vol. lvii. p. 457.

Halithææ Hermionæ, Savigny, Syst. Annelid. p. 20.

Eyes peduncled, the peduncles attached under the margin of the head; back more or less free from covering. Elytra bearing feet armed with barbed bristles on dorsal branch; bristles of ventral branch few and bidentate or forked.

Savigny, Blainville, Audouin and Milne-Edwards, Johnston, Grube, and others, all give as a decided character of the genus *the back being naked* and showing the elytra, instead of being covered with a felty coat. This, however, I consider to be a character upon which not much reliance is to be placed, as in the first species, *Hermione hystrix*, we have a specimen in the collection brought by Mr. M'Andrew from the Canaries, in which the back is entirely covered with a thin coat of matted hair and membrane, which completely conceals the elytra from view; and in another

species (to be here described), which evidently belongs to this genus, the back is also covered with a coat composed of matted hairs. This character must therefore be modified as I have given it in the diagnosis.

Savigny, in his System of Annelides, placed the species upon which the genus was founded in a tribe, which he designates *Halitheaæ Hermionæ*. De Blainville was the first who formed the genus, and called it, in accordance with the indication of Savigny, *Hermione*.

Sp. 1. HERMIONE HYSTRIX.

Halithea hystrix, Savigny, *Syst. Annelid.* p. 20.

In general the elytra of this species are quite or nearly exposed; but, in all the specimens I have examined, the feet are more or less covered with sordes, apparently the remains of a felty coat which most probably clothed the whole back; and, as I have mentioned above, we have one specimen from the Canaries, the whole back of which is covered with the same material. The *H. hystrix* is a native of the seas of Europe, and occurs pretty commonly on our own coasts. (Mus. Brit.)

Sp. 2. HERMIONE HYSTRICELLA, *Quatrefages*; *Cuv. Règn. An., edit. Croch., Annelides*, t. 19. f. 1. 1a-f.; *Kinberg, l. c.* p. 382.

A figure only of this fine species is given by Milne-Edwards in the work just quoted, and he refers for a description to an unpublished work upon the *Annelides* by M. Quatrefages; but Kinberg, who appears to have seen the species, gives a description of it in his paper in the Swedish Transactions, and a figure in the 'Fregatt. Eugen. Resa.' It is nearly allied to the preceding, but excels it in colours. According to Kinberg, it inhabits the Mediterranean on the coast of Syria.

Sp. 3. HERMIONE CHRYSOCOMA, sp. nov.

Body elongate-ovate, of about 12 or 13 lines long, and at the broadest part about 5 lines in diameter. The back is covered with a thin skin, composed, as in other species, of a fine matted felt of delicate brown hairs. Head small; eyes peduncled; tentacle small; palpi short, setaceous, brownish-coloured. Scales thin, overlapping each other on the dorsal surface. The feet appear to be 32 pairs; but those at each extremity are so small that it is difficult to count them satisfactorily. They are, as usual, biramous and furnished with two kinds of bristles. Those on the dorsal branch are rather long, and of a golden-brown colour. They are all of similar form, are curved, and somewhat flattened

like the blade of a scimitar at the upper half of their length, and strongly toothed on the convex edge for some distance along the upper portion. These teeth are about 14 or 15 in number, and the last, which forms the point, is longer than the others, and sharp pointed. The bristles of the ventral branch are shorter and rather darker coloured than those of the dorsal branch, and are bidentate or forked at the extremity, the teeth which form the lower part of branch being short and stout. Both branches of feet are stout and blunt-pointed. The under surface of the body is dark brown, and roughened with numerous raised vesicular points. The upper cirri are small; the inferior are short.

This species may possibly be the *Halithea aurata* of Risso; but, as I have said before, Risso's species cannot be determined, and as the particular locality where our specimen (there is only one) was found is not specified, I think it better to distinguish it by a new name.

Hab. South of Europe. Collected by the late P. B. Webb, Esq., joint author of the 'Natural History of the Canaries.' (Mus. Brit.)

Genus III. APHROGENIA, *Kinberg, Öfversigt Kongl. Vetenskaps-Akademiens Förhandlingar*, 1855, p. 382.

Eyes sessile, placed upon the basal part of the tentacle, lateral; no felty covering on the back. Bristles of the dorsal branch of the feet uncinatè, not barbed; those of the ventral branch few in number, bidentate.

I have not seen any species belonging to this genus. Kinberg describes only one.

Sp. 1. APHROGENIA ALBA, *Kinberg, l. c.*; *Fregatt. Eugen. Res.* p. 6, tab. 2. fig. 6, 6 A-6 H.

This is a native of the seas of the West Indies, having been collected at the island of St. Thomas by M. Werngren.

Genus IV. LÆTMATONICE, *Kinberg; Fregatt. Eugen. Resa*, p. 7.

Lætmatonice, Kinberg, Öfversigt Kong. Vet. Akad. 1855, p. 382.

Eyes supported on peduncles which spring from the anterior margin of the cephalic lobe; back covered with a felty coat; bristles of elytra-bearing feet barbed, those of ventral branch semi-pennate.

Sp. 1. LÆTMATONICE FILICORNIS, *Kinberg; Fregatt. Eugen. Resa*, p. 7, tab. 3. fig. 7, 7 A-7 H.

Lætmatonice filicornis, Kinberg, Öfversigt Kong. Vet. Akad. 1855, p. 382.

This species I do not know; it is a native of the western and northern coasts of Sweden.

Sp. 2. *LÆTMATONICE KINBERGI*, sp. nov.

Body oval, from 12 to 15 lines long, and from 4 to 5 in breadth at thickest part. Back covered with a felty coat composed of a thin membrane and numerous fine hairs matted together, which are generally obscured with sordes, but when cleaned from it are smooth and simple, colourless, and not very numerous. Head-lobe constricted in the middle by a deep groove on each side. Tentacle short and conical. Palpi white, long, and setaceous. Elytra 15 pairs, oval, thin, membranous-looking, and smooth, overlapping each other the whole length of the back. Cirri rather long and club-shaped at the extremity. Feet 30 pairs, biramous; branches widely apart. Dorsal branch rounded and rather short; the bristles issuing from it, about ten or twelve in number, long, apparently furnished with a loose joint at about the upper third of its length. They are of a bronzed brown colour, and barbed near the extremity, which is straight and sharp pointed. The ventral branch of the foot is long, conical, obtuse-pointed, and the bristles issuing from it, about five or six in number, are of considerable length, though much shorter than those of dorsal branch. They are more slender also, are curved at the point, have a tooth at some distance from the extremity, and between the teeth and point are rather densely plumose or feathered. The edges of this ventral branch, and indeed the whole surface, are beset with a number of rounded vesicular bodies, placed on short pedicels. The under surface of the body is greyish-coloured, and covered all over with small vesicles, which give it a rough appearance.

This species of *Aphrodita* resembles in general appearance the *Aphrodita borealis* of Johnston; but the fascicle of bristles of the ventral branch of the foot and those of the dorsal also are totally different from those figured by Dr. Johnston. In the latter species also the elytra are quite different. In the figure of *A. borealis* given by Dr. Johnston they do not nearly meet on the middle of the back, while in the present species they overlap each other along the whole length of the dorsal surface. It differs chiefly from *L. filicornis* of Kinberg in the length of the tentacle, and the shape of the cephalic lobe.

Hab. Dredged in considerable numbers in the North Sea, off the Shetland Islands, by J. G. Jeffreys, Esq., in July 1864. (Mus. Brit.)

Family II. IPHIONIDÆ.

(Iphionea, *Kinberg*; Polynoæ Iphionæ, *Savigny*.)

Facial tubercle small, placed between two antennæ, which are produced from the surface of the face; no tentacle; palpi thick; tentacular and buccal cirri slender; elytra reticulated.

There is only one genus as yet belonging to this family, which *Kinberg*, adopting the divisional denomination indicated by *Savigny*, has named *Iphione*. The typical species is the *Polynoë muricata* of *Savigny*, so beautifully represented by that author in his great work on Egypt.

Genus IPHIONE, *Kinberg*, *l. c.* p. 383.Polynoë Iphionæ, *Savigny*, *Syst. Annelid.*

Eyes four, sessile; cephalic lobe produced from between the basal joints of the antennæ, which are longer than the lobe itself; elytra 13 pairs. The setæ of the dorsal branch of feet are fine subulate hairs: bristles of ventral branch placed close to them, and serrate.

Sp. 1. IPHIONE MURICATA.

Polynoë muricata, *Savigny*, *l. c.* Atlas, tab. 3. figs. 1, 1. i., 1. ii.

This is a well-marked species, and resembles at first sight a species of *Chiton*, with which, as *Savigny* says, it is often confounded as it creeps slowly upon the stones under the water. It is a native of the shores of the Red Sea, as also of the coast of the Isle of France (*Mus. Brit.*).

Sp. 2. IPHIONE OVATA, *Kinberg*, *l. c.* and *Fregatt. Eugen. Resa*, p. 8, tab. 3. figs. 8, 8 A-8 E.

I have not seen this species, but it appears quite distinct. *Kinberg* says it is a native of the Pacific Ocean, having been taken at Honolulu, one of the Sandwich Islands.

Sp. 3. IPHIONE SPINOSA, *Kinberg*, *Fregatt. Eugen. Resa*, p. 8, tab. 10. fig. 46.*Hab.* Port Natal, *Wahlberg*.

Family III. POLYNOIDÆ.

(Polynoïna, *Kinberg*, Polynoæ simplices, *Savigny*.)

No facial tubercle; tentaculum in general long; two antennæ; jaws large and horny; eyes four in number; elytra 10 (?) or 12 to 35 pairs; segments of body not bearing elytra, furnished with a dorsal cirrus; no branchiæ.

Genus I. LEPIDONOTUS, *Leach* (s. str. *Kinberg*).

Bases of antennæ produced from the anterior margin of the

cephalic lobe; 12 (-13?) pairs of elytra, covering the back wholly; body short.

Sp. 1. LEPIDONOTUS SQUAMATUS.

Aphrodita squamata, *Linnaeus, Syst. Nat.* 10th ed. p. 655.

The *Aphrodita punctata* of Müller, *A. clavigera* of Freminville, and *Polynoë scutellata* of Risso are either identical with or mere varieties of this species.

This well-known European species may be taken as the type of the genus.

Hab. Northern Seas, British coasts, coast of France and Mediterranean (*Mus. Brit.*).

Sp. 2. LEPIDONOTUS CLAVA.

Aphrodita clava, *Montagu, Linn. Trans.* ix. 108, tab. 7. fig. 3.

This species was first made known by Montagu, and since then has been more fully described by Dr. Johnston in his lately published, posthumous "Catalogue of British non-parasitical Worms in the Collection of the British Museum."

Hab. Southern coasts of England—Devon, Cornwall, &c. (*Mus. Brit.*).

Sp. 3. LEPIDONOTUS POMAREÆ, *Kinberg, l. c.* p. 383; and *Fregatt.*

Eugen. Resa, p. 10, tab. 3. figs. 9, 9 A-9 H.

Hab. Tahiti, *Kinberg.*

This and the following nine species have been described by Kinberg as belonging to the genus *Lepidonotus*, as restricted by him. I have not had an opportunity of seeing any of them.

Sp. 4. LEPIDONOTUS SOCIALIS, *Kinberg, l. c.*, and *Fregatt. Eugen.*

Resa, p. 10, tab. 3. figs. 10, 10 B-10 G.

Hab. Island of Eimeo, in the Pacific Ocean, *Kinberg.*

Sp. 5. LEPIDONOTUS JACKSONI, *Kinberg, l. c.* and *Fregatt. Eugen.*

Resa, p. 11, tab. 3. figs. 11, 11 B-11 H.

Hab. Port Jackson, *Kinberg.*

Sp. 6. LEPIDONOTUS MARGARITACEUS, *Kinberg, l. c.*, and *Fregatt.*

Eugen. Resa, p. 11, tab. 3. figs. 12, 12 A-12 H, tab. 10. fig. 49.

Hab. Guayaquil, South America, *Kinberg.*

Sp. 7. LEPIDONOTUS JOHNSTONI, *Kinberg, l. c.* 384, and *Fregatt.*

Eugen. Resa, p. 12, tab. 4. figs. 13, 13 A-13 H, tab. 10. fig. 50.

Hab. Islands near to Panama, *Kinberg.*

Sp. 8. LEPIDONOTUS WAHLBERGI, *Kinberg, l. c.* and *Fregatt. Eu-*

gen. Resa, p. 12, tab. 4. figs. 14, 14 A-14 H.

Hab. Port Natal, *Wahlberg.*

Sp. 9. LEPIDONOTUS CÆRULEUS, *Kinberg, l. c.*, and *Fregatt. Eugen.*
Resa, p. 13, tab. 4, figs. 15, 15 B-15 H.
Hab. Rio Janeiro, *Kinberg.*

Sp. 10. LEPIDONOTUS HAVAICUS, *Kinberg, l. c.*, and *Fregatt. Eugen.*
Resa, p. 14, tab. 4, figs. 17, 17 A-17 H.
Hab. Honolulu, Pacific Ocean, *Kinberg.*

Sp. 11. LEPIDONOTUS STRIATUS, *Kinberg, l. c.*, and *Fregatt. Eugen.*
Resa, p. 14, tab. 4, figs. 18, 18 B-18 H.
Hab. Port Jackson, *Kinberg.*

Sp. 12. LEPIDONOTUS INDICUS, *Kinberg, l. c.*, and *Fregatt. Eugen.*
Resa, p. 15, tab. 4, figs. 19, 19 A-19 H, tab. 10, fig. 52.
Hab. Straits of Banka, *Kinberg.*

Sp. 13. LEPIDONOTUS SAVIGNYI.
 Polynöe Savignyi, *Grube, Annulata Oerstediana*, p. 19.
Hab. Callao, *H. Kröyer.*

This and the following species were described by Grube in his enumeration of species of *Annelides* in the collections of Oersted and Kröyer. I have not seen either of them.

Sp. 14. LEPIDONOTUS TOMENTOSUS.
 Polynöe tomentosa, *Grube, l. c.*
Hab. Puntarenas, Costa Rica, *Oersted.*

Sp. 15. LEPIDONOTUS FUSCICIRBUS.
 Polynöe fuscicirra, *Schmarda, Neue wirbellose Thiere*, ii. p. 152.
 tab. 36, fig. 311.
Hab. Bay of Belligam, island of Ceylon, *Schmarda.*

This and the two following species are described and figured by Schmarda in his description of new species of *Annelides* discovered by him in his voyage round the world. I only know them from Schmarda's figures and descriptions.

Sp. 16. LEPIDONOTUS POLYCHROMA.
 Polynöe polychroma, *Schmarda, l. c.* p. 153, t. 36, f. 307.
Hab. East coast of New Zealand, *Schmarda.*

Sp. 17. ? LEPIDONOTUS ANTILLARUM.
 Polynöe Antillarum, *Schmarda, l. c.* p. 158.
Hab. Port Royal, Jamaica, *Schmarda.*

This species is rather loosely described by Schmarda; so that it is difficult exactly to place it in its proper genus. Schmarda himself says that he was not able to determine its proper place.

Sp. 18. LEPIDONOTUS IMPATIENS.

Polynoë impatiens, *Savigny, Syst. Annelid.* 24 ; Atlas, t. 3. fig. 2.

Hab. Red Sea, *Savigny*.

Sp. 19. LEPIDONOTUS GLAUCUS.

Polynoë glauca, *Peters, Monatsbericht der königl. Preuss. Akad. der Wissenschaft. Berlin*, 1854, p. 610.

Hab. Haven of Mossambique, *Peters*.

Sp. 20. LEPIDONOTUS CLYPEATUS.

Polynoë clypeata, *Grube, Archiv für Naturg.* 1860, p. 71, t. 3. f. 1.

Hab. Mediterranean, Adriatic and near the Scilly Islands, *Grube*.

Sp. 21. LEPIDONOTUS SEMITECTUS.

Lepidonota semitecta, *Stimpson, Proceedings of Academy of Natural Sciences of Philadelphia*, 1855, vol. vii. p. 393.

Hab. Simon's Bay, Cape of Good Hope.

Sp. 22. LEPIDONOTUS SINCLAIRI, sp. nov.

Head-lobe rather small ; tentacle unfortunately broken, only the base remaining. Antennæ produced from the anterior margin of cephalic lobe, dark-coloured at their bases, which are the only parts remaining. Palpi stout, white, setaceous, and smooth. Elytra 12 pairs, pale-coloured, mottled with black ; rounded, thin, covered all over with minute points, with some larger, raised, and rounded punctations intermixed ; ciliated on outer margin. Back completely covered. Feet biramous : ventral branch the larger of the two, with a fascicle of yellow bristles, stout, slightly curved at the point, and serrated a short distance below the apex. Dorsal branch small ; bristles short, slender, sharp-pointed, and minutely serrated nearly their whole length. Dorsal cirri conical, setaceous, smooth ; anal cirri rudimentary.

Length about 9 lines ; breadth 2 lines.

Hab. New Zealand. Named after the late Dr. Andrew Sinclair, to whom we are indebted for the only specimen we possess (*Mus. Brit.*).

Sp. 23. LEPIDONOTUS OCLATUS, sp. nov.

Animal about $1\frac{1}{2}$ inch long, and, including the setæ, about $\frac{1}{2}$ an inch broad, nearly equal in breadth at each extremity. It is of a light-yellow colour.

Head rather small ; tentacle and antennæ rather short, of nearly equal length, club-shaped near extremity, which terminates suddenly in a slender point. Palpi stout, conical, setaceous, only a little longer than the tentacle and antennæ. Feet stout, bira-

mous. Bristles of dorsal branch few in number, short, straight, sharp-pointed, and finely striated across. Those of ventral branch are more numerous, much stronger, slightly curved at the point, but becoming broader near the extremity, where it is serrated, the teeth of the serrations being long and prominent. The elytra are 12 pairs, rather rounded, extending laterally beyond the body; smooth on the edges, roughly tuberculated on the surface, and near the centre marked with a large, round, black spot, like an eye. Dorsal cirri of considerable length, incrassated or club-shaped beneath the extremity, which is marked by a black ring, and, like the tentacle and palpi, terminates suddenly in a sharp point. Ventral cirri nearly reaching the extremity of the ventral branch of the foot, slightly incrassated beneath the extremity, which terminates in a fine point. Anal cirri of considerable length, and, like the dorsal cirri, club-shaped near the extremity, black-ringed and sharp-pointed.

Hab. Australia (*Mus. Brit.*).

For our specimen we are indebted to Dr. Bowerbank, who obtained it from the seas of Australia.

Sp. 24. *LEPIDONOTUS STELLATUS*, sp. nov.

This animal is about 8 lines in length, and 3 in breadth. The dorsal surface and elytra are of a somewhat uniform olive-colour. The ventral surface is yellow. Head rather small; tentacle unfortunately destroyed. Antennæ slender, rather short; palpi stout, conical, short, about the same length as the antennæ. Feet stout, biramous; bristles of ventral branch longer than those of the dorsal, bidentate at the point, and serrated a little below its apex. Bristles of dorsal branch short, straight, and serrated throughout their whole length. Dorsal cirri about the length of the feet and bristles, setaceous. Elytra 12 pairs in number, oval, marked across one half with two divaricating rows of pustules. When seen under the microscope, each scale is very prettily marked with numerous lucid dots ranged in rounded spots, like stars. The margins are quite smooth. Segments of body 26 in number; last segment terminated by two short anal cirri.

Hab. Australia (*Mus. Brit.*).

For a specimen of this species we are indebted to Dr. Bowerbank, who received it from the Australian Seas.

Sp. 25. *LEPIDONOTUS BOWERBANKII*, sp. nov.

Animal 6 lines in length, and about 2 broad. The colour is

greyish on the back, and yellow underneath. Head, antennæ, and palpi much the same as in preceding species (*L. stellatus*). The bristles of the ventral branch are not bidentate at the point, but are more loosely or longly toothed or serrated below the apex. The bristles of the dorsal branch are slender, and finely serrated and striated across. The elytra are 12 pairs in number, the upper ones nearly round, becoming more ovate as they descend. When seen by the microscope, the surface is covered over with very minute granulations, and the external margin is densely ciliated. They are of a light colour, but speckled all over with light fawn-coloured spots.

Hab. Australia (*Mus. Brit.*).

For a specimen of this species we are indebted to Dr. Bowerbank, who received it from the Australian seas.

Genus II. HALOSYDNA, *Kinberg, l. c.* 384.

Bases of antennæ produced from the anterior margin of the cephalic lobe; elytra from 15 to 35 pairs (15 to 21, *Kinberg*) not covering the whole of the back; body long.

Sp. 1. HALOSYDNA BREVISETOSA, *Kinberg, l. c.* 385, and *Fregatt.*

Eugen. Resa, p. 18, tab. 5. figs. 25, 25 A-25 H.

Hab. Coast of California, *Kinberg, Cuming (Mus. Brit.)*.

This is a very pretty species, and we are indebted to Mr. Cuming for our specimens.

Sp. 2. HALOSYDNA VIRGINI, *Kinberg, l. c.* 384, *Fregatt. Eugen.*

Resa, p. 15, tab. 5. figs. 20, 20 A-20 H, tab. 10. fig. 53.

Hab. Honolulu, Sandwich Islands, *Kinberg*.

Sp. 3. HALOSYDNA AUSTRALIS, *Kinberg, l. c.* 385, and *Fregatt.*

Eugen. Resa, p. 16, tab. 5. figs. 21, 21 A-21 H, tab. 10. fig. 54.

Hab. Mouth of the River Plate, South America, *Kinberg*.

Sp. 4. HALOSYDNA PATAGONICA, *Kinberg, l. c.* 385, and *Fregatt.*

Eugen. Resa, p. 17, tab. 5. figs. 23, 23 A-23 H.

Hab. York Bay, Straits of Magellan, *Kinberg*.

Sp. 5. HALOSYDNA PARVA, *Kinberg, l. c.* 385, and *Fregatt. Eugen.*

Resa, p. 17, tab. 5. figs. 24, 24 A-24 H.

Hab. Valparaiso; Chincha Islands; San Lorenzo, near Callao, *Kinberg*.

Sp. 6. HALOSYDNA BRASILIENSIS, *Kinberg, Fregatt. Eugen. Resa*,

p. 16, tab. 5. figs. 22, 22 A-22 H.

Hab. Rio Janeiro, *Kinberg*.

Sp. 7. HALOSYDNA LONGICIRRA.

Polynoë longicirra, *Schmarda, Neue wirbell. Thiere*, ii. 152, t. 36. fig. 309.

Hab. Near Belligam, island of Ceylon, *Schmarda*.

Sp. 8. HALOSYDNA LOBOCEPHALA.

Polynoë lobocephala, *Schmarda, l. c.* 157, t. 36. fig. 314.

Hab. Port Royal, Jamaica, *Schmarda*.

Sp. 9. HALOSYDNA GELATINOSA.

Polynoë gelatinosa, *Sars, Beskrivelser*, p. 63, tab. 9. fig. 25.

Hab. Bergen, coast of Norway, *Sars*.

Sp. 10. HALOSYDNA MÜLLERI.

Polynoë Mülleri, *Grube, Annulata Oerstediana*, p. 22.

Hab. Valparaiso, *Kröyer*.

Sp. 11. HALOSYDNA PUNCTULATA.

Polynoë punctulata, *Grube, l. c.* p. 23.

Hab. Rio Janeiro, *Kröyer*.

Sp. 12. ? HALOSYDNA CLAVATA.

Polynoë clavata, *Grube, l. c.* p. 22.

Hab. Christianstad, isle of Santa Cruz, West Indies, *Oersted*.

Sp. 13. ? HALOSYDNA IMBRICATA.

Aphrodita imbricata, *Linnæus, Syst. Nat.* edit. 12, p. 1084 (*fide Johnston, Cat. Brit. Non-parasit. Worms*, p. 118).

Sp. 14. ? HALOSYDNA FLOCCOSA.

Polynoë floccosa, *Savigny, Syst. des Annélides*, 23.

Hab. West coast of France, *Savigny*.

Sp. 15. ? HALOSYDNA CHILENSIS.

Polynoë Chilensis, *Blanchard, Gay's Historia fisica y politica de Chile*, tom. iii. p. 15, *Atlas, Anillados*, tab. 1. figs. 1, 1a.

Hab. San Carlos, coast of Chiloe, *Gay*.

Sp. 16. ? HALOSYDNA VIRENS.

Polynoë virens, *Blanchard, l. c.* p. 16, tab. 1. fig. 2.

Hab. Calbuco, coast of Chiloe, *Gay*.

I quote these two species with doubt as to their true generic position, because the figures do not correspond with the descriptions. In *Polynoë chilensis*, M. Blanchard describes the number of elytra as being 16 pairs, "covering the back entirely." In his figure he depicts the animal as having 29 pairs of elytra, which leave the back naked in the centre! In *P. virens* he describes the animal as having 35 pairs of elytra, while he figures it as possessing 56 or 57!

Sp. 17. HALOSYDNA MALLEATA.

Polynoë malleata, *Grube, Archiv f. Naturg.* 1855, p. 81.

Hab. Trieste, *Grube.*

Sp. 18. HALOSYDNA TUTA.

Polynoë tuta, *Grube, l. c.* p. 82.

Hab. Sitka, *Grube.*

Sp. 19. HALOSYDNA VITTATA.

Polynoë vittata, *Grube, l. c.* p. 82. 3.

Hab. Sitka, *Grube.*

In the 'Zoological Proceedings' for April 1863, I described four species of *Lepidonotus*, collected at Vancouver Island by J. K. Lord, Esq., naturalist attached to the British North American Boundary Commission. They were also figured for the Report to be issued by that commission, which, however, has not yet been published.

Owing to a slight mutilation of some of the parts, the descriptions of these species were in some respects slightly incorrect and in others deficient in precision. They all belong to the sub-generic group designated *Halosydna* by Kinberg; and I take the opportunity now afforded me of a more minute re-examination, to give a somewhat more detailed account of them. This examination has also enabled me to alter one of the generic characters as given by Kinberg. This author states distinctly the number of elytra to be from fifteen to twenty-one. The interesting species, *H. Lordi*, possesses thirty-five pairs of elytra; and as in other respects it agrees in generic characters with *Halosydna*, I conclude that the exact number of elytra is not a certain character, and only proves that Kinberg had not examined any species which was furnished with a larger number than twenty-one.

Sp. 20. HALOSYDNA INSIGNIS.

Lepidonotusinsignis, *Baird, Proc. Zool. Soc.* April 1863.

This species is rather more than 3 inches long, and is nearly $\frac{1}{2}$ an inch in breadth, exclusive of the setæ of the feet. The head is small, and the anterior eyes are larger than the posterior. The proboscis is large and wrinkled, and the jaws are of a reddish-brown colour. The tentacle is rather club-shaped, blunt at the tip, and ringed with black. The antennæ, which are produced from the anterior margin of the cephalic lobe, are a little shorter than the tentacle, are slightly incrassated below the point, ringed with black, and terminate in a fine white setaceous point. The palpi are conical, white, setaceous at the extremity, and are very

long, being at least three times the length of tentacle or antennæ. The buccal cirri are about the same length as the antennæ, and are ringed with black and white. The body on the dorsal surface is of a whitish colour, marbled with black. The sides, which are covered by the elytra, are white; and a broad, black, interrupted line runs along the back, throughout its whole length. The under or ventral surface of the body is of a bluish-black colour, and a narrow uninterrupted white line runs down through the centre. The elytra are 18 pairs in number, are oval, white, with black dots on the outer sides and centre, and marked with a black semicircular patch on the inner side. They do not overlap each other except near the head, being wide apart on the rest of the body, and leaving the middle of the back uncovered. The feet are very prominent, stout, rounded, conical, encircled with fine, black, circular lines, and biramous. The ventral branch is very much the larger, and the bristles are stout and amber-coloured. They are rather long, and terminate in a slightly curved point, beneath which they are for a short distance strongly serrated on both sides. The dorsal branch of the foot is small, and the setæ sent off from it are few in number, of a white colour, short, straight, and very finely serrated on each margin. The dorsal cirrus is tolerably long and sharp-pointed; it is pedunculated, the peduncle being stout, conical, and of a deep black colour. The ventral cirrus is short, conical, and sharp-pointed; and at the base of each foot there is a blunt papilla at each corner, of the same dark colour as the under surface of the body. The anal cirri are short, but tolerably stout, and ringed with black and white.

Hab. Esquimalt Harbour, Vancouver Island, *J. K. Lord* (*Mus. Brit.*).

Sp. 21. HALOSYDNA GRUBEI.

Lepidonotus Grubei, *Baird, Proc. Zool. Soc.* April 1863.

Animal about 2 inches long, and $\frac{1}{2}$ inch broad. Head small, broad: eyes very small, placed obliquely near each other; tentacle unfortunately deficient; the peduncle, however, which remains, is thick and marked at the base, on anterior margin, with a small, round, raised, black spot. Antennæ produced from the anterior margin of cephalic lobe, rather short, somewhat club-shaped and white at the extremity, broadly ringed with black at their base and on anterior portion; palpi conical, thick at the base, of a uniform light-brown colour, except at the tip, which is white, and a little longer than the antennæ. The buccal cirri are

longer than the palpi, clubbed at extremity, and ringed with black at the base and at a short distance from the point. The back is partially uncovered by the elytra, and is marked by a broad blotch of black in the centre of each segment, striated or as it were wrinkled across and marked with fainter blotches of a dark colour. The under surface of the body is of a uniform brownish colour. The elytra are 18 pairs in number, are all nearly round, rough on the upper surface with small tubercles, edged by a raised margin, and mottled with black and white. They are smallest at the anterior extremity. The dorsal cirri are clubbed and white at extremity, about equal in length to the feet and bristles; they are pedunculated, and marked with a black spot at the base where they issue from the peduncles, and are ringed with black at a short distance from the point. The inferior cirri are short, and acute at the point. The feet are stout, broad, and biramous. The bristles of ventral branch are disposed in two fascicles, are of a bright yellowish-brown colour, and are all similar in structure. They are uncinatè at the point, and at a short distance from it are strongly serrated for a short way down. The dorsal branch of the foot is small, and the bristles of that branch are very short and serrated across for the upper two-thirds of their length. At the base of the feet, where they are attached to the body of the animal, there is a small papilla projecting at one corner, and occurring in each foot.

Hab. Esquimalt Harbour, Vancouver Island, *J. K. Lord* (*Mus. Brit.*).

Sp. 22. HALOSYDNA LORDI.

Lepidonotus Lordi, *Baird, Proc. Zool. Soc.* April 1863.

This species is about 3 inches in length, and rather more than $\frac{1}{3}$ rd of an inch in diameter at the broadest part of the body. It tapers gradually from the head to the tail, which is only about $\frac{2}{15}$ ths of an inch broad. The colour is of a light brown, a broad line of a much darker brown running along the whole length of the centre of the back. The head is broad and short; the eyes are small, placed obliquely near to each other. The tentaculum and antennæ are very short, about equal in length, and white; the bases of the antennæ are produced from the anterior margin of the head-lobe, and the tentaculum occupies a deep emargination on the front of the lobe. The palpi are stout, short, conical, of a light colour, but close to the point ringed with black, the point itself being quite white. They are a little longer than the tentaculum and antennæ. The feet are tolerably stout; the two

divisions of which they are composed placed very close to each other. The bristles of the elytra- and cirri-bearing feet are similar in structure; those of dorsal or upper division stout, smooth, somewhat curved as they approach the point, enlarged and flattened and uncinatate at the point; those of ventral or lower division a little more slender, slightly enlarged near the point, which is straight, blunt, and striated across. The bristles of both bundles are nearly of equal length, and two or three similar to those of ventral division are mixed up with the bundle of bristles of dorsal division. The two spines are stout, rather long, straight, and blunt-pointed. All these organs are of a yellow colour. The dorsal cirri are white, rather short, about equal in length to the foot itself; the ventral cirrus very short. The elytra are 35 pairs in number, thin, membranous, and of a light brown colour. The anterior pair overlap each other slightly in the centre of the back; but for the rest of the length of the body the middle portion of the back is uncovered.

Hab. Vancouver Island, *J. K. Lord (Mus. Brit.).*

A good many specimens of this interesting species were taken by Mr. Lord at Macaulay's Point, Vancouver Island; and they were all found nestling under the shell, and occasionally coiling themselves under the foot of the animal of the *Fissurella cratitia*. I have named it after its discoverer, J. K. Lord, Esq.

Sp. 23. *HALOSYDNA FRAGILIS.*

Lepidonotus fragilis, Baird, Proc. Zool. Soc. April 1863.

This species appears, from a re-examination of the specimens in the collection, to belong to the genus *Halosydna* of Kinberg. It is exceedingly brittle, and, owing to the specimens brought home by Mr. Lord being broken into several pieces, it is impossible to describe the species accurately. The head is rather small, and the eyes are placed obliquely, but not very near to each other. The tentaculum and antennæ, with the palpi and buccal cirri, are all short, nearly of equal length, and almost white or colourless.

The elytra are very deciduous, and appear to be numerous, and to leave the centre of the back uncovered; but it is impossible to state the number, as it is extremely difficult to be able to fit the fragments into which the body is broken to the respective individuals. The whole body of the worm appears destitute of any markings or colour. The feet are moderate in size and are biramous. The ventral branch is much the larger, and the bristles belonging to it are of a light amber-colour, uncinatate or hooked at the point, but quite smooth and not toothed or serrate on the

edges. The dorsal branch is very small, and the bristles are short, straight, and simple, not toothed or serrate on the edges. The dorsal cirri are stout and club-shaped at the extremity, to which is appended a small flagellum, or narrow, loosely floating process. They appear to become nearly obsolete on the feet of the lower portion of the body. The ventral cirri are so exceedingly small as to be scarcely perceptible. The length of the species, judging from the fragments, might be about $2\frac{1}{2}$ inches, and the breadth about 4 lines.

Hab. Esquimalt Harbour, Vancouver Island, *J. K. Lord (Mus. Brit.)*.

This species was found by Mr. Lord adhering to a large species of Starfish; but he says in his notes, "It is next to impossible to obtain one perfect, as they break themselves to pieces on the slightest touch, or however carefully killed."

Genus III. ANTINOË, *Kinberg, l. c.* 385.

Bases of antennæ fixed under the margin of the emarginated cephalic lobe, close to the tentacle; elytra 12-15 pairs, covering the back; body short.

Sp. 1. ANTINOË LÆVIS.

Polynoë lævis, Aud. & Edw. Littoral de la France, ii. 85, t. 2. f. 11-19.

Hab. Coast of France, Isle of Chausey, *MM. Audouin and Milne-Edwards (Mus. Brit.)*.

Sp. 2. ANTINOË PHARETRATA.

Lepidonotus pharetratus, Johnston, Cat. Non-parasitical Worms in Brit. Mus. p. 113, t. 3. f. 17-19.

Hab. British coast, *Dr. Johnston, J. G. Jeffreys (Mus. Brit.)*.

Sp. 3. ANTINOË IMPAR.

Polynoë impar, Johnston, Ann. Nat. Hist. ii. 436, t. 22. f. 3-9.

Hab. British coasts, *Dr. Johnston (Mus. Brit.)*.

The only specimen we possess was taken on the coast of Northumberland.

Sp. 4. ANTINOË SEMISCUPTA.

Lepidonotus semisculptus, Leach, MS. Johnston; in Catalogue of Non-parasitical Worms in Brit. Mus., p. 116.

Hab. South Devon coast, *J. Cranch; Guernsey, J. Smith (Mus. Brit.)*.

Sp. 5. ANTINOË PELLUCIDA.

Lepidonotus pellucidus, Dyster, MS.; Johnston, l. c. 117.

Hab. Tenby, *Dyster*.

- Sp. 6. ANTINOË ÆQUISETA, *Kinberg, l. c.* 385, and *Fregatt. Eugen. Resa*, p. 19, tab. 6. figs. 27, 27 B-27 G.
Hab. Port Natal, South Africa, *J. A. Wahlberg*.
- Sp. 7. ANTINOË WAAHLI, *Kinberg, l. c.* and *Fregatt. Eugen. Resa*, p. 19, tab. 6. figs. 28, 28 A-28 H, tab. 10. fig. 55.
Hab. Port Jackson, *Kinberg*.
- Sp. 8. ANTINOË PULCHELLA, *Kinberg, l. c.*, and *Fregatt. Eugen. Resa*, p. 20, tab. 6. figs. 29, 29 A-29 H, tab. 10. fig. 56.
Hab. Mouth of River Plate, South America, *Kinberg*.
- Sp. 9. ANTINOË MICROPS, *Kinberg, l. c.* and *Fregatt. Eugen. Resa*, p. 20, tab. 6. figs. 30, 30 B-30 H.
Hab. Rio Janeiro, *Kinberg*.
- Sp. 10. ANTINOË SPINIFERA.
 Polynoë(Antinoë) spinifera, *Ehlers, die borsten. Würmer*, i. p. 95, tab. 3. f. 1-4.
Hab. Quarnero, Istria, *Ehlers*.
- Sp. 11. ANTINOË LONGISETIS.
 Polynoë longisetis, *Grube, Archiv für Naturg.* 1863, p. 37, t. 4. f. 1.
Hab. Lussin Island, Adriatic, *Grube*.
- Sp. 12. ? ANTINOË TENUISETIS.
 Polynoë tenuisetis, *Grube, Annulat. Oerstediana*, p. 20.
Hab. Rio Janeiro, *Kröyer*.
- Sp. 13. ? ANTINOË EXANTHEMA.
 Polynoë exanthema, *Grube, l. c.*
Hab. Valparaiso, *Kröyer*.
- Sp. 14. ? ANTINOË CRUCIS.
 Polynoë Crucis, *Grube, l. c.* p. 21.
Hab. Island of Santa Cruz, West Indies, *Oersted*.
- Sp. 15. ? ANTINOË LEUCOHYBA.
 Polynoë leucohyba, *Schmarda, Neue wirb. Th.* 153, t. 36. f. 308.
Hab. Port Royal, Jamaica, *Schmarda*.
 I quote this species with a doubt, because though in its general appearance it agrees with the genus *Antinoë*, yet it possesses 17 pairs of elytra.
- Sp. 16. ? ANTINOË VIOLACEA.
 Polynoë violacea, *Schmarda, l. c.* 154, t. 36. f. 313.
Hab. Coast of Chili, *Schmarda*.
- Sp. 17. ? ANTINOË AUSTRALIS.
 Polynoë australis, *Schmarda, l. c.* 154.
Hab. Port Jackson, New South Wales, *Schmarda*.

Sp. 18. ? ANTINOË LOBOSTOMA.

Polynoë lobostoma, *Schmarda, l. c. p. 155, t. 36. fig. 315.*

Hab. Canal of St. Malo, *Schmarda.*

Sp. 19. ? ANTINOË MACROLEPIDOTA.

Polynoë macrolepidota, *Schmarda, l. c. p. 155, t. 36. fig. 306.*

Hab. Auckland Bay, New Zealand, *Schmarda.*

Sp. 20. ? ANTINOË POLYTRICHA.

Polynoë polytricha, *Schmarda, l. c. p. 156.*

Hab. South coast of Jamaica, *Schmarda.*

Sp. 21. ? ANTINOË NEPHROLEPIDOTA.

Polynoë nephrolepidota, *Schmarda, l. c. t. 36. f. 312.*

Hab. East coast of Ceylon, near Trincomalee, *Schmarda.*

I have not seen any of the species described by Grube and Schmarda; and the characters as given by these authors do not enable me to refer them, without considerable doubt, to this generic group. The species *P. leucohyba*, as I have stated above, possesses 17 pairs of elytra, *P. polytricha* 16; and the number of these appendages is not stated by Schmarda in the *P. nephrolepidota*.

Sp. 22. ANTINOË GRANULOSA.

Polynoë granulosa, *Rathke, Faun. der Krym, Mem. Acad. Petersb. iii. 408.*

Hab. Sebastopol, *Rathke.*

Sp. 23. ? ANTINOË FASCICULOSA.

Polynoë fasciculosa, *Blanchard, in Gay's Histor. fisic. y politic. de Chile, iii. p. 17, Atlas, Anillados, pl. 1. fig. 3.*

Hab. Chile, *Gay.*

Sp. 24. ANTINOË MARGINATA.

Polynoë marginata, *Grube, Annulat. Oersted. p. 22.*

Hab. Callao, *Kröyer.*

Genus IV. HARMOTHOË, *Kinberg, l. c. p. 386.*

Bases of antennæ fixed under the tentacle, which occupies the notch in front of cephalic lobe; elytra 15 (14 to 15?) pairs, covering the back; body not long.

Sp. 1. HARMOTHOË CIRRATA.

Aphrodite cirrata, *Fabricius, Faun. Grænland. 308, tab., f. 7.*

Hab. British coasts; coast of France, &c. (*Mus. Brit.*).

Sp. 2. HARMOTHOË ASSIMILIS.

Lepidonota assimilis, *Oersted, Annulat. Danicor. Conspect. p. 13.*

Hab. Oresund, coast of Denmark, *Oersted.*

Sp. 3. HARMOTHOË SCABRA.

Aphrodita scabra, *Fabricius, Faun. Grænl.* 311.

Hab. North Sea (*Mus. Brit.*).

Sp. 4. HARMOTHOË SPINOSA, *Kinberg, l. c.* 386, and *Fregatt. Eujen. Resa*, p. 21, tab. 6. figs. 31, 31 A-31 H, tab. 10. fig. 57.

Hab. Straits of Magellan (*Mus. Brit.*).

We are indebted for a specimen of this species to the Lords of the Admiralty. It was obtained, during the voyage of H. M. ship 'Rattlesnake,' in the Straits of Magellan.

Sp. 5. HARMOTHOË AREOLATA.

Polynoë areolata, *Grube, Archiv für Naturg.* 1860, p. 72, t. 3. fig. 2.

Hab. Mediterranean and Adriatic Seas, *Grube*.

Sp. 6. HARMOTHOË PLUMOSA.

Polynoë plumosa, *Grube, Actinien Echinod. und Würmer des Adriatischen und Mittelmeers*, p. 86.

Hab. Adriatic and Mediterranean Seas, *Grube*.

Sp. 7. ? HARMOTHOË FASCICULOSA.

Polynoë fasciculosa, *Grube, l. c.* 87.

Hab. Adriatic and Mediterranean Seas, *Grube, l. c.* 25.

Sp. 8. ? HARMOTHOË SETOSISSIMA.

Polynoë setosissima, *Savigny, Syst. des Annelid.* 25.

Hab. Havre, *Cuvier*.

Sp. 9. HARMOTHOË NODOSA.

Polynoë nodosa, *Sars, Förhand. Vidensk. Selskab. Christiania*, 1860. p. 58.

Hab. Coast of Sweden, *Sars*.

Sp. 10. HARMOTHOË ASPERRIMA.

Polynoë asperrima, *Sars, l. c.* 59.

Hab. Coast of Sweden, *Sars*.

This species, according to Sars, has 18 pairs of elytra. In other respects it agrees generically with *Harmothoë* as described by Kinberg.

Sp. 11. HARMOTHOË RARISPINA.

Polynoë rarispina, *Sars, l. c.* 60.

Hab. Coast of Sweden, *Sars*.

Sp. 12. HARMOTHOË SCABRIUSCULA.

Polynoë scabriuscula, *Sars, l. c.* 61.

Hab. Coast of Sweden, *Sars*.

Sp. 13. *HARMOTHOË UNICOLOR*, sp. nov.

Animal elongate-elliptical, narrow, about 1 inch in length, and about 3 lines in breadth, nearly uniform in breadth throughout. Head-lobe broad. Tentacle long, of a dark-brown colour for two-thirds of its length; incrassated near the extremity, which is quite white; and terminating in a long, delicate, white, setaceous point. Antennæ much shorter than the tentacle, but longer than head-lobe, slender, and terminating, like the tentacle, in a long, slender, delicate, white point. Palpi stout, setaceous, not ringed with black and white, and of nearly the same length as the tentacle. Elytra 14 pairs, of a uniform olive-colour, covering the whole of the back, with the exception of five or six of the last articulations, which are naked and spotted with black. The upper elytra are nearly round and small, the others becoming oval and larger as they descend down the back toward the lower extremity. They are sparsely fringed with a few setæ on outer edge, and covered all over with minute spots, which under the microscope appear as very short, blunt setæ, set upon a round pedicle, and having the appearance of the stopper of a wine-decanter. Feet biramous, the bristles of the two branches differing in structure. The ventral bristles are shorter and stouter than the dorsal, scimitar-shaped, slightly uncinatè at the point, and strongly serrated on the convex edge for some distance along the upper half. Dorsal bristles rather slender, toothed at the point, and strongly denticulate along both edges for some distance, and somewhat enlarged near the point where the denticulations commence. The dorsal cirri resemble the tentacle and antennæ in structure.

This species strongly resembles the *H. cirrata*, except in the number of elytra (which apparently do not exceed 14 in number), and in their uniform colour.

Hab. Esquimalt Harbour, Vancouver Island, *J. K. Lord.*

Genus V. *HERMADION*, *Kinberg*, *l. c.* 386.

Antennæ with their bases attached to the cephalic lobe under the tentacle, which occupies the notch in front; elytra 15 pairs, not meeting on the back, and leaving the middle of the dorsal region and the posterior segments uncovered; ventral setæ serrated below the apex; body elongated.

Sp. 1. *HERMADION LONGICIRRATUM*, *Kinberg*, *l. c.* and *Fregatt.*

Eugen. Resa, p. 22, tab. 6. figs. 33, 33 A-33 H.

Hab. Straits of Magellan, *Kinberg.*

Though this species is stated by Kinberg only to occur in the Straits of Magellan, we have in the collection a considerable number of specimens brought from various habitats, though all from the South Atlantic Ocean. We have them from Hermit Island, Cape Horn—from the Falkland Islands—the sea off Crozet's Island, Kerguelen's Land—and, though with some doubt, from the shores of New Zealand. They were collected chiefly by the officers attached to the Antarctic Expedition (*Mus. Brit.*).

Sp. 2. HERMADION MAGELHAENSE, *Kinberg, l. c.* and *Fregatt. Eugen. Resa*, p. 22, tab. 6. figs. 32, 32 A—32 H.

Hab. Straits of Magellan, *Kinberg*.

Sp. 3. ? HERMADION EXTENUATUM.

Polynoë extenuata, *Grube, Actin. Echin. und Würm. Adriat. und Mittelmeers*, p. 86.

Hab. Adriatic and Mediterranean Seas, *Grube*.

Sp. 4. ? HERMADION PELLUCIDUM.

Polynoë pellucida, *Ehlers, die Borstenwürm.* i. 105, t. 3. f. 5, 7—14, t. 4. f. 1—4.

Hab. Quarnero, Istria, *Ehlers*.

These two latter species are doubtfully referred to this generic group, *H. pellucidum* having only 10 pairs of elytra.

Sp. 5. ? HERMADION TROCHISCOPHORUM.

Polynoë trochiscophora, *Schmarda, Neue wirb. Th.* p. 151, tab. 36. f. 310, 310a, b.

Hab. Table Bay, Cape of Good Hope.

This species, apparently belonging to this genus, has only 12 elytra, instead of 15. Notwithstanding this discrepancy, the place for it seems to be here.

Sp. 6. HERMADION FEROX, sp. nov.

This very striking species is about 2 inches long, exclusive of the proboscis. The colour of the whole dorsal surface, except the bristles of the feet, is nearly black; and the ventral surface is of a dark pearly hue. It is slightly attenuated at the inferior extremity. It has a singular appearance, from the very strong, straight spines on the dorsal branch of the foot, which extend nearly an inch from the body, and give it a ferocious aspect.

The head is of moderate size; eyes large and round; tentacle very short, thick at the base, setaceous at the point. Antennæ a little longer, fixed by their bases under the tentacle, setaceous; palpi long, thick at the base, setaceous at the point. Proboscis

large, black; jaws large and stout. Feet strong, biramous, the two branches of nearly equal size and wide apart. Bristles of dorsal branch very long, strong and sharp-pointed, smooth, and of a bright horn-colour. Bristles of ventral branch much shorter, and finely serrated from a little below the sharp smooth point down for about $\frac{1}{3}$ rd of their length. Both branches are produced into a long sharp point. Dorsal cirrus long, very slender and setaceous, only a little shorter than the long bristles of dorsal branch. Elytra thin, membranous, nearly smooth, but armed with a few scattered, rather strong prickles. Anal cirri long, slender, and setaceous like the dorsal cirri. Ventral cirri set upon strong peduncles, reaching to about the end of ventral branch of foot.

Hab. Dredged, during the Antarctic Expedition, from a depth of 300 fathoms, in lat. S. $74\frac{1}{2}^{\circ}$, long. E. $175\frac{1}{2}^{\circ}$ (*Mus. Brit.*).

Sp. 6. HERMADION FULIGINEUM, sp. nov.

The animal is about $1\frac{1}{2}$ inch in length, and, including the setæ of feet, about $\frac{1}{2}$ an inch broad. It is nearly black, the dorsal surface especially so, while down the centre of the ventral surface there runs a lighter-coloured streak or line. The head is of moderate size; the antennæ are affixed by their bases to the cephalic lobe under the tentacle, and are short. The tentacle is long—about three times the length of the antennæ. The palpi are very stout at their bases, and very long, much longer than the tentacle. All these organs are smooth and setaceous. The feet are stout, biramous; and each branch is prolonged into a long, sharp, setaceous point, that of the ventral branch being the longest. The two spines are brown-coloured, and extend to the point of each prolongation. The bristles of the dorsal branch are slightly curved and densely serrated along the upper half of their length. Those of the ventral branch are longer, more numerous, more slender, straight, and toothed from the apex, on each side, for about a third of their length. The dorsal cirri are long, setaceous, and sparsely and irregularly armed with cilia. The ventral cirri are sharp and setaceous. The elytra are 15 (?) pairs, oval in shape, and covered all over with minute granulations. The margin and the surface near the external margin are dotted with large, round, prominent tubercles; and one extremity is densely fringed with cilia.

All the specimens we possess are unfortunately in rather bad condition, so that it is difficult to determine the exact length of

the animal and the number of the elytra. Most of the dorsal cirri, too, have fallen off.

Hab. Along with the preceding species, from a depth of 300 fathoms, in lat. $74\frac{1}{2}^{\circ}$ S., long. $175\frac{1}{2}^{\circ}$ E. (*Mus. Brit.*).

Genus VI. THORMORA, gen. nov.

Bases of antennæ produced from the anterior margin of the cephalic lobe; elytra 12 pairs, not covering the middle of the back, and leaving the posterior segments of the body naked; setæ of dorsal branch of feet of two kinds; body elongated.

Sp. THORMORA JUKESII, sp. nov.

Animal about $1\frac{1}{2}$ inch long, rather more slender at the anterior extremity, elongated, and of a very dark colour. Antennæ and tentaculum nearly of the same length, incrassated a little below the apex, where they suddenly become produced to a fine slender point. Palpi longer than antennæ or tentacle, conical at the base, setaceous at the point. Buccal cirri of about the same length as the palpi, and, like the antennæ and tentacle, incrassated below the apex, and terminating suddenly in a sharp slender point. Elytra 12 pairs, but apparently small, and leaving the middle of the back and lower portion of the body uncovered. They are of a rounded form, tuberculated on the surface, and ciliated on the external margin. The feet are stout, biramous. Bristles of ventral branch stout, of a yellow colour, somewhat curved near the apex, and a little below the point strongly serrated and striated across. The fascicle of bristles springing from the dorsal branch is composed of two kinds,—one numerous, slender when compared with those of ventral branch, straight, acute at the point, and very finely serrated on both sides; the other, slender hairs, longer than the others, very numerous and quite smooth, appearing like a brush of fine hairs intermixed with the bristles. The dorsal cirri are, like the antennæ, incrassated below the apex, and ringed with black, and terminating suddenly in a fine slender point. Ventral cirri of feet setaceous, and reaching nearly to the apex of the ventral branch of the foot. Anal cirri stout, and of the same structure as the dorsal.

In the way in which the antennæ are attached to the cephalic lobe, and in the number of elytra, this species might appear to belong to the genus *Lepidonotus* as restricted by Kinberg; but the disposition of the elytra, their leaving the middle of the back and the posterior segments of the body uncovered, distinguish it

from that genus, and would apparently refer it to the genus *Hermadion*. It differs from that genus, however, in the number of the elytra, whilst, on the other hand, the existence of two distinct kinds of bristles in the fascicle of the dorsal branch of the feet distinguishes it from all of the genera established by Kinberg. I have therefore been obliged to propose for its reception a new genus, which I have characterized as above.

For the specimen of this species in the collection we are indebted to Mr. Jukes, who collected it during the voyage of H.M. ship the 'Fly.' Unfortunately the habitat has not been preserved; but probably it is a native of the seas of Australia or New Zealand (*Mus. Brit.*).

Genus VII. NOREPEA, gen. nov.

Head three-lobed. Tentacle attached to the margin of the centre lobe; palpi attached to the side lobes; no antennæ. Elytra 14 pairs, covering the back entirely. Body short.

Sp. NOREPEA PERONEA.

Polynoë Peronea, *Schmarda*, l. c. 157, t. 36. f. 315*, 315*a.

Hab. Coast of Ceylon, *Schmarda*.

This species approaches in general form and appearance to the *Polynoë* (*Iphione*) *muricata* of Savigny. It differs, however, from that species in the number of elytra, in having a tentacle, which is wanting in the genus *Iphione*, and in the absence of antennæ, which, again, are present in *Iphione*.

I only know the animal in question from *Schmarda's* figure and description.

Genus VIII. HERMENIA, *Grube*, *Annulata Oerstediana*, p. 18.

Tentacle long. Antennæ only half the length of the tentacle, but much exceeding the 1st elytron. No palpi. Elytra 12 pairs, exceedingly small, except 1st pair. Branches of feet connate. Body short.

In his description of this genus, *Grube* makes no mention of the situation of tentacle and antennæ, or appearance of cephalic lobe; and the species upon which the genus is founded I have never seen.

Sp. HERMENIA VERRUCULOSA, *Grube*, l. c.

Hab. St. Jan (Honduras?), *Oersted*.

Genus IX. HEMILEPIDIA, *Schmarda, l. c.* 149.

Elytra 15 pairs, placed only on anterior portion of body, the posterior (larger portion) being left uncovered. Dorsal cirri in all the segments. Eyes 4; jaws 4, large.

Schmarda, who first characterized this genus, says that it is closely allied to the genus *Hermadion* of Kinberg, differing chiefly from it in the possession of large maxillæ.

Sp. 1. HEMILEPIDIA TUBERCULATA, *Schmarda, l. c.*

Hab. Table Bay, Cape of Good Hope, *Schmarda*.

Sp. 2. HEMILEPIDIA ERYTHROTÆNIA, *Schmarda, l. c.* 150.

Hab. Sea, near Cape of Good Hope, *Schmarda*.

Genus X. POLYNOË (as restricted by Oersted).

Polynoë et Lepidonotus (pars) auctorum.

Antennæ with their bases attached to the anterior portion of cephalic lobe, under the tentacle. Elytra 15 to 40 pairs, placed only on the anterior portion of the body, leaving the greater part of the posterior portion uncovered. Dorsal cirri alternating with the elytra. Branches of feet connate; bristles simple; body long and slender.

Sp. 1. POLYNOË SCOLOPENDRINA, *Savigny, Syst. Annél.* p. 25.

This fine species, at least 4 inches in length, is a native of the coasts of France as well as England.

Hab. Falmouth (*Mus. Brit.*).

Sp. 2. POLYNOË LONGISSIMA.

Eumolpe longissima, Blainville, Dict. Sc. Nat. lvii. 459, Atlas, pl. 10. f. 3.

M. Audouin and Milne-Edwards notice this species in their 'Hist. Nat. Littoral de la France,' quoting Blainville's specific name and figure, but regret that it had not been more fully described. I have not seen the species.

Hab. Coast of Genoa, *Blainville*.

Sp. 3. POLYNOË BLAINVILLII, *M.-Edwards, Littoral de la France,* p. 94; *Grube, Famil. der Annelid.* pp. 37 and 120.

Eumolpe scolopendrina, Blainville, Dict. Sc. Nat. lvii. 459, Atlas, pl. 10. f. 2.

Hab. Unknown.

Sp. 4. POLYNOË ELEGANS, *Grube, Actin. Echinod. Würm. des Adriat. und Mittelmeers,* p. 85.

Hab. Adriatic and Mediterranean Seas *Grube*.

Sp. 5. POLYNOË VARIEGATA, *Grube, Ann. Oersted.* 23.

Hab. Madeira, *Kröyer.*

Sp. 6. POLYNOË NIGROVITTATA, *Grube, l. c.* 24.

Hab. Rio Janeiro, *Kröyer.*

Sp. 7. POLYNOË ANTARCTICA, *Kinberg, Bearbeitung der Würmer
K. Svenska Fregatten Eugénies Resa* (fide *Carus*).

Hab. Straits of Magellan, *Kinberg.*

Sp. 8. POLYNOË AUCKLANDICA, *Schmarda, l. c.* 158.

Hab. Auckland, New Zealand, *Schmarda.*

Sp. 9. ? POLYNOË LONGA.

Aphrodite longa, Fabricius, Faun. Grænland. p. 313.

Hab. Coast of Greenland, *Fabricius.*

This species is said by Fabricius to possess 56 pairs (!) of elytra.

Sp. 10. ? POLYNOË MINUTA.

Aphrodite minuta, Fabricius, l. c. 314.

Hab. Coast of Greenland?, *Fabricius.*

[*To be continued.*]

On the Surface-fauna of mid-Ocean.

By Captain SAMUEL R. J. OWEN, F.L.S.

[Read March 2, 1865.]

No. I.

POLYCYSTINA AND ALLIED RHIZOPODS.

SOME years since, when surface-dredging for Pteropods, &c., in the Bay of Bengal and other parts, living Polycystina, together with a few species of Foraminifera, were frequently found attached to the nets. This induced me to systematically dredge the surface of mid-ocean for these Rhizopods on the first opportunity that afterwards presented itself. The regions chosen for these researches were the Indian and Atlantic Oceans, where there were few or no islands near, the washings from whose shores might interfere with the results.

The surface-dredgings were commenced near the Sandheads in the Bay of Bengal, and in a longitude of about 90° east, until we arrived at 10° south of the line, thence making nearly a direct course for the Cape Land, passing Madagascar at a distance of 250 miles. They were resumed in the South Atlantic Ocean, near the Cape of Good Hope, and continued in nearly a straight

course to latitude 33° north, and longitude 44° west, the equator being crossed in longitude 22° west. A register has been kept of the different species of animal life met with in each portion of these long tracts of ocean-surface, and rarely has the sea been found free from some species of Polycystina.

Many of these forms have been hitherto claimed by the geologist; but I have found them still enjoying life, according to their small powers, in this their true homè, the siliceous shells filled with coloured sarcode, and sometimes this sarcode in a state of distention somewhat similar to that found projecting from the Foraminifera, but not in such slender threads.

I will now make a few observations on the appearance of these little gems of ocean. Having seen the Polycystina fresh from their native element in all their living splendour, I can assert that there are no objects in nature more brilliant in their colouring or more exquisitely delicate in their forms and structure. Unfortunately these tints can rarely be preserved. I have, however, coloured a few drawings to illustrate their appearance when fresh from the sea. Some are of but one colour—crimson, yellow, or blue; sometimes two of these colours will be found in the same individual, but always separate, and rarely if ever mixed to form green or purple. In a globular species, whose shell is made up of the most delicate fretwork, the brilliant colours of the contained blue and yellow sarcode shine through the little perforations very prettily. In two other specimens of the triangular and square forms, the respective tints of yellow and crimson are vivid and delicately shaded. In one the pink lines are concentric; while another is of a stellate form, the points and uncoloured parts being bright clear crystal, a beautiful crimson ring surrounding the centre portion.

I have dwelt upon the colours in order to give some idea of their natural appearance in the living state. The beautiful forms and delicately fine structure could be nearly as well seen in the fossil specimens.

The Polycystina appear to avoid the light, as they are rarely to be found on the surface of the sea in the daytime; it is after sunset, and during the first part of the night especially, that they make their appearance. I cannot say whether they make the bottom of the ocean their home during the day. The weight of their siliceous coverings would no doubt allow them to sink rapidly; and if they do so but to the distance of a few fathoms, it proves that they must have some means of extracting air from the

water, to enable them to rise again to the surface. Whether the living Polycystina are to be found at the bottom of the ocean can only be determined by deep-sea dredgings.

It will naturally be asked if I can throw any light on the propagation of the race. It is a subject I touch upon with some diffidence; but I must not pass by this very interesting topic without giving what little information I have been able to gather by a long and diligent search. Rare have been my opportunities of witnessing anything that seemed to elucidate this matter; but still sufficient has presented itself to enable me to offer or rather perhaps to hazard an opinion; but my facts and specimens may, at all events, be of some value.

I would refer to the mode in which two Diatoms or two Desmidiaceæ will unite, and how the contents of one will pass into the cell of the other. With Diatoms, &c., this process has been easily watched; with the rarer Polycystina such opportunities have been more difficult to obtain. I have seen the conjunction of two individuals, the yellow sarcode appearing as two separate yolks, one in each shell. One of my specimens shows the line of junction very distinctly, and, I think, proves that such specimens must not be taken as single individuals of another species. Another represents a similar case, in which only one shell is filled with the sarcode, the other being quite empty. A drawing was taken by me while at sea from a specimen in the live-box: this proved to me that the sarcode had not contracted in drying and thus filled only a portion of its original space. In a dead and dried specimen this might have been contended for. As I have said before, the thing is rare to witness; and it will require the evidence of other careful observers to clear up this point entirely to our satisfaction, for I hold it to be a matter of great interest.

In the cases I have observed, the siliceous shells appear to closely unite; they might be easily mistaken for one individual, if seen only in the fossil state, or after having been subjected to the action of nitric acid. It was the fact of the sarcode being found in only one portion that first gave me a clue to its real nature. I say *real*, provided always I am right in my conjecture.

The shells of some of the globular forms of the Polycystina, whose conjugation I believe that I have witnessed, are composed of a fine fretwork with one or more larger circular holes; and I suspect the junction to take place by the union of two such apertures. That the figures of these shells become somewhat distorted or elongated, and the passage of communication en-

larged, I do not take to be a difficulty; for I believe that, while living, some of the forms are to a certain extent elastic. Some species lose their globular form after death, and present a distorted surface. When the aperture is enlarged, it is easy to conceive that the elastic shelly portion is both distended and absorbed.

Although I have searched most diligently for the young of the Polycystina, I have been unable to find even comparatively small specimens of each species. I have therefore been led to doubt their growth in their present form. May not the Polycystina be the more perfect condition of some other creatures that attain their full size, and at the point of change or chrysalis-state are resolved into sarcode, upon which the siliceous shell is afterwards formed? (some minute marine Entozoa for instance?) or may not their first form of life be simple sarcode, or an *Amœba*? Some of the extremely thin shells still elastic seem to favour this supposition. If periodically, on increasing in size, they change their shells like the Crustaceans, where are we to look for the very small ones?

One globular species appears like a specimen of the Chinese ball-cutting—one sphere within another; but it is a marked and distinct kind.

I have not been able to meet with any cases of multiplication by division, unless the few specimens of conjugation which I have before noticed should hereafter prove to be of this nature: in most of the forms anything of this kind would be at once detected. There is one that at first sight seems to favour this notion; but as it has likewise an internal shelly portion, I do not think it can be looked upon in this light.

A case of the breaking-up of the contained sarcode into granules, as in the diatoms, was observed, and a drawing taken from the living specimen in the live-box. I would call attention to two kinds of egg-like forms—some yellow, others of a bright deep blue. The colour of this species generally is uniform—either all blue, red, or yellow—but not granular. It is but little I can say on this most important point; but I hope what I have witnessed, and here brought to notice, though but a few steps in advance, will show the road to be taken for further investigation.

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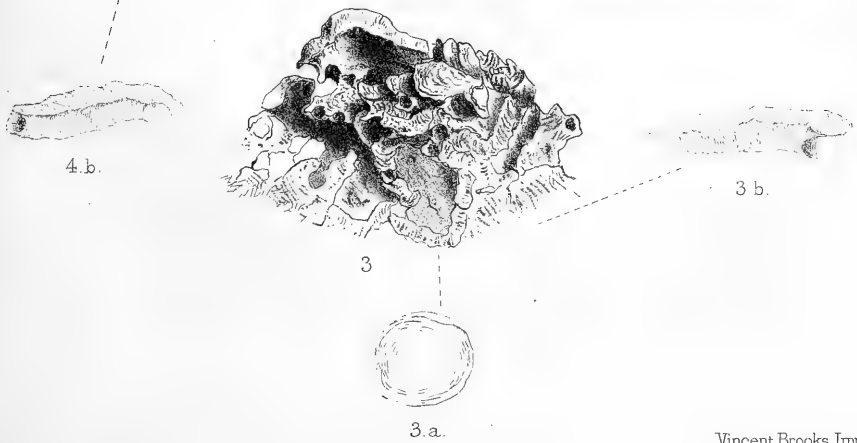
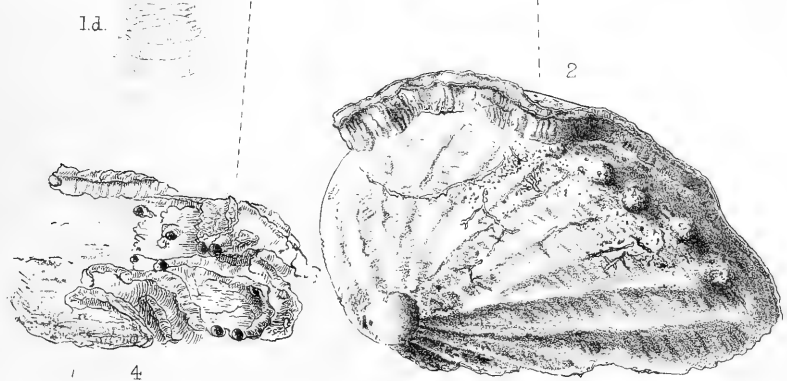
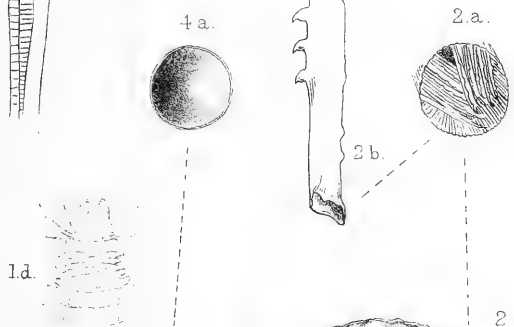
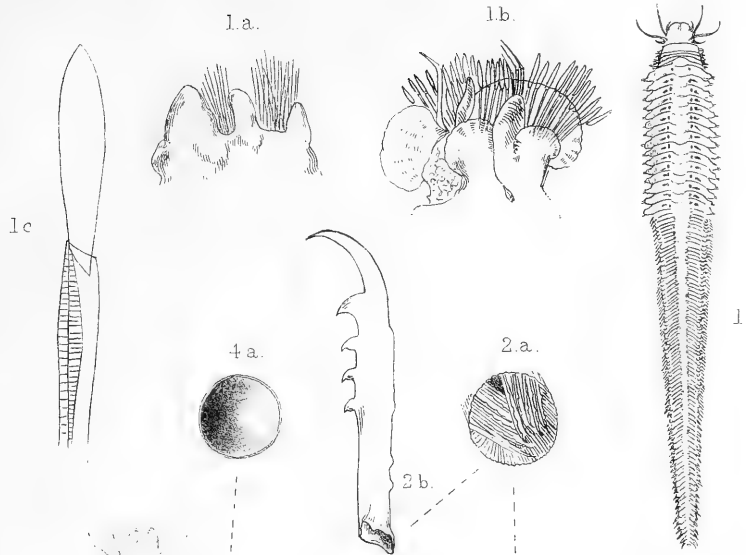
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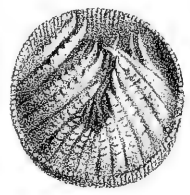
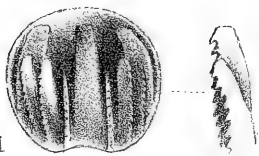
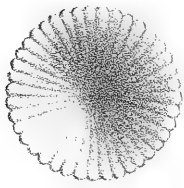
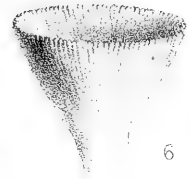
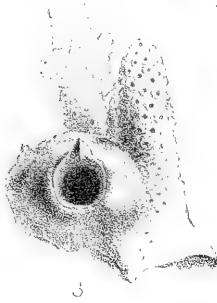
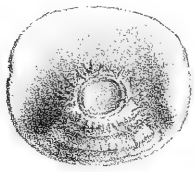
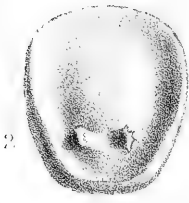
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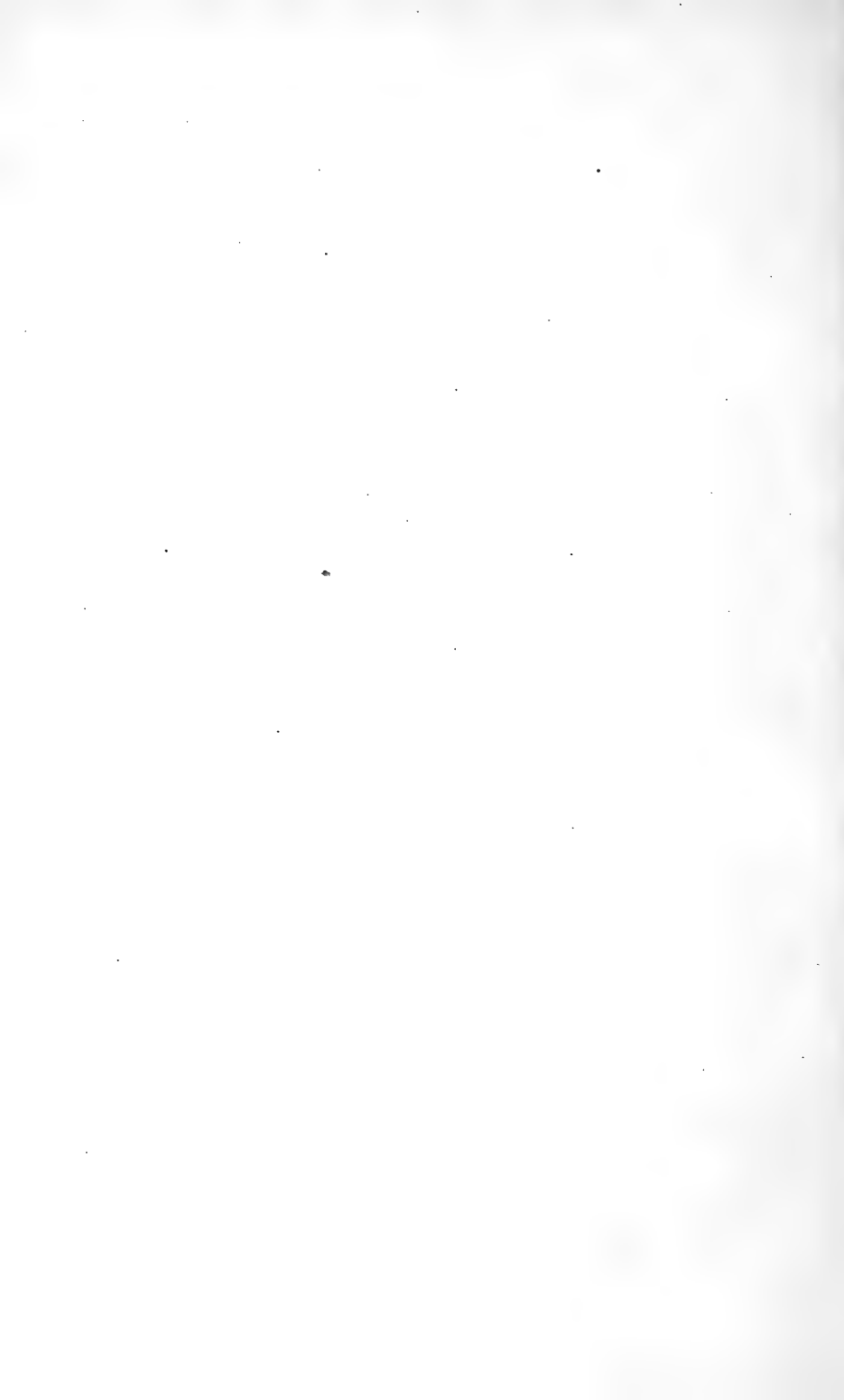
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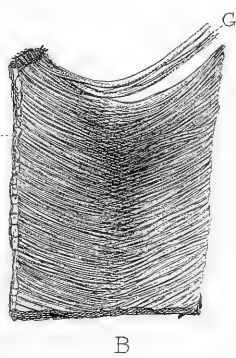
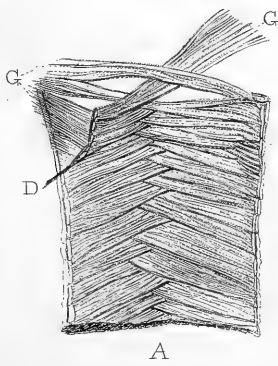
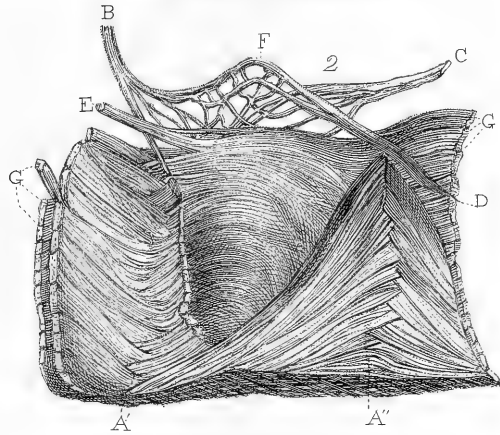
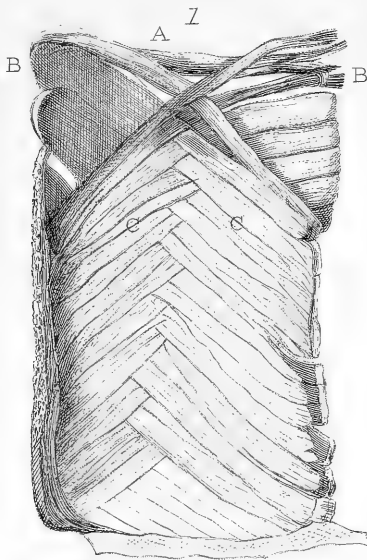
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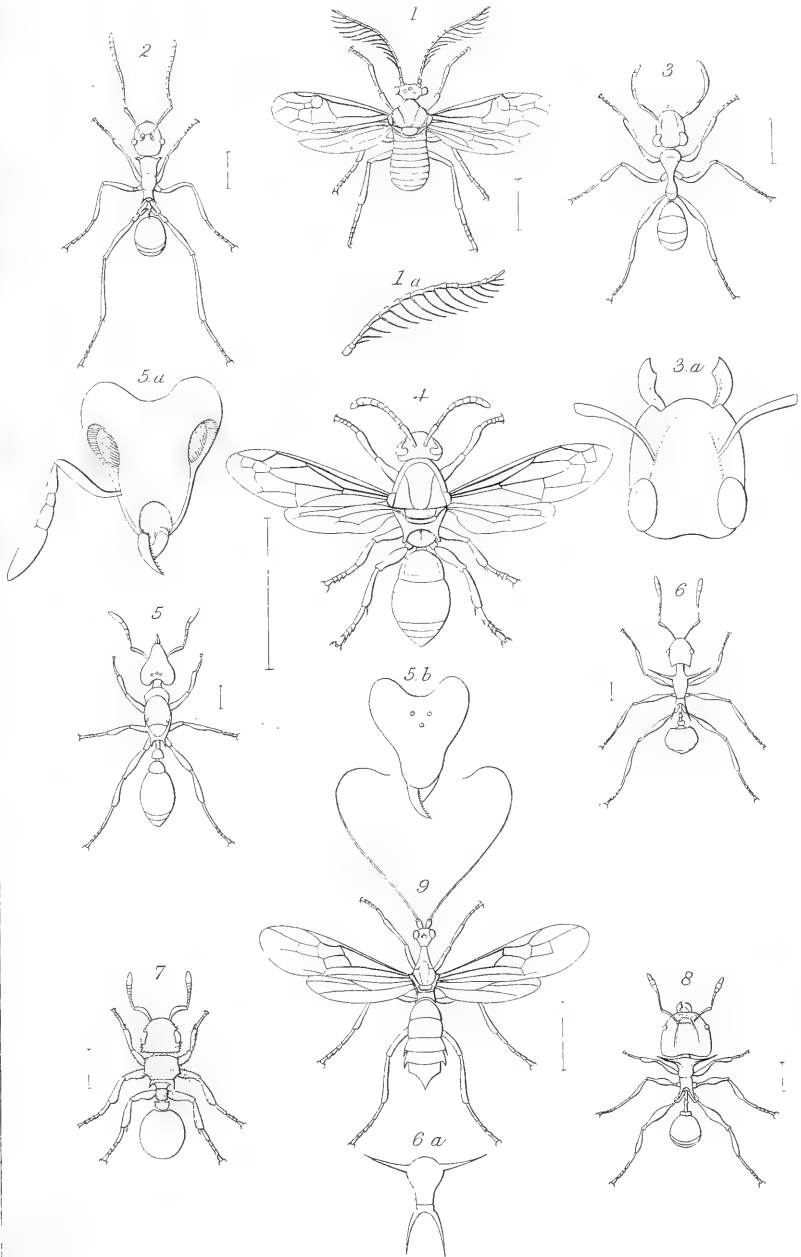


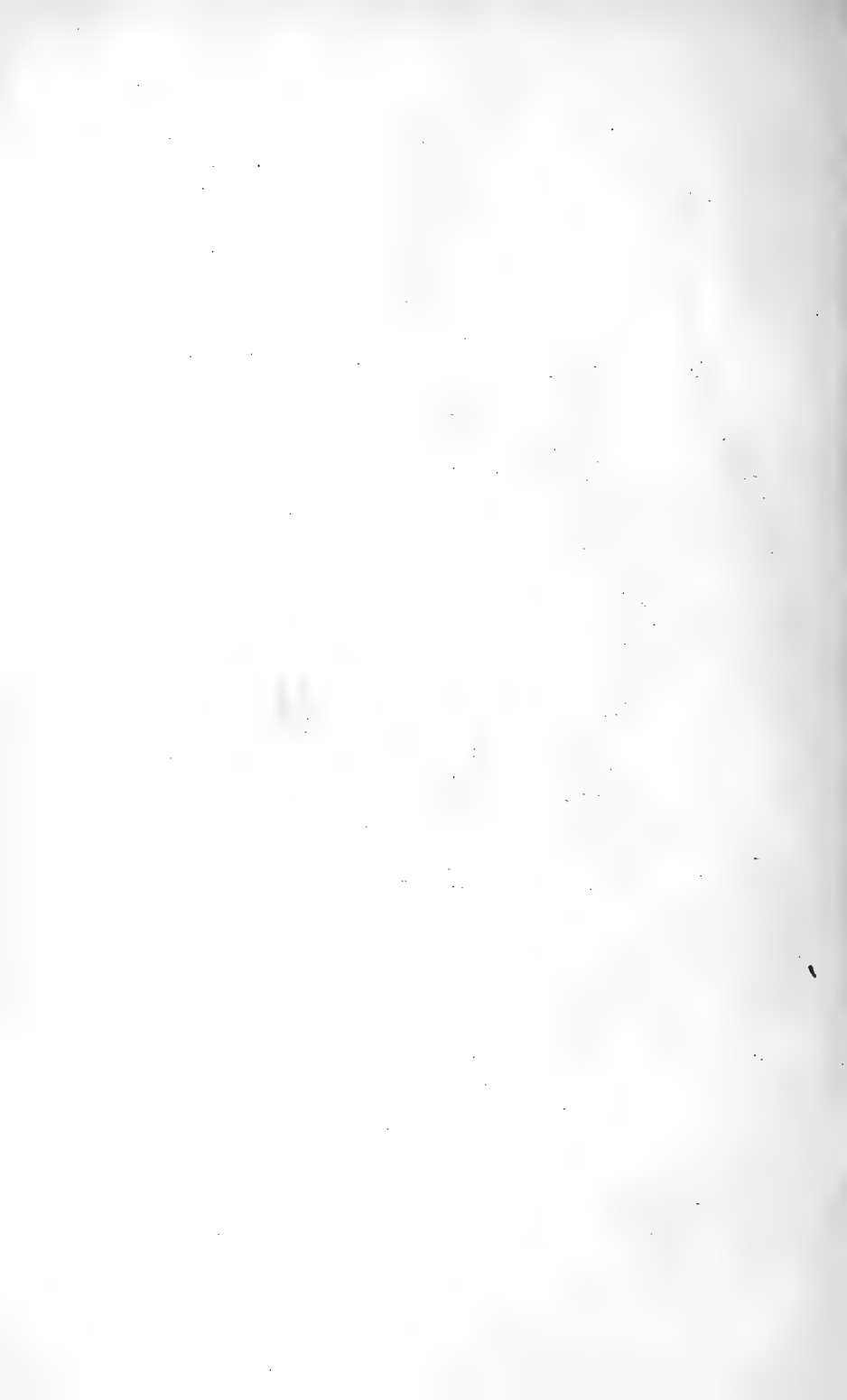


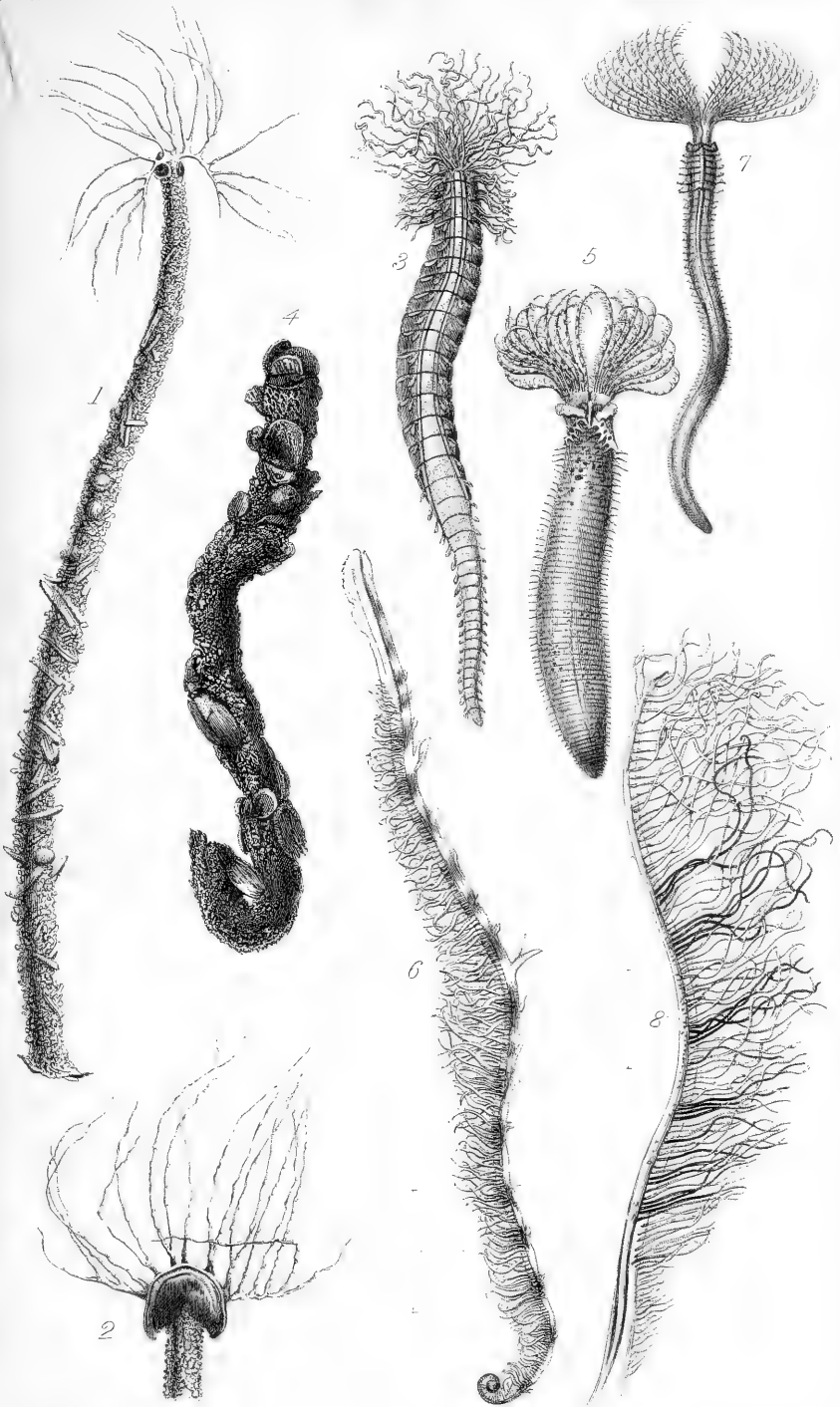














PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

November 5, 1863.

George Bentham, Esq., President, in the Chair.

The following Papers were read, viz. :—

1. "On the genus *Euptelea*, Sieb. & Zucc.;" by J. D. Hooker, M.D., V.P.R.S. & L.S., and Thomas Thomson, M.D., F.R. & L.S. (See 'Botanical Proceedings,' vol. vii.)

2. "On the Plants of the Temperate Regions of the Cameroons Mountains and Islands in the Bight of Benin, collected by Mr. Gustav Mann, Government Botanist;" by J. D. Hooker, M.D., V.P.R.S. & L.S. (See 'Botanical Proceedings,' vol. vii.)

3. "Contributions to the Cryptogamic Flora of the Atlantic Islands;" by William Mitten, A.L.S. (See 'Botanical Proceedings,' vol. viii.)

November 19, 1863.

George Bentham, Esq., President, in the Chair.

Frederick Du Cane Godman, Esq., and G. O. St. Brody, Ph.D. were elected Fellows.

The President read letters of acknowledgment from Mr. Panizzi, on the part of the Trustees of the British Museum, in return for the donations of the Banksian Collections of Insects and Shells,

the typical specimens of Australian Mammals and Birds, &c., directed to be presented to the Museum, at the Meeting of June 4th; and from Mr. Brady, on the part of the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne, for the donation of the Herbarium of the late Mr. Winch.

The following Papers were read, viz. :—

1. “Note on the Structure and Mode of Dehiscence of the Legumes of *Pentaclethra macrophylla*, Benth. ;” by Daniel Oliver, Esq., F.R. & L.S. (See ‘Transactions,’ vol. xxiv. Part 3.)

2. Letter from William Archer, Esq., F.L.S., to Sir W. J. Hooker, F.R.S. & L.S., giving an account of some very remarkable Fern trees with many crowns. (See ‘Botanical Proceedings,’ vol. vii.)

3. “Memorandum on a presumed case of Parthenogenesis in *Zanthoxylum alatum*, Roxb. ;” by Daniel Hanbury, Esq., F.L.S. (See ‘Botanical Proceedings,’ vol. vii.)

At a Meeting subsequently held, and which had been specially summoned for the Election of a Member of Council in place of Beriah Botfield, Esq., deceased, Robert Heward, Esq., was elected into the Council in his stead.

December 3, 1863.

George Bentham, Esq., President, in the Chair.

James Edward Tierney Aitchison, M.D., Edward John Waring, Esq., the Rev. Julius Edmund Woods, and Robert Carr Woods, Esq., were elected Fellows.

Sir J. B. Hearsey, K.C.B., exhibited a box of Indian *Noctuidæ*.

The following Papers were read, viz. :—

1. “On the Species of *Mitridæ* found in the Seas of Japan ;”

by Arthur Adams, Esq., F.L.S. (See 'Zoological Proceedings,' vol. vii.)

2. "On the Palms of Western Tropical Africa;" by Gustav Mann and Hermann Wendland. Communicated by J. D. Hooker, M.D., V.P.R.S. & L.S. (See 'Transactions,' vol. xxiv. Part 3.)

December 17, 1863.

George Bentham, Esq., President, in the Chair.

Robert Hardwicke, Esq., was elected a Fellow.

The following Papers were read, viz. :—

1. "On a new Species of *Cissus* (*C. gastropus*, Wellw.) from the Littoral Region of South Benguela (District, Mossamedes);" by Frederick Welwitsch, M.D., A.L.S., &c. (See 'Botanical Proceedings,' vol. viii.)

2. "Flora of the Jhelum District of the Punjab;" by J. E. Tierney Aitchison, M.D., F.L.S. (See 'Botanical Proceedings,' vol. viii.)

3. "On *Adelanthus*, a new genus of *Hepaticæ*;" by William Mitten, A.L.S. (See 'Botanical Proceedings,' vol. vii.)

January 21, 1864.

George Bentham, Esq., President, in the Chair.

Capt. George Ernest Bulger, Julius Haast, Esq., W.R. Hughes, Esq., William Jameson, M.D., Thomas C. Jerdon, Esq., Osbert Salvin, Esq., James Smith, Esq., and W. J. Hawke Spink, Esq., were elected Fellows.

It was moved by Mr. Bennett, seconded by Dr. Hooker, and carried unanimously,

"That this Meeting is desirous of recording, at the earliest

opportunity, the sincere and profound regret with which it has received the announcement of the death of Dr. Francis Boott, whose name during a period of twenty-five years, has been so intimately associated with the affairs and with the progress of the Society.

“That the Meeting is especially desirous of giving expression to its grateful recognition of the advantages which the Society has derived from the soundness of his judgment, from his constant devotion to its best interests, and from his untiring zeal in the discharge of the duties of the several offices of Secretary, Treasurer, and Vice-President; in all of which he deservedly won the confidence, esteem, and respect of every Fellow of the Society.

“That the Meeting also earnestly desires to express its sincere and respectful condolence with the sorrowing partner of his affections, and to assure her of its deep and heartfelt sympathy in this her irreparable loss.”

The following Papers were read, viz.:—

1. “On *Cygnus Passmori*, a new American Swan;” by the Rev. William Hincks, F.L.S. (See ‘Zoological Proceedings,’ vol. viii.)

2. On *Nausitora*, a new genus of *Teredininae*,” by E. P. Wright, M.D., F.R.C.S.I., F.L.S., &c. (See ‘Transactions,’ vol. xxiv. Part 3.)

3. “On *Iapyx*, a new genus of Insects, belonging to the Stirps *Thysanura* in the Order *Neuroptera*;” by A. H. Haliday, Esq., F.L.S. (See ‘Transactions,’ vol. xxiv. Part 3.)

4. “Description of a new species of Annelides, belonging to the Family *Amphinomidae*;” by William Baird, M.D., F.L.S. (See ‘Transactions,’ vol. xxiv. Part 3.)

5. “The ‘Bryologia’ of the Survey of the 49th Parallel of Latitude;” by William Mitten, A.L.S. (See ‘Botanical Proceedings,’ vol. viii.)

February 4, 1864.

George Bentham, Esq., President, in the Chair.

The Rev. Tullie Cornthwaite, M.A., John Thompson Dickson, Esq., and Clements R. Markham, Esq., were elected Fellows.

The following Papers were read, viz.:—

1. "Observations on the Functions and Structure of the Reproductive Organs in the *Primulaceæ*;" by Mr. John Scott, of the Royal Botanic Garden, Edinburgh. Communicated by Charles Darwin, Esq., F.R.S. & L.S. (See 'Botanical Proceedings,' vol. viii.)

2. "Notes on some Points in the Anatomy of the *Rotatoria*;" by Walter Moxon, M.B., F.L.S. (See 'Transactions,' vol. xxiv. Part 3.)

February 18, 1864.

George Bentham, Esq., President, in the Chair.

The Secretary read the following extract from the Will of the late Joseph Woods, Esq., F.L.S., viz.:—

"I give to the Linnean Society of London such of my local Floras, or editions of local Floras, as they do not possess; and some other botanical works in the like predicament. A list of these will be found with these papers, in the writing of Richard Kippist."

It was proposed by the President, and unanimously resolved, that the Special Thanks of the Society be presented to the Executors for this very acceptable and valuable bequest.

Dr. Hooker, V.P.L.S., exhibited the Fruit of the "Chayota" (*Sechium edule*), cultivated in the West Indies and Azores, and lately introduced into South Europe and India.

The following Paper was read, viz.:—

"Contributions to the Knowledge of *Foraminifera*.—On the

Rhizopodal Fauna of the Shetlands;" by Henry B. Brady, Esq., F.L.S.

March 3, 1864.

George Bentham, Esq., President, in the Chair.

Charles W. Villiers Bradford, Esq., B.A., Bernard Edward Brodhurst, Esq., and Hammett Hailey, Esq., were elected Fellows.

It was proposed by Dr. Hooker, seconded by Mr. Hanbury, and unanimously resolved, that the following Memorial be addressed to his Excellency the Governor of the Mauritius:—

"The Linnean Society of London beg to call the attention of his Excellency the Governor of the Mauritius and Seychelles Islands to a statement of Mr. Ward, Civil Commissioner of these islands, relating to the wanton destruction of the Sea Cocoa-nut tree, threatening its total extinction; and to express their confident hope that his Excellency will see the expediency of taking some steps towards the preservation of a tree of such high scientific interest, independently of its practical importance."

The following Papers were read, viz. :—

1. "On the Identity of *Pinus Peuce*, Griseb., of Macedonia with the *P. excelsa* of the Himalaya Mountains;" by J. D. Hooker, M.D., V.P.R.S. & L.S. (See 'Botanical Proceedings,' vol. viii.)

2. "On the Double Cocoa-nut of the Seychelles (*Lodoicea Seychellarum*);" by Swinburn Ward, Esq., Civil Commissioner. Communicated by Sir W. J. Hooker, K.H., F.R. & L.S. (See 'Botanical Proceedings,' vol. viii.)

3. "On *Frerea*, a new genus of *Asclepiadæ*;" by N. A. Dalzell, Esq., Superintendent of the Botanic Garden, Bombay. Communicated by Dr. Thomson, F.R. & L.S. (See 'Botanical Proceedings,' vol. viii.)

4. "Description of *Brandisia*, a new genus of *Scrophularinæ*

from Martaban;” by Dr. J. D. Hooker and Dr. T. Thomson. (See ‘Botanical Proceedings,’ vol. viii.)

5. “Notes on the Fecundation of Orchids and their Morphology;” by Dr. H. Crüger, Director of the Botanic Garden, Trinidad. Communicated by Charles Darwin, Esq., F.R. & L.S. (See ‘Botanical Proceedings,’ vol. viii.)

6. “Observations on a peculiar Mode of Fecundation in *Chionyphe Carteri*, Berk. ;” by the Rev. M. J. Berkeley, M.A., F.L.S. (See ‘Botanical Proceedings,’ vol. viii.)

7. “Descriptions of new species of the Dipterous Insects of New Guinea;” by Francis Walker, Esq., F.L.S. (See ‘Zoological Proceedings,’ vol. viii.)

8. “Descriptions of new species of Dipterous Insects from the Island of Salwatty, near New Guinea;” by the same. (See ‘Zoological Proceedings,’ vol. viii.)

March 17, 1864.

George Bentham, Esq., President, in the Chair.

The Rev. George Henslow, M.A., and Gervase F. Matthews, Esq., were elected Fellows.

The following Paper was read, viz. :—

“On the Phenomena of Variation and Geographical Distribution, as illustrated by the *Papilionidæ* of the Malayan Region;” by Alfred R. Wallace, Esq. (See ‘Transactions,’ vol. xxv. Part 1.)

April 7, 1864.

George Bentham, Esq., President, in the Chair.

William Eassie, Esq., was elected a Fellow.

Dr. H. J. Carter exhibited leaves of *Ficus glomerata*, Roxb., in

which a double foliaceous development had formed along some of the secondary veins on the under surface of the leaf, recalling the indusium of Ferns.

The following Papers were read, viz. :—

1. "On the *Garcinia* yielding Gamboge in Siam;" by Danie. Hanbury, Esq., F.L.S.; with remarks on the structure of the Anther in the section *Hebradendron*, of the genus *Garcinia*;" by Prof. Oliver, F.R. & L.S. (See 'Transactions,' vol. xxiv. Part 3.)

2. "Dimorphism in the Flowers of *Monochoria vaginalis*;" by John Kirk, M.D. Communicated by the President. (See 'Botanical Proceedings,' vol. viii.)

April 21, 1864.

George Bentham, Esq., President, in the Chair.

Richard Peck, Esq., and Henry Prescott, Esq., were elected Fellows.

The following Papers were read, viz. :—

1. "On some species of *Musci* and *Hepaticæ*, additional to the Floras of Japan and the Coast of China;" by William Mitten, A.L.S. (See 'Botanical Proceedings,' vol. viii.)

2. "Descriptions of new Species and Varieties of tubicolous Annelides in the Collection of the British Museum;" by William Baird, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

3. "On a new species of British Annelides, belonging to the Family *Chætopteridæ*;" by the same. (See 'Transactions,' vol. xxiv. Part 3.)

4. "Monograph of the *Corynodina*;" by the Rev. T. A. Marshall, B.A. Communicated by the Rev. Hamlet Clark, M.A., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

May 5, 1864.

George Bentham, Esq., President, in the Chair.

Dr. John Kirk was elected a Fellow, and Professor Moris and Professor Steenstrup Foreign Members.

The following Papers were read, viz. :—

1. "Note on *Cœnurus*;" by T. S. Cobbold, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

2. "On four new genera of Plants of West Tropical Africa, belonging to the Natural Orders *Anonaceæ*, *Olacineæ*, *Loganiaceæ*, and *Thymeleaceæ*, and on a new species of *Paropsis*;" by Professor Oliver, F.R. & L.S. (See 'Botanical Proceedings,' vol. viii.)

3. "On a new genus of *Conanthereæ*;" by John Kirk, M.D., F.L.S. (See 'Transactions,' vol. xxiv. Part 3.)

4. "On a new species of *Chatopterus* from North Wales;" by John Williams, Esq. In a letter to Dr. Baird, F.L.S. (See 'Transactions,' vol. xxiv. Part 3.)

5. "Note on *Cygnus Passmori*;" by the Rev. William Hincks, F.L.S. (See 'Zoological Proceedings,' vol. viii.)

May 24, 1864.

Anniversary Meeting.

George Bentham, Esq., President, in the Chair.

This day, the Anniversary of the Birth of Linnæus, and the day appointed by the Charter for the Election of Council and Officers, the President opened the business of the Meeting with the following Address :—

GENTLEMEN,

IN rising to make my annual report on the progress of our Association, I feel great satisfaction in alluding to the resolution you

came to, last November, finally to abandon all idea of forming a general Museum, which we could have no hopes of ever having the means of rendering practically useful. Retaining such collections of historical value as are complete in themselves, require little expenditure of time and money for their preservation, and are readily consultable like the books of a library, we have disposed of the remainder as you directed; and although the sum received for them is, as was expected, of no great amount, yet it has enabled us to acquire several works of importance, and we are now free to devote our energies to the rendering our Library as useful as possible to our Fellows, and to maintain and increase the extent and importance of our publications. You have heard, from our Treasurer's accounts, that we have, in the course of the past year, expended on books and binding about £120, having purchased, amongst other works of value, Martius's great 'Flora Brasiliensis,' Blume's 'Rumphia,' Owen's 'Odontography,' Pander and d'Alton's 'Comparative Osteology,' Eschricht's 'Wallthiere,' &c., and a large number of smaller useful works of reference. The 'Transactions' preparing for the autumn issue are of unusual extent, and the Council are making arrangements for printing the Catalogue of our Library, which they hope to be able to effect with the aid of a moderate charge to Fellows desirous of obtaining it. With all this, we have not lost sight of the necessity of regularly investing a portion of the sums received as life-compositions: £300 Consols have been purchased since our last Anniversary, making a total of £1300 now standing in the name of the Society.

In attempting, last year, a general review of the principal biological questions to which the attention of naturalists and of our own Society especially had been recently directed, there were a few points which, for want of space, I was obliged to leave untouched, and upon which I would now say a few words.

The phenomena of **HYBRIDISM** are, to the botanist especially, a subject for study of considerable importance, not only for the practical results obtained under domesticity or cultivation, but from their influence on the questions of species and variety, and on systematic arrangement and description. The existence of hybrid plants in a wild state had long been denied by many, and is now scarcely recognized amongst extra-European plants, whilst others, amongst recent botanists, consider them as not only frequent but abundant in certain genera in northern and temperate Europe. The difficulties in establishing facts of which the evidences are all circumstantial have been summarily disposed of,

and the authors of some of our most carefully prepared modern European floras have thought that, by external characters alone, they could not only recognize a hybrid, but even determine which parent supplied the male and which the female element, and have accordingly adopted a nomenclature expressive of their decision as of a proved fact. As a test of specific identity and diversity, the relative perfection of the hybridizing power is also still regarded by them as absolute, in opposition to the conclusions of Darwin. It may therefore be useful to consider how far the propositions, on this head, of that distinguished biologist have been confirmed or modified by subsequent observers, and what are the points which are specially in need of further illustration.

The principal facts, bearing on this question, established in the admirable chapter on Hybridism in the 'Origin of Species,' appear to be:—

That generally, in order to produce the most fertile offspring, that is, beings most perfect in constitution as to the reproductive system, there must be near affinity, although not always too close a consanguinity, between the two parents.

That generally, as the affinity is more remote, the fertilizing process is less successful, not ceasing abruptly at a definite stage of remoteness, but diminishing by various gradations.

That generally, also, the fertility of the offspring of plants or animals nearly enough related to be considered as slight varieties will be unimpaired, but frequently diminishes if the parents belong to more constantly distinct races. Where the distinctions between the parents have obtained constancy and importance enough to be admitted as specific, interbreeding usually produces sterile offspring, and all power of interbreeding ceases as the differences still further increase so as to be deemed generic or ordinal.

But that exceptional cases more or less interfere with any universal regularity in any of these rules.

And that, although the generality of these rules has practically the effect of maintaining the distinctness of wild races once separated by a wide interval, yet that their indefiniteness—the numerous exceptions observed—forbid our considering them as a special provision for the preservation of any fixed relations of varieties, races, species, or genera. Nor can the greater or less perfection in the power of interbreeding, or the absolute want of it, be taken as positive tests of affinity or diversity. They are constitutional characters, standing more or less in correlation with external and structural characters, as these do with each other; and their value

in the appreciation of affinity and diversity must be estimated, as we do other characters, not *à priori*, but by their observed constancy.

Since the publication of Mr. Darwin's work, two important botanical papers on the subject have appeared,—the one the result of ten years' experiments, carried on, perhaps, in some measure with a view to proving a preconceived theory; the other after eight years' experiments, but on a larger scale, and apparently with less of bias, and that in an opposite direction: the conclusions of the one are in direct opposition to,—of the other, as far as they go, confirmatory of,—Mr. Darwin's. Neither contains any reference to Mr. Darwin's chapter, which most probably the one author had never seen, and the other had not had an opportunity of studying, before drawing up his conclusions; we may therefore consider both these memoirs as founded on an independent study of previous works, as well as on personal observations.

The immediate occasion of the publication of both memoirs, was the prize offered by the Académie des Sciences, in 1861, to be awarded in 1862, "Étudier les Hybrides végétaux au point de vue de leur fécondité et de la perpétuité ou non-perpétuité de leurs caractères." As it was impossible that such a study could be usefully completed in a single twelvemonth, the Academy, in offering the prize, must have had specially in view one or both of these observers, who were known to have been for years carrying on experiments on the subject.

Accordingly memoirs were sent in by M. Godron, Dean of the Faculté des Sciences of Nancy, and one of the authors of an elaborate and in many respects excellent 'Flore de France,' in which more definiteness had been ascribed to hybrids than in almost any other work; and by M. Naudin, Aide-Naturaliste at the Muséum d'Histoire Naturelle at the Jardin des Plantes, whose attention had been probably first directed to the subject in the course of his researches on Cucurbitaceæ. The former had carried on his experiments in the Botanic Garden of Nancy, and had also much studied the real or supposed wild hybrids of the centre and south of France; the latter had experimented, on a much larger scale, on plots of ground allotted to him in the Jardin des Plantes, where, moreover, he had the benefit of the great experience and judgment of his distinguished friend, M. Decaisne.

M. Godron's memoir is printed at length in the 'Annales des Sciences Naturelles' (sér. 4, vol. xix. p. 135). He concludes, as he began, with the conviction that mongrels or crosses between the

varieties of one species are absolutely fertile, whilst hybrids of two species, unless fertilized by one of the original parents, are always sterile; or, in other words, that this character is absolute for the testing of species and varieties. Opposed as this would seem to Mr. Darwin's views, the contradiction is, in some measure, more verbal than real. M. Godron makes the definition of the term 'species' to depend on this one physiological character, in preference to any combination of characters, external, structural, or physiological. If two supposed species (for example, *Datura Stramonium* and *D. Tatula*) produce fertile crops, then they are varieties only, not species. If two supposed varieties (for example, *Diplacus aurantiacus* and *D. puniceus*) produce crosses uniformly sterile, then they are species, not varieties. But these are not strong exceptional cases, nor does M. Godron deal with any such; he was probably not aware of them, not having met with any in the limited range of species he experimented upon; or if anything in his experiments did turn out contrary to his expectations, he would attribute it to some failure owing to deficiency in his precautions. So again, although he observed great variety in the degree of apparent perfection or defects in both the male and female organs of hybrids, the idea of different degrees of sterility does not appear to have occurred to him; and, on the whole, his memoir, notwithstanding a number of facts and observations of considerable interest, cannot be said to have contributed much, if anything, towards the confirmation or refutation of Mr. Darwin's views.

M. Naudin's memoir is of a very different character. It is not yet published *in extenso*; but the second portion, including the discussion and general results of his experiments, is inserted in the same Number of the *Annales des Sciences Naturelles* (sér. 4, vol. xix. p. 180), and the principal facts it contains are very clearly pointed out in an article in the 'Natural History Review' (1864, p. 50). This is quite sufficient to enable us to appreciate the great value of his labours; and having moreover, on various occasions, had personal opportunities of witnessing the zeal, care, and assiduity with which he pursues any subject that he takes up, I cannot but concur in the high eulogium conferred on his memoir by the committee appointed to award the prize. It is therefore of considerable importance that his conclusions should, in the main, so closely coincide with Mr. Darwin's, although independently formed. He especially insists on the great diversity in degree of sterility, and the impossibility of drawing, by means of this or any other character, any positive line of demarcation between a variety, a race,

and a species; and the exceptional cases he has observed, more or less interfering with any universal regularity in the rules above given, are some of them very striking.

One new point brought out by the observations of both these experimenters is, that when hybrids between species or marked varieties do become fertile, that fertility increases in successive generations, accompanied, apparently, by a tendency more or less rapid to return to one of the parent types. M. Godron, reasoning *à priori* from the fact, supposed to be proved, that hybrids are never fertile except when fecundated by the pollen of one of the parents, regards this return to the parent type and increasing fertility as the natural consequence of such fecundation; but Naudin states that this increased fertility and return occur constantly (though not uniformly) under conditions in which he believes that no such fecundation from the parent type can have occurred. This he is disposed to account for by the supposition that the two parent essences are intermixed, not truly combined, in the hybrid and in all its parts, reproductive as well as vegetative, and that, in future generations, the tendency of the reproductive parts of one essence to combine with those of the same essence has the gradual effect of eliminating the other. This hypothesis appears to be new, and many circumstances are adduced in its support, but it requires much further observation and a much better knowledge than we yet possess of the physiology of fecundation before it can be admitted as proved.

Puzzling exceptional cases occur to both experimenters, in which, as usual, if they cannot refute the conclusions to be drawn, they are obliged to doubt the premises. Thus *Ægilops speltæformis*, asserted to be the readily bred offspring of the hybrid *Æ. triticoides* fecundated by wheat, its male parent-type, is found both by Naudin and Godron to be uniformly fertile without further assistance from either parent, and to remain unchanged through successive generations. Godron, who admits that hybrids fecundated by one of the parents produce offspring which have so far returned to the nature of species as to become fertile, cites this in support of his rule that there is no return to the nature of the original parent without fecundation by that parent. Naudin doubts the assumed origin of *Æ. speltæformis*. So again, Naudin, among the observations in support of his theory of intermixture of species, adduces the fact, not only of the well-known differences in resemblance to either parent in their hybrid off-

spring, but that sometimes this first cross will be undistinguishable from one parent. Godron does not touch upon this circumstance, so opposed to the rules by which, in his 'Flora,' he had practically established the parentage of the hybrids described; but having observed that whilst, by fecundating *Ægilops ovata* with wheat, he never failed to produce the intermediate *Æ. triticoides*, all his fecundations of wheat by *Ægilops*, repeated upon several varieties of wheat during five successive years, produced invariably nothing but wheat, he explains this anomaly by supposing that his precautions were always insufficient for preventing simultaneous fecundation by neighbouring wheat-flowers. I allude to these facts only as showing with what care experiments of this kind must be repeated, so as not, on the one hand, too hastily to oppose the evidence of our senses to reason from analogy, nor, on the other, to allow general theory to overrule actual experience.

With regard to animals, in the references to the subject which Dr. Sclater has kindly pointed out to me, I find nothing new on the fertility of hybrids, except a short notice by Mr. Newton, in the 'Proceedings of the Zoological Society' (1860, p. 338), of a pair of hybrids between a Pintail Drake and a farmyard Duck, producing four ducklings; but, in the next generation, the fertility ceased, instead of increasing as in many plants.

Almost all experiments and observations upon hybridism have been upon plants in a state of cultivation, or animals in domesticity. In the wild state there is this difference, that exceptionally fertile hybrids must be still more rare; for to the obstacles opposed by sterility, or return to parent forms (or, say, disjunction of parent essences), to the establishment of new hybrid races, must be added the destruction ensuing from the want of the protection and assistance afforded by human care. Of this a curious instance is mentioned by M. Godron, in accounting for the rarity in a wild state of the *Ægilops speltaformis*, which seeds so readily under cultivation: the structure of the spike is such as to render the germination of the seed exceedingly difficult without extraneous aid in forcing it into the ground. All tends to confirm the now generally received opinion, that although hybridism in a wild state between races sufficiently distinct to be fairly called species is not unfrequent, the individuals are few, and generally differ from each other as much as they do from either parent. The modern practice, therefore, of giving names and descriptions of these hybrids as of distinct races cannot be too much deprecated: it is an attempt to give fixity to that which has none, confounding

individuals with races, and overloading with practically useless matter our floras and faunas. I say, faunas as well as floras; for similar circumstances appear to attend the production of hybrids in a wild state in the animal as in the vegetable kingdom. They are at least well exemplified, in the case of fishes, in Professor C. Th. E. v. Siebold's elaborate monograph of 'Central European Freshwater Fishes,' to which Dr. Sclater has referred me—not unfrequent, but usually almost isolated, specimens of the hybrid caught where the parents are in shoals, and differences so great between the individuals of the same origin as to have caused them to be classed sometimes with the one, sometimes with the other parent. The evidences of hybridity adduced by the author in each instance appear to be convincing; and, so far as I may be allowed to pronounce an opinion on what is out of my special department, the work gives proof of great pains and labour successfully bestowed upon collecting and methodizing all that could be learnt on the subject chosen, but shows at the same time that ichthyologists are determined not to be outdone by botanists in the reckless splitting of genera. In four of the five cases given of undoubted hybrids, the two parents are placed in different genera; in three of these, the offspring is referred to a third; and in two out of these three, the third genus is a new one, created for the hybrid alone. If this be correct, if a genus may be less than a species, the question naturally occurs, What does a genus mean, and where is its use?

As to the direction in which future researches on hybridism are likely to be the most useful, it does not appear that any further evidence is required in support of Darwin's general laws and exceptions, as confirmed by Naudin. No number of cases of sterility in hybrids will disprove the well-established ones of exceptional fertility. But Naudin's hypothesis of the intermixture and subsequent disjunction of parental essences opens out a new field of research, requiring for its confirmation or refutation numerous varied and careful experiments, which may ultimately give us some further insight into the hitherto concealed mysteries of fecundation. Practically also, much is to be done in the observation of plants in a wild state. Hybrids in our cold damp northern climates always appear to me much less frequent than in the south, for the same reasons, perhaps, that the proportion of perennials to annuals, and of propagation by offset to propagation by seed, is greater in the north than in the south. Is that the case? Is the confusion in the delineation of our willows, for in-

stance, mainly owing, as some pretend, to the frequency of hybrids, or to our having attempted to define as species races as yet too closely allied to have become fixed? These and similar questions may be well worth the attention of botanists resident in the country, who have leisure for observation supported by experiment.

TERATOLOGY, the investigation of abnormal or monstrous developments, including everything which in the form, structure, or course of life in an individual differs from what is generally observed in its race or species, has acquired considerable importance in the consideration of questions of homology of organs, as well as in that of affinities, descent, and supposed atavism. In animals, monstrous productions have been chiefly treated pathologically or physiologically, or as mere objects of curiosity; but in vegetables abnormalities are so frequent, and appear so often subject to general laws, that they have attracted much attention on the part of philosophical naturalists. There are few botanists who have not, on some occasion or other, recorded instances which have come under their observation. Continental botanical periodicals are full of notices, more or less descriptive or speculative, on vegetable anomalies; and in our own more recent publications we have several interesting papers on the subject, by Dr. Masters and others. The value of these records of facts, independently of the confidence to be reposed in the observer, depends on their novelty, that is, their difference from what has been authentically established in analogous cases, or on their bearing upon divergences of structure liable to doubt or discussion. Every new observation ought therefore to be carefully collated with analogous instances already on record, and for this a general work on the subject is indispensable. The best I am acquainted with is the late Professor Moquin-Tandon's '*Éléments de Tératologie Végétale*,' a work little known in this country, but now added to our library. It was the result of a great deal of research, carried on for several years, and the subject is generally well methodized and clearly put. It was published, however, so far back as 1841; and there is much in the general principles enounced which recent biological investigations would considerably modify. It were much to be desired that some one of our Fellows, who, like Dr. Masters, have devoted much attention to the subject, would undertake a remodelling of the work, suited to the present more advanced stage of vegetable biology.

METAMORPHISM, or the history of the changes, abrupt or continuous, of the phases of life or stages of development which the

individual undergoes, from its first formation on the parent stock to the final close of its life, is a subject more or less treated of by all biologists, from the earliest times to the present day; and yet there is much which has only recently come to light, and requiring further investigation on the part of careful observers. I was much struck by some observations made at one of our meetings last year by Mr. Lubbock, on the metamorphosis of insects, that the four stages of egg, larva, pupa, and imago are not nearly so definite as is popularly supposed, the transformations which some insects undergo within the egg, or in the course of their subsequent lives, being numerous and more or less abrupt or gradual,—a subject which I trust he will pursue and methodize for the use of the general naturalist, who has not time to enter into the details of entomology. In Dr. Cobbold's forthcoming general work on Helminthology, we may hope to find all that can be learnt as to the periods of existence of the dreadful animals he treats of, the investigation of which is so essential to aid in devising the means of obviating their destructive influences. Mycologists, and others who make the lower order of animals and plants abounding in parasites the object of their study, now find how essential it is to follow these beings through all their different stages, not only to prevent that confusion of method which has often placed the same individual at different ages in different genera or classes, but to enable us to recognize at one stage the plant or animal which at another stage may do us incalculable injury or benefit. In all these cases we look for critical inquiry into the perfect authentication of each individual fact, and general treatises to enable us to make proper use of the facts ascertained.

The study of DIMORPHISM in flowers has acquired a new interest since the appearance of Mr. Darwin's paper on *Primula* and *Linum*, first published in our own 'Journal' (vol. vi. p. 77), and since reproduced in the 'Annales des Sciences Naturelles' (sér. 4, vol. xix. p. 204). Isolated cases had, indeed, frequently been observed; but either no particular attention was paid to them, or advantage was taken for establishing species or even genera solely upon these differences in the proportions or degrees of perfection in the sexual organs. Mr. Darwin having now pointed out the significance of these differences, and how much they appear to be connected with the complicated mysteries of efficient fecundation, the subject has been taken up by other observers. We have ourselves had two communications from Mr. John Scott, of Edinburgh, which will shortly appear in our 'Journal'; and the

numerous cases where the relative proportions of the styles and stamens, or the constant dissimilarity of two sets of flowers, have entered more or less into specific characters will probably ere long be sifted and reduced to their just value, and facts accumulated which may give us some further insight into the laws which govern this curious provision.

In the case of insects, we listened with great interest, a few meetings since, to a paper of Mr. Wallace's, which appeared to contain new facts and views of considerable importance in the economy of insect life, especially in relation to dimorphism or heteromorphism, although not of the same description as what is so termed in plants. It is impossible, however, to understand correctly discussions of this nature without study, and it would be premature to give any opinion on them till the paper is published, as I hope it will be by the close of the year.

I cannot conclude my remarks upon the recent progress of biological science without alluding to the modern discovery of the dynamical theory of heat, or equivalence of heat and force—a wonderful theory, which the lectures of Tyndall have rendered practically clear even to the unscientific mind, but which, nevertheless, it is difficult to follow in all its details without feeling a certain bewilderment of the brain. I may refer to Dr. Carpenter's article "On the Application of the Principle of Conservative Force to Physiology," in the 'Quarterly Journal of Science' for January and April of the present year, for a general review of the influence of this force on vegetable and animal life; and for a more popular summary, to the graphic sketch of the relation of the sun to life, contained in the closing portion of Prof. Tyndall's twelfth lecture. But in this summary occur the following passages, which, however correct in regard to the great principle they are intended to illustrate, might yet, I think, without explanation, lead the ordinary reader into considerable error with regard to some great biological facts, and upon which therefore, on account of the high standing of the distinguished author, and the general circulation which the work must command, I think it necessary to offer a few observations.

"The earth's atmosphere contains carbonic acid, and the earth's surface bears living plants; the former is the nutriment of the latter. The plant apparently seizes the combined carbon and oxygen, tears them asunder, storing up the carbon, and letting the oxygen go free. By no special force, different in quality from other forces, do plants exercise this power: the real magician is here the sun." (p. 430.)

“But we cannot stop at vegetable life; for this is the source, mediate or immediate, of all animal life. In the animal body, vegetable substances are brought again into contact with their beloved oxygen, and they burn within us, as a fire burns in a grate. This is the source of all animal power, and the forces in play are the same in kind as those which operate in inorganic nature. In the plant the clock is wound up, in the animal it runs down. In the plant the atoms are separated, in the animal they recombine.” (p. 431.)

The sun “rears, as I have said, the whole vegetable world, and through it the animal. The lilies of the field are his workmanship, the verdure of the meadows, and the cattle upon a thousand hills. He forms the muscle; he urges the blood; he builds the brain. His fleetness is in the lion’s foot; he springs in the panther; he soars in the eagle; he glides in the snake. He builds the forest, and hews it down,—the power which raised the tree, and which wields the axe, being one and the same. The clover sprouts and blossoms, and the scythe of the mower swings, by the operation of the same force.” (p. 432.)

Notwithstanding the assertion to the contrary, it must be admitted that there is here a little of poetry mixed with rigid mechanical truth; and we, as special investigators of the complex phenomena of animal and vegetable life and living beings, ought not to allow this quiet and summary dismissal of what is ordinarily, though perhaps erroneously, called “vital force” without remark. Life may not be a force in the sense which natural philosophers give to the term, but it is a power which so materially modifies the action of heat-force, that it comes within the general and more popular meaning of the word. Life cannot indeed be set in action without the operation of heat-force; but, on the other hand, the sun cannot build a tree without the assistance of life. What life really is we do not know: its origin is probably beyond our investigation; but its existence and continuity cannot be denied. Notwithstanding the objections of heterogenists, to which I had occasion last year to allude, I cannot but remind you that in the present state of science we have as yet no prospect of proofs that any new life is created, that any new living being is built, by the sun or any other force, out of matter organic or inorganic. Life is continuous, and has been so from a period beyond human cognizance. We witness its cessation, but it has never been known to commence. Every new being grows out of, and is a portion detached from, a preexisting one. We cannot even fix precisely the moment when its independent life commences. It is not when

the detached bud first shoots out its own roots, not when the seed bursts, or the egg-shell is broken, or the young animal is born; for the bud, the embryo or fœtus, had a previous existence, more or less independent of, or connected with, the parent, according to species. It is not at the moment of fertilization or impregnation; for the bud, and even the ovum in cases of parthenogenesis, may grow into independent beings without ever being impregnated. Nor can our most powerful instruments perceive the moment when the first embryo-cell receives that impress which has irrevocably determined the form which the perfect being is to assume, within those narrow limits which neither impregnation nor any other influences set in action by the sun can ever make it exceed. And if life is once stopped, if interrupted, be it for a moment, no force can set it in action again. It may lie dormant for a long (but not perhaps indefinite) succession of years; its action may be absolutely imperceptible or limited to the resistance of disorganization, until recalled into more active operation by the action of the sun on surrounding influences; but if during the dormant period (of the seed, egg, &c.) life has once ceased, nothing will restore it: the action of the same sun upon the same surrounding influences will produce decomposition, not growth. The word "force" may indeed be properly limited to mechanical force, and it may be incorrect to say that life is a force different in quality from other forces; but, as we must have some term equivalent to the popular sense, we may call life a *power* different in quality from force. Dr. Carpenter (p. 80) proposes to term it a *germinal capacity*; but it is surely much more than a capacity, to be paraphrased as the "power of utilizing, after its own particular fashion, the heat which it receives, and of applying it as a constructive power to the building up of its fabric after its characteristic type" (p. 87). There is here this difference between the term and its paraphrase, that the one expresses a passive, the other an active idea.

"Vegetable substances, brought into contact with their beloved oxygen in the animal body, will burn within it as a fire burns in the grate." True; but that burning will be fermentation and corruption, unless brought under the influence of the living parts of the body to be converted into growth. I say *growth*, not *building*; for building the brain and the forest is a metaphor which must lead the unscientific mind far astray from all that science has as yet taught us. Nothing in life is built, in the ordinary "sense" of the term; no portion, no single cell, has been externally added to a living being; everything has grown out of it, every new cell is gradually compounded within a living cell.

“The plant apparently seizes the combined carbon and oxygen, tears them asunder, storing up the carbon, and letting the oxygen free.” True; but it does much more. Every living being, animal or vegetable, absorbs compound substances, decomposes them, liberates at once a portion (chiefly oxygen in the case of most plants), and stores up a portion. Of this portion some may be deposited unchanged in visible particles in various parts of the animal or plant, but some also undergoes a further decomposition and dilution into a state hitherto concealed from our observation, from which it emerges recombined, having already received a peculiar impress, definitely differing in every species, or even in every individual—differences then inappreciable, it is true, to our senses, but evidenced by the forms the animal or plant is compelled to assume as it grows. And the process is substantially the same in animals and plants; both absorb, decompose, select, reject, and recombine. An animal may select what a tree rejects; but so also may one plant select what another rejects. None feed upon carbon or oxygen alone. Some are not satisfied without drawing their nutriment direct from the living plant or animal; many feed upon organic substances, in which the decomposition after death has scarcely commenced; and most, if not all, appear to require for their support some small portion, at least, of matter in which life is or has been. In both animals and vegetables the clock is wound up, and it runs down; in both, the atoms are separated and recombined, and in both, these operations take place in a totally different way from what they do in the same bodies under the same influences, the moment life is extinct, the moment the vital power ceases to act. It is this vital power, its continuity and infinite divisibility, its unity and infinite diversity, the concordances, discrepancies, and reciprocal action and influences of the infinity of forms it produces, that our Society is specially called upon to investigate. As systematists, we have so to discriminate, describe, and class these forms as to enable us readily to identify them, both individually and collectively, to comprehend one and another and ourselves in treating of them, and to retain and store in our minds and books what is known of their resemblances, differences, and peculiarities, of their influences and relations to each other and to the lifeless world, as a starting-point for future observation. As biologists, we have to study life itself in all its phases, and the multifarious influences by which it is continued, preserved, multiplied, checked, injured, destroyed, or extinguished. But, in addition, we must not neglect to learn from natural philosophers what are those general forces which act on organic as

well as on inorganic bodies, and whilst carefully watching every modification these forces undergo, when applied in combination with vital power, gratefully accept any proved identity of action in the living and inanimate world.

OBITUARY NOTICES.

The Secretary then read the following Notices of deceased *Members*:—

Francis Boott, M.D.—Dr. Boott was born at Boston, in Massachusetts, U.S., Sept. 26th, 1792, and was the son of Kirk Boott, an Englishman who had settled there early in life; his mother was a Scotch lady, and his early education was acquired at Harvard University. When only between 16 and 17 years of age he came over to England, where he resided near Derby with a family connected with his own, and where he made the acquaintance of Mrs. Hardcastle, his future mother-in-law, from whom he acquired his taste for botany and for everything that is beautiful in nature and refined in literature and art. At about this time he also became acquainted with Sir Joseph Banks, and formed life-long friendships with the late Robert Brown, Sir William (then Mr.) Hooker, Sir James Smith, and most of the eminent botanists of the day. During the years 1818–20 he made several voyages to America, and formed an excellent herbarium of Massachusetts plants, then little known in this country. These he afterwards gave to Sir William Hooker, in whose Herbarium they are preserved at Kew. On his final return to England in the latter year he determined to follow the medical profession, for which purpose he placed himself under the direction of the late Dr. J. Armstrong, for whose professional ability and private character he ever entertained a profound veneration. From London he went to the University of Edinburgh, where he studied under Hope, Munro, Alison, Pillans, Christison, and other most eminent men, of whom the last two only survive him. After presenting his inaugural Essay on Hydrocephalus, he received his degree of M.D. in 1824, and finally settled in London in 1825. Here he first held the chair of lecturer on Botany in the Webb Street school of medicine, where his friend Dr. Armstrong was professor of *Materia Medica*. His lectures are said to have been admirable, both in matter and style, and to have excited much enthusiasm; whilst his untiring efforts to promote the welfare of

his pupils in other ways were so deeply and generally felt, that on the eve of his too early withdrawal from the lectureship, they in one day raised a large subscription to present a testimonial "to their friend and teacher," a tribute which, with characteristic modesty and consideration, was declined as soon as heard of; he was, however, afterwards persuaded to accept a collection of books instead, in remembrance of their grateful feelings and goodwill.

The death of his friend Dr. Armstrong soon followed, at whose dying request he undertook to publish his life, which appeared in 2 vols. 8vo, in 1833-4, and was entitled 'Memoir of the Life and Medical Opinions of John Armstrong, M.D.; to which is added an Inquiry into the Facts connected with those forms of Fever attributed to Malaria and Marsh Effluvium.' In this work Dr. Boott entered largely into the subject of the plague in Egypt, Syria, Holland, France, and London; holding that the plague obeys the same laws which govern other forms of malignant fever, and does not wholly lose its periodical type in the more northern latitudes. He also stated his belief that mean temperature influences type, which he founded on a careful study of the disease in its march from Italy and the Mediterranean through Paris to Great Britain. He also published in 1837 two lectures on *Materia Medica*.

About this period University College was founded, an institution in which Dr. Boott took the warmest interest, holding for upwards of a quarter of a century the posts of member of its Senate and Council, and being chosen latterly President of the Committee of Council. During this time, and indeed up to the last, he maintained an active correspondence with America, while his house became a place of resort for many of his countrymen, who were not only introduced by him to the men best worth knowing in England, but were also provided with letters of introduction to his continental friends.

For some years Dr. Boott carried on a very successful practice in London, and was especially noted for his treatment of fevers, he being one of the first physicians who, abandoning the old system of confining the patient in hot close rooms, gave abundance of free air in carefully ventilated apartments. For the arduous duties of a full London practice he was, however, constitutionally unfitted; and inheriting a competency at a comparatively early age, he devoted most of his time to the study of literature, both ancient and modern, and to the analysis of an extensive and very difficult genus of plants, that of the *Carices*.

The genus *Carex* is one of the largest in the vegetable kingdom, embracing, according to his computation, upwards of 600 species, and is spread over every quarter of the globe; and to the study of these he latterly gave up most of his time, much to the detriment of his health, though greatly to the interest of science. Amongst other contributions to their history, he prepared the monograph of 158 species, published in Hooker's 'Flora Boreali-Americana,' and analyzed and determined the species in every private and public herbarium to which he could gain access.

More recently he commenced at his own expense the publication of a folio work in two volumes, intended to contain no fewer than 600 plates and descriptions of *Carices*. Of this work 411 admirably executed plates, full of most accurate analyses of as many species and varieties, are already published: he was engaged in its continuation up to within a few weeks of his death, and we understand that a considerable part of a third volume is all but ready for publication. This work is without doubt one of the most munificent contributions ever made to scientific botany, besides being one of the most accurate; on which account it certainly entitles its author to take a much higher place amongst botanists than that of an amateur, which was all his modesty would allow him to lay claim to. *Carex*, he used to observe to his friends, was his hobby; tracing out the characteristics of its multitudinous forms was his delight; and to be the exponent of the structure of every species, after an examination of every available specimen, was his unselfish ambition. The work itself cost him many years of assiduous labour, and a very large sum of money, both drawings, engravings, and letterpress being executed at his own cost. Of his own merits as author of so noble an undertaking Dr. Boott could never be brought to speak (nor to listen to any praise of them), and the motto inscribed on the title-page of the volumes best explains his own estimate of his feelings regarding them—

“The man who labours and digests things most
Will be much apter to despair than boast.”—*Roscommon*.

A double allusion is here intended: to his own assumed incompetency for the task, and the perplexing difficulties the genus *Carex* presents to the systematist. Again, in no part of the volumes is there any allusion whatever to the duration or extent of his labours, or the manifold cares that must attend the production of so considerable a work; and, indeed, the only mention of himself as connected with the task he had set himself is the

following, which occurs in the dedication to John Amory Lowell, Esq., trustee of the Lowell Institute of Boston:—"I say nothing of the difficulties of my undertaking, undoubtedly increased by my inadequacy to treat them successfully."

Of the many kind offices he undertook on behalf of the needy, the sick, and the diffident this is no time to speak, for he suffered no allusion to them during his life; one action alone is so far public, and so truly characteristic, that we may be permitted to mention it, viz. his having placed in All Saints Church, Cambridge, a tablet in memory of Henry Kirke White, a poet in whose character and early fate he was deeply interested. The epitaph for this was written by his friend Professor Smythe, of Cambridge and the medallion portrait was executed by Chantrey; and it is a circumstance worth mentioning, that the first piece of sculpture received by the National Portrait Gallery was his gift to it of Chantrey's original of this medallion.

It was, however, in connexion with the Linnean Society that Dr. Boott was best known in London; he joined the Society in 1819, and acted for some years as its Secretary (viz. from 1832 to 1839) and as its treasurer (from November 1856 to May 1861). The latter office he still held when those changes were introduced into its working, to which the Society is so largely indebted for its present unexampled prosperity; and it is not too much to say that, but for his admirable moderation and judgment, those reforms could not have then been carried out. As it was, with consummate tact and irresistible kindness of manner, he stepped in to harmonize opinions apparently the most opposite, as to what was for the best interest of that venerable body, and carried without a dissentient voice whatever organic changes were required. His tall and fragile frame, silvery voice, and quiet energy were then familiar, both in the Council and general meetings of the Society, at which he practically acted as the Nestor, and that amongst some of the oldest and most eminent scientific men in London.

In this and in all other phases of life Dr. Boott was remarkable for great force of character, boundless sympathy for whatever is good and beautiful, and an enthusiastic admiration for all honest cultivators of literature and science. His house was filled with pictures, chiefly by modern artists selected without regard to names, but with a keenly discriminative eye to harmony of colour and truth of expression; his library was as select as were his pictures; and all his tastes, actions, and manners were

in keeping. When practising as a physician, he discarded the customary black coat, knee-breeches, and silk stockings, for the very good reason that sombre colours could not but suggest gloomy ideas to the sick; and was one of the first who adopted the custom, now universal in the profession, of dressing in ordinary costume. In doing this Dr. Boott adopted the blue coat, gilt buttons, and buff vest of the period, which he continued to wear to the last, and with which dress his casual acquaintances, no less than his personal friends, will ever associate him. In person he was so tall and thin as almost to suggest ill-health, and the refinement of his manners, his expression, address, and bearing were in perfect keeping with his polished mind and many accomplishments. Of enemies he had none—very much, no doubt, because he shunned contact with uncongenial spirits; and he never lost a friend, which is the more remarkable, as he often appeared to be over-enthusiastic in his estimate of the qualities of those he loved: this, however, mainly arose from that true modesty which with him amounted to an unconscious abnegation of self as a standard of comparison, and not to any affectation of admiration which he did not feel; for he was never known to alter such opinions.

Dr. Boott's scientific merits were widely known and recognized. He was on several occasions a Vice-President of the Linnean Society; in 1837 he was elected a corresponding member of the Lyceum of Natural History of New York; in 1835 he became a Foreign Honorary Member of the American Academy of Arts and Sciences; in the same year an honorary Fellow of the Medical Society of Massachusetts; in 1840 a corresponding member of the Boston Society of Natural History; and in 1844 a correspondent of the National Institute of Science of Washington.

Dr. Boott's health had never been robust, and in 1839 he had a dangerous attack of pneumonia. From this time he had repeated slight attacks, but no alarming symptoms occurred till June 1863, when the remaining lung gave way, and from that time he never fairly rallied. He died at his residence, 24 Gower Street, on Christmas day; retaining to the last his faculties and all the characteristics of his most admirable life.

Beriah Botfield, Esq., M.A., F.R.S., S.A., G.S., &c., and M.P. for the borough of Ludlow, was born in the year 1807, the eldest son of Mr. Ralph Botfield, of Norton Hall, Northamptonshire, and grandson of Dr. Withering. His education was commenced at Harrow,

under the Head-Mastership of Dr. Drury, and continued at Christchurch, Oxford, where he graduated in 1828, taking his Master's degree in 1847. Although his tastes, probably in great measure derived from Dr. Drury, and natural disposition led him to literary pursuits, and more especially perhaps to bibliography, his position led him into political life, and in 1857 he was returned for Ludlow in the Conservative interest. He was again returned for the same borough in 1841; but at the general election in 1847 he was defeated. He remained out of the House till the retirement of Col. Percy Herbert again made an opening for his re-entry; and since that period he continued to represent the borough, without intermission, up to his death in August last.

Mr. Botfield had acquired considerable reputation in literature, both in this country and abroad, and was a liberal patron of science in all its branches. He was regarded as one of the soundest bibliographers in Europe, and, as such, published several works that have deservedly attained extensive repute. Amongst these may be mentioned 'An Account of the Cathedral Libraries in England and Wales'—a work of great interest and research; and which has been followed up by 'Notes on Private Libraries of England, from the 9th to the 19th Centuries.' He also published anonymously a 'Journal of a Tour through the Highlands of Scotland during the Summer of 1829,' which contains several notices on subjects connected with natural history, as on the Herring Fishery, the Brora Coal-field, &c. He presented the valuable British herbarium of his grandfather to the Linnean Society.

He devoted much of his time to, and spared no expense in, the formation of a noble library at Norton Hall, which may be regarded as one of the finest private collections ever brought together, and was so extensive even in 1839 as to have been termed by Dr. Dibdin, at that time, "a pyramid of books." He became a Fellow of the Society on the 2nd November, 1859.

John Mussendine Camplin, M.D., M.R.C.S., died on the 3rd November, 1863, aged 73. He was formerly a medical practitioner, though latterly, I believe, retired from active practice. He became a Fellow of the Linnean Society in 1844; and his only published work with which I am acquainted is a short treatise on Diabetes.

The Rev. R. Daniel, M.A. (Clare Hall, Cambridge), F.S.A. & G.S., died suddenly, February 20, 1864, from disease of the heart, at

Combs, in Suffolk, of which place he had been rector for twenty-eight years. Mr. Daniel was well known in his own circle for his botanical acquirements; and he had formed a very extensive and valuable collection of mosses, equalled, I believe, by few in the kingdom. He became a Fellow of this Society on the 5th March, 1862.

Mr. Thomas Corbyn Janson, who died on the 23rd of June last, at his residence at Stamford Hill, was born on the 1st July, 1809, and consequently at the time of his decease had nearly completed his 54th year.

His education was chiefly conducted at the school of Dr. Morell, of Hove, near Brighton, with whom he was a favourite pupil. He early showed a great proficiency in the dead languages, and being in advance of the other boys of the school, though by no means senior to all of them, he was taken out of the usual classes, and read Thucydides and the more difficult authors in Greek and Latin with the master alone. During his boyhood he evinced that ardent taste for natural science which never deserted him. He joined but little in the ordinary sports of youth, but, while at school, passed most of his play-hours in searching for fossils, with which the neighbouring chalk- and gravel-pits abounded. Geology was his first pursuit; but on leaving school, and during the few years which he passed at home before he engaged in business, he devoted himself with his usual enthusiasm to botany, and made a considerable collection of dried plants, chiefly from the neighbourhood of Tunbridge Wells, where his father then resided. His taste for botany was doubtless much increased by his intimacy, almost from his childhood, with the late Mr. Joseph Woods, as well as with our former Treasurer, Mr. Edward Forster, with whom he was a not unfrequent guest both at Hale End and Woodford.

After he entered the banking-house, in which he continued a partner to the time of his death, he had less frequent opportunities for gratifying his taste in these pursuits, but took up the subject of astronomy, which had also been a favourite study with him at one part of his earlier life, and he was a careful and laborious observer of the heavenly bodies.

He became a Fellow of the Linnean Society in March 1843, and was a very constant attender at its meetings, as well as at those of the Linnean Club.

Mr. Janson followed science chiefly as a recreation. His retiring habits prevented him from placing himself at any time

before the public, and he never committed any results of his observations to print; but as a lover of natural history he yielded to few. He was a liberal contributor to objects connected with the Societies to which he belonged; and his premature death will be felt as a loss not easily repaired.

Among many other instances of his liberality to this Society may be specially mentioned a contribution of ten guineas to the fund for meeting the expenses connected with our removal to Burlington House; a recent donation of twenty pounds to the Library Fund; a third cabinet, in addition to the two formerly presented by his uncle (the late Mr. Joseph Janson), for the reception of the Society's collection of fruits; and a legacy of £200, payable on the decease of his widow.

Mr. Janson leaves a widow surviving him, but no issue.

John Jesse, Esq., M.R.C.S., F.R.S. & R.A.S., died on the 23rd September, 1863, at his residence, Llanbedr Hall, near Ruthin, in Denbighshire, in his 61st year, having been born at Manchester in the year 1801. He was brought up to the medical profession, and was admitted a member of the Royal College of Surgeons in the year 1825. He was High Sheriff for Denbighshire in 1856, and in the commission of the peace for that and the neighbouring counties of Cheshire and Montgomery. He contributed several papers on professional subjects in the 'Provincial Medical Journal,' as on "Hæmorrhage and Necrosis after Amputation," and on the "Philosophy of Dislocation." Mr. Jesse had an extensive knowledge of English literature and a general love of science, and was a munificent contributor to many charitable and religious works, amongst which may be recorded his gift of a magnificent and costly window to Ruthin Church; and at the time of his death he was in the course of erecting a new church for his parish, at a cost of upwards of £300. He was one of the oldest members of the Linnean Society, having been elected on the 21st January, 1823.

Benjamin Maund, Esq., was born in the year 1790. For many years he carried on the combined business of a chemist, bookseller, printer, and publisher, at Bromsgrove, in Worcestershire. Having a great love for flowers and gardening, he endeavoured to spread a taste for these subjects, and commenced, in 1825, the publication of a monthly periodical, entitled 'The Botanic Garden.' Each Number of this publication contained a plate representing four hardy garden flowers, neatly engraved from drawings by Mr. Edwin Dalton Smith, accompanied by as many pages of

letterpress, furnished and printed by himself. This work extended to upwards of twenty volumes, and the neatness and elegance with which it was got up reflect great credit on Mr. Maund's taste. In 1837, however, he projected a publication of rather more ambitious character, under the title of 'The Botanist.' In this he secured the cooperation of the late Professor Henslow, of our President Mr. Bentham, Dr. Graham, Professor of Botany in Edinburgh, and others. This work, which extended to five volumes small 4to, exhibits the same elegance and taste in its getting up as 'The Botanic Garden,' and each Number was accompanied by portions of a valuable introduction to botany, and dictionary of botanical terms, from the able pen of Professor Henslow; but these, owing to the discontinuance of the periodical, were unfortunately never completed.

Mr. Maund, having realized by his honourable industry a moderate competence, retired about twelve years since, first to Folkestone, and afterwards to Sandown in the Isle of Wight, where he died on the 21st of April, 1863. He was elected a Fellow of this Society on the 5th June, 1827.

John Bowyer Nichols, Esq., F.S.A. & R.H.S., died on the 19th October, 1863, at Hanger Hill, Ealing, in his 85th year, having been a Fellow of this Society since the 3rd November, 1812. He was the only son of Mr. John Nichols, one of the printers of the Votes and Proceedings of the House of Commons, a business which he himself conducted for more than sixty years. His father, like himself, was an author, however, as well as printer, and published, among other works, a 'History of Leicestershire,' 'Bibliotheca Topographica,' &c. As writer and editor, Mr. Nichols was long connected with the 'Gentleman's Magazine;' and he was also one of the editors of the improved edition of Hutchins's 'History of Dorset,' the third and fourth volumes of which were superintended by him. As an author, he published 'Collectanea Topographica et Genealogica,' in eight vols. 8vo, which have been continued by his son and successor, Mr. John Gough Nichols. And besides these might be mentioned several antiquarian and topographical publications of minor importance.

Samuel Peace Pratt, F.R.S. & G.S., was born on the 6th November, 1789, and was educated at Mr. Clarke's school at Enfield. At an early age he appears to have been distinguished for his love of physical natural science, and for the zeal with which he devoted himself to its pursuit, and especially to geology. In 1823 he went to reside at Bath, and remained there for about six-

teen years, during which he was an active member of the Literary Institution of that city. Mr. Pratt became a Fellow of this Society in the year 1829, and was in the same year also admitted into the Geological Society, in whose Transactions he has published several valuable and interesting memoirs; amongst which may be enumerated, "On the Existence of *Anoplotherium* and *Palæotherium* in the Lower Freshwater Formation at Binstead, near Ryde, in the Isle of Wight," and "On the Osseous Caves of Santo Ciro, near Palermo," in which he showed from the boring of *Lithodomus* that the country had undergone elevation subsequent to the habitation of the Mediterranean by existing species. In 1843 he read a memoir "On the Geology of the neighbourhood of Bayonne," and in 1852 a more important one "On the Geology of Catalonia," in which he corrected some grave errors inserted in the French map of the district.

This excellent and useful geologist and estimable man died at his residence, Mellone Villa, Fulham Road, on the 22nd September, 1863, aged 73.

Charles Tomkins, M.D., who died on the 17th May, at the age of 68. He was formerly in considerable practice at Abingdon in Berkshire, but has latterly resided at Weston-super-Mare in Somersetshire, to which place he removed in 1852. He was an intimate friend of Mr. Bicheno, formerly Secretary to this Society, and by whom he was proposed as a Fellow of the Society, into which he was elected in November 1823.

Dr. Tomkins was a man of considerable acquirements, and took especial interest in the extension of education among the poorer classes, acting for some years as Secretary to the British School at Abingdon.

To the close of his life he continued to interest himself in botanical pursuits; and so lately as 1859 forwarded to the Society specimens of the rare *Chrysocoma Linosyris*, from Weston-super-Mare, and of *Pæonia corallina*, gathered, in flower, on the Steep Holmes Island, its only British habitat.

Mr. Joseph Woods was born at Stoke Newington, Middlesex, on the 24th of August, 1776. His parents were members of the Society of Friends; his mother being a daughter of Mr. Samuel Hoare, whose son Samuel eventually became the senior partner in the banking-house of Hoare, Barnett, and Co., of Lombard Street. His father, although successfully engaged in commercial pursuits, was a gentleman of high classical and antiquarian attainments, and a frequent gratuitous contributor, both in Latin

and English prose and verse, to the pages of the 'Monthly Ledger' (a short-lived periodical), the 'Gentleman's Magazine,' and other literary publications. Joseph, the subject of this notice, as well as his elder brother Samuel, who died in 1853, aged 80, appears to have inherited the tastes and talents of his father. In the days of his childhood, to use his own words, "there was a great deficiency of good schools among the Society of Friends, and one year passed in attendance on a day-school in London, kept by a Mr. Lord, was the only efficient schooling I ever had." He must, however, in later years have made up for the defects of his early education by the most assiduous self-instruction, as he subsequently became proficient in Latin, Greek, and Hebrew, as well as the modern languages, French, German, Italian, and Romaic, in which he was able to converse familiarly. Having been obliged to leave school by the state of his health, for which sea-bathing had been recommended, he was sent, when about thirteen or fourteen, to Folkestone, where he became acquainted with the late Lewis Weston Dillwyn, with whom (the two lads being about of an age) much of his time was spent. At the age of sixteen, Mr. Woods was apprenticed to Mr. J. Beck, at Dover, and, during his stay there, paid some attention to botany; but it was not till some years later that, on revisiting Dover, he was fairly inoculated with a taste for that science by his friend Dillwyn, who had succeeded him in that place, and by whom he was introduced to the three brothers, Edward, Thomas Furley, and B. M. Forster, and subsequently to the breakfast-table of Sir Joseph Banks, where his passion for the pursuit of natural history could hardly fail of being further developed.

His health and strength being re-established, and finding his commercial avocations at Dover uncongenial, Mr. Woods, at the close of his apprenticeship, yielded to a natural inclination for architectural design, and placed himself, about the year 1798, with Mr. Alexander, the architect of the West India Docks, and who was then largely engaged in carrying out some important public works in the metropolis and elsewhere. Upon quitting Mr. Alexander, he seems to have commenced business on his own account, devoting himself, with his usual energy and perseverance, to the practice of his profession, notwithstanding that the state of his health rarely left him long free from suffering. In the year 1806, he united with a few professional friends to found, with a view to mutual improvement by discussion and the reading of papers, the London Architectural Society, of which he was the

first president. It consisted of about twenty members, of whom he was the last survivor. To the publication of this rather short-lived* Society, consisting of two thin octavo volumes, Mr. Woods contributed several essays: one, read in 1807, on the uninviting subject of Dilapidations, necessarily dry and technical, but to which subsequent writers have admitted their great obligation; another, illustrated by four plates from his designs, "On the Situations and Accompaniments of Villas." In a third, read in 1808, "On modern Theories of Taste," he reviewed those of Hogarth, Burke, Uvedale Price, Repton, Alison, Gilpin, &c., in a manner which gave abundant evidence of the thought and study by which he prepared himself subsequently to examine and illustrate the works of ancient art in foreign countries.

Shortly after the appearance of these essays, Mr. Taylor, the architectural publisher, seems to have proposed to Mr. Woods that he should arrange for publication, as a fourth volume of the magnificent 'Antiquities of Athens,' the remaining documents of the deceased Athenian Stuart. It was the singular fate of this work that each of its four volumes was ushered into the world by a different editor. The first volume appeared in 1762; the second, though bearing date 1787, was not published till after Stuart's death in 1788, when the arrangement was completed by Newton; the third, edited by Mr. Reveley, was issuing in 1794; and, after a further interval of twenty years, the papers were placed in Mr. Woods's hands, which enabled him to bring out the fourth (and concluding) volume in 1816, just fifty-four years after the publication of the first volume by Stuart himself. Most of the matter had been already prepared by Stuart, and the plates engraved under his superintendence. Mr. Woods, however, had to select from a vast mass of crude materials of more or less interest, and some of them very imperfect. "This" (says his friend

* In an account of this Society and its publications, which appeared in the 'Builder' for February 14, 1863, an extract is given from a letter addressed, a few days before, by Mr. Woods to Professor Donaldson, who thus speaks of the writer:—"It is charming to see my old friend Joseph Woods seated in his study, finishing up some of his Grecian sketches made above forty years ago, and discoursing of arts and artists with grace and vivacity, and of reminiscences when we were together at Rome, and were meeting Canova, Camuccini, Thorwaldsen, and like men of mark there, with John Soane, jun., Bassevi, Bond, Saunders, George Rennie the sculptor, and other such, now passed away. Hardwick and myself used to go to his rooms, and we read Goldoni and Alfieri together, and battled it out on many questions of taste regarding Greek and Roman architecture."

Professor Donaldson, in an interesting memoir of him, read, in January last, to the Royal Institute of British Architects) "he did with great judgment, by rendering more complete the series of the sculptures of the Parthenon, selecting many choice fragments of Attic art, and the curious ox-head details from Delos, &c., all rendered with the care and delicacy of the original work. With like scrupulousness, he availed himself of Stuart's own MSS. and chance notes, adding little of his own, except in direct explanation, and, with a modesty and self-negation characteristic of the man, ascribing all merit to Stuart alone, and abstaining from bringing forward the personal researches and labour which must have been required by so difficult a task." It was about the time when he was engaged in the publication of this volume that he must have been employed to prepare designs, and carry out the works, for the Commercial Sale Rooms, in Mincing Lane. "The elevation," says Mr. Donaldson, "is one of the most striking in the City of London; and although situate in one of the narrowest thoroughfares of one of the most out-of-the-way parts of London traffic, no passer-by can resist the impression which its simple character and noble proportions produce on the mind of the observer. The entrance-floor is simply channelled; but the principal story consists of Ionic columns, boldly projecting and as boldly profiled. It was a fine result of his study of Grecian monuments, and shows that, if he had ultimately followed his art with the like impressions and the like sobriety of treatment, I might have had to quote many other monuments honourable to his reputation as a man of taste."

While thus actively engaged in the duties of his profession, Mr. Woods still found time to prepare that elaborate Monograph of the difficult genus *Rosa*, in which attention was first called to the importance of the *setæ* on the stem in characterizing species, and which, read before this Society in 1816, and published in the 12th volume of our Transactions, at once established his reputation as a systematic botanist. Sir J. E. Smith makes continual reference to it in his revision of the genus in the 'English Flora,' and bears testimony to the value of the characters mainly relied upon by Mr. Woods, though disposed to think, by a too absolute dependence on some of them, he may have been induced in some few instances to elevate mere varieties to the rank of species.

The Continent having, by the fall of Napoleon, become once more accessible to English tourists, Mr. Woods, in 1816, determined to avail himself of the opportunity to study some of the

best examples of architecture in foreign lands. With this view, and intending, as he says, to resume the practice of his profession on his return (an intention never carried out), he passed about four years in a tour through France, Switzerland, Italy, Sicily, and Greece, during which he formed a most extensive collection of sketches and critical notes upon the principal public buildings which came in his way. The results were given to the world, in 1828, in two quarto volumes, under the title of 'Letters of an Architect from France, Italy, and Greece,'—a work, says the late Mr. Britton, "written by a man of science, of general knowledge, of discriminating habits of observation: it may be referred to with confidence, and read with pleasure, by every person who is attached to the fine arts generally or to architectural antiquities in particular." Mr. Donaldson, the eminent President of the Institute of British Architects, thus speaks of the work:—"Whether describing the monuments of art, the customs of the people, politics, or religion, he discusses all with a calm, impartial, and unimpassioned spirit; for, although deeply impressed with every object he saw, he never allowed any intensity of impression to mislead his sober judgment. It is the same philosophic mind, and lucidity of perception, that directed his descriptions and matured his judgment on the architecture of the various countries through which he passed. Imbued, as he educationally was, with the purity and sublime beauty of Grecian art, he still had admired and revered the impressive grandeur of mediæval buildings in England." . . . "Throughout, he generalizes his observations, and seeks to form some broad principles of composition, as to arrangement, proportions, or decorations of buildings, or the distribution of light and shade. He passes in review the most remarkable buildings, ancient or modern, of all styles, in France, Italy, Greece, Turkey, and Sicily, and makes his remarks on them in the most simple and unaffected manner, never seeking to enhance the subject by ambitious language or high-flown sentiment: all is calm and tranquil, yet firmly treated with simple truth. His pages teem with maxims of precious meaning, and he treats on every subject connected with our art, including his ideas for the studies of the architect and the best system of architectural education."

On his return to England in 1819 or 1820, Mr. Woods took up his abode in Furnival's Inn, where, though his principal occupation for several years was the preparation of his 'Letters' for publication, much of his time was also devoted to the arrangement of the botanical collections formed during his recent tour,—his

British herbarium (which must have contained some interesting varieties, now no longer to be found in the neighbourhood of London) having been, some years before, presented to his old friend Mr. Bicheno, by whom, on his leaving England for Van Diemen's Land, it was given to the Natural History Society of Swansea. This British herbarium Mr. Woods subsequently endeavoured, as far as possible, to replace; while his foreign collection was greatly augmented during several successive visits to the Continent, in which, though he did not by any means ignore architecture, he gradually came to regard botany as his profession—one which, if it did not produce any income, had at least the advantage, to an invalid, of enabling him to study when the state of his health would permit, and to relax so soon as he found it painful. The botanical notes made during these continental excursions, and in others made within the British Islands, were communicated either to this Society, to Sir W. J. Hooker for publication in the 'Companion to the Botanical Magazine' (viz. "Botanical Excursion in the North of England in 1835," and "Account of a Botanical Excursion into Brittany in 1836"), or to the 'Phytologist,' in the successive volumes of which appear, "Notes of a Botanical Excursion in France in 1843" (vol. i.); "Notes of a Botanical Tour in Germany in 1844" (vol. ii.); "Notes of a Botanical Excursion in Hants in 1849" (vol. iii.); "Letter to R. Brown, Esq., P.L.S., containing Botanical Memoranda of a Visit to France in 1851" (vol. iv.); "On the Botany of the Great Orme's Head, Caernarvon, in 1855" (new ser., vol. i.); and "Some Botanical Notes made during a Tour through a part of Ireland in 1855" (new ser., vol. i.).

His last journey on the Continent was made in the summer of 1857, when he was already upwards of 80 years of age; and the results, under the title of "Notes of a Botanical Ramble in the North of Spain," were read before the Linnean Society in November 1857, and published in the second volume of its 'Journal.'

The infirm state of his health continuing to unfit him for the struggle of business-life, and being possessed of some independent means, he at length resolved to quit the profession of an architect, and, having disposed of the greater part of his valuable library, finally left London, and went to reside with his maiden sister at Lewes, in Sussex. Here he remained during the last thirty years of his life, devoting much of his time to the investigation of the botany of the county, a pursuit which naturally brought him into frequent communication with the late Mr. William Borrer, with whom he had long kept up an active correspondence, and whose

death, in January 1862, must have been deeply felt by one who had survived so many of the scientific friends of his early days.

In 1850 appeared his 'Tourist's Flora,' a work in the preparation of which he had been engaged during many previous years, and which, embracing as it does a much larger portion of Europe than had been included by any previous author of recent date, has become an almost indispensable *vade mecum* of the English traveller on the Continent. "Few books," observes Sir William Hooker, in the 'Journal of Botany,' "were more required for the use of the many English travellers who make the ordinary European tours, in their own country or on the Continent, and who desire an acquaintance with the many vegetable productions they see around them, than one like the present; and few men are more competent to prepare such a work than Mr. Joseph Woods, a very considerable portion of whose long life has been devoted to travelling, at home and abroad, with this special object in view. He is familiar with most of the plants described in this volume, from having studied them in their native localities; and he has taken great pains to give the essential characters of the genera and species in as few words as possible."

Down almost to the day of his decease, which occurred on the 9th of January last, he was steadily occupied in the preparation of a second edition of this work, for which he had collected an ample store of materials. These, together with his herbarium, have now become the property of Mr. F. Townsend, of Leanington. Among his varied attainments, he was an admirable artist, and had gradually accumulated an extensive series of sketches, which, even to the close of his life, were remarkable for their accuracy and for the firmness of the pencilling. Many of the latest of these sketches were made in connexion with a revision of the perplexing genus *Rubus*, upon which he had already published something in the 'Phytologist' (new ser., vol. i.), and on which he was occupied during great part of the past summer and autumn. It thus proved to be the last of his botanical labours, as the revision of the allied genus *Rosa* had been his first.

In addition to the above-mentioned Synopsis of the British species of *Rosa*, which appeared in the 12th volume of our 'Transactions,' the following papers were communicated by him to this Society, and published in successive volumes of the 'Transactions,' 'Journal,' &c. :—

1. Observations on the Species of *Fedia*, in 1835. — *Transactions*, vol. xvii.

2. Observations on the Genera of European Grasses, in 1837.—*Transactions*, vol. xviii.
3. On *Crepis biennis* and *Barkhausia taraxacifolia*, in 1841.—*Ibid.* vol. xix.
4. An attempt to arrange the *Carices* of Middle Europe, in 1844.—*Ibid.* vol. xix.
5. Remarks on the Genus *Atriplex*, in 1849.—*Proceedings*, vol. ii.
6. On the various Forms of *Salicornia*, in 1851.—*Ibid.* vol. ii.
7. Notice of his Botanical Notes made during a tour in France, in 1852.—*Ibid.* vol. ii.
8. Notes of a Botanical Ramble in the North of Spain, in 1857.—*Ibid.*, § *Botany*, vol. ii.

Mr. Woods was for upwards of sixty years a Fellow of this Society, of which he lived to be nearly the oldest member. He was also a Fellow of the Geological Society, of the Society of Antiquaries, and an Honorary Member of the Royal Institute of British Architects, now presided over by his old friend and fellow-traveller, Professor Donaldson, to whose memoir, communicated to the Institute in January last, we are indebted for much of the information contained in this notice.

His name will be perpetuated among botanists by the well-marked genus of Ferns dedicated to him by the late Mr. Robert Brown, in the 11th volume of our 'Transactions,' and so exquisitely illustrated by drawings from the pencil of Francis Bauer; by a species of *Rosa*, appropriately named in honour of him by Dr. Lindley, in his 'Rosarum Monographia;' and by the beautiful Irish *Jungermannia*, first discovered by himself, and named after him by Sir W. J. Hooker, in his admirable work on the British *Jungermannia*, and also described and figured in the 'Supplement to English Botany,' to which work he was a not unfrequent contributor.

His favourite recreation was chess, a game in which his very retentive memory was of immense advantage to him, and in which he acquired so great a proficiency that, even down to the close of his life, very few could cope with him. Painstaking and laborious even in his amusements, he kept a record, forming three thick octavo volumes, of many games played, about the years 1808–1816, with Lewis, Sarratt, Cochrane, Samuda, and several of the best players of his day, for most of whom he seems to have been fully a match. These games were carefully analyzed, and their possible variations worked out. For this purpose he invented a set of symbols to represent the different pieces, which enabled him to note their position and movements much more concisely than can

be done by the usual plan of employing initial letters. He does not seem, however, to have published anything upon the game, with the exception of occasionally contributing to the various periodicals' chess-problems, in the construction and solution of which he displayed great ingenuity.

In any movement for the extension of education among the middle and lower classes Mr. Woods ever took a deep interest. In 1841 he published 'Notes on Schools for the Labouring Classes in Ireland,' the result of a journey undertaken for the special purpose of investigating the condition of that country in regard to its educational progress under the system of the Government Board established in 1831. For many years, while residing in Furnival's Inn, he took a very active part in the management of the British School for Boys in Harp Alley, Farringdon Street, of which he was the Honorary Secretary, and where he had for coadjutors the late Messrs. Bicheno, Joseph Janson, Daniel Sharpe, Richard Taylor, and others. For a very considerable period he used to visit this school two or three times a week, and examine into the state of the different classes, detaining the monitors after the other children were dismissed, in order to give them a lesson himself. He was likewise a frequent visitor to the Central British School in the Borough Road, and to one founded at Stoke Newington by the late William Allen, Mr. Janson, and other members of the Society of Friends. About this time he published a set of excellent blank maps, with keys for the use of the teachers, which contained a great deal of valuable information respecting the various places mentioned in them. With the view of better qualifying for their duties the lads employed as monitors, and also of making up to them the time occupied in teaching their juniors, a class was formed by the selection of one or two of the more advanced of the monitors from the above-mentioned schools, who were invited to meet on alternate weeks, either at his own chambers or at the house of his friend Mr. Janson, where, with the assistance of the masters of the respective schools and any other friends who might be willing to cooperate in the work, the lads were examined on some subject upon which they had received notice to prepare themselves during the week. Nor did Mr. Woods's interest in his young friends cease with their school-days. With that partiality for youth which was one of the most pleasing traits in his character, he attached himself readily to any young man who was earnestly engaged in his studies; he would assist him by his advice, not dogmatically, but simply, kindly given; he

would read with him, and open up all the stores of his varied experience; he would correspond with him, if absent, and take the greatest interest in his success; and happy were those who, thus guided by his counsels and encouraged by his approval, grew up to be the cherished companions of after-years.

Mr. Woods was a very careful and accurate artist, and made an immense collection of water-colour drawings, chiefly landscape, which, though sometimes defective in vigour of colouring, are remarkable for their exquisite pencilling, as well as for their minute accuracy and the perfect knowledge of perspective which they evince. Even up to the last week of his life he continued to occupy himself in re-examining the sketches taken in years long past, and finishing off some of the drawings that still remained incomplete, or in revising his notes and journals; leaving also several unpublished essays on architectural subjects.

The last words in one of his journals, written in a fine clear hand, about two years ago, are these:—"Now, in my 86th year, I experience considerable diminution of muscular strength, and I find myself incapable of continual exertion either of mind or body. But I have great reason to be thankful for what I still enjoy. I want no physical comfort: I have a loving sister and kind friends; I have little pain of any sort, and my mind seems to be perfectly clear." "And thus" (to quote once more from the Memoir to which we have already been so greatly indebted), "on the 12th of January, 1864, in his 88th year, in his own study, and seated in his chair, passed away this calm, beautiful spirit, without a struggle, his hand clasped in that of his loving and beloved sister, with a Christian character respected by all, and most loved by those who knew him best."

Mr. James Drummond, who died in Western Australia on the 27th of March, 1863, at the advanced age of 79, was elected an Associate of the Linnean Society so far back as 1810, and has been one of the most eminent and useful amongst those who have enjoyed the same honour. He was the brother of the equally indefatigable collector, Thomas Drummond, to whom our gardens have been indebted for the introduction of so many hardy North American plants. When first elected an Associate, he was in charge of the Botanic Garden at Cork (in the neighbourhood of which place, it may be mentioned, he discovered *Neottia gemmipara*, *Pinguicula grandiflora*, &c.). Here he remained till 1829, when he proceeded to the Swan River Settlement, now termed Western Australia, where he busily employed himself in the

collection of plants, both living and for the herbarium. Of the former he introduced numerous highly ornamental species for our gardens, many of which are distinguished by his name as a specific appellation.

Early in 1839 he commenced preparing for sale in Europe sets of the plants of the district in which he resided, which include a vast number of novelties, and rival in interest and importance those from any other part of the world. Mr. Drummond's exertions were actively continued for upwards of fifteen years, during which he made extensive journeys as far as King George's Sound in a south-east direction, and the Moore and Murchison Rivers to the northward. Accounts of these journeys and of his discoveries will be found in the 'Botanical Journal' (vols. ii. iii. iv.), in the 'London Journal of Botany' (vols. i. ii. iii.), and in the 'Kew Journal of Botany' (vols. i. ii. iv. and v.).

Dr. Lindley's able 'Sketch of the Vegetation of the Swan River Colony,' published in 1839, is founded chiefly on materials furnished by Dr. Drummond's collections.

A genus of *Saxifragaceæ*, named in honour of Thomas Drummond by DeCandolle, having subsequently merged in *Mitellopsis*, and the *Drummondia* of Sir W. J. Hooker not having been universally adopted by muscologists, a genus of West Australian *Diosmeæ* was dedicated to the two brothers by Dr. Harvey, in a paper published in the 7th volume (3rd series) of Hooker's 'Journal of Botany,' entitled "Characters of some new Genera of Plants recently discovered by Mr. James Drummond in Western Australia."

Mr. Charles McIntosh, an eminent horticulturist, was born at Abercainry, in Perthshire, in August 1794, where his father was a gardener, and whom he succeeded in the charge of the gardens at that place; whence he afterwards removed to undertake the management of those belonging to Taymouth Castle, the seat of the Marquis of Breadalbane. But while still a young man he left this situation, and, proceeding to the south, was engaged as gardener to Sir Thomas Baring, at Stratton Park, Hampshire. Having relinquished this engagement, he was employed under Mr. Horner in the laying out and planting of the grounds attached to the Colosseum (which was at that time completed) in the Regent's Park. His intelligence and energy recommended him to the notice of Prince Leopold; and at Claremont he resided for many years, during which he effected very considerable improvements in the gardens and grounds. After the Prince's accession to the Belgian

throne, Mr. M'Intosh was continued in his service, not only to superintend the Royal gardens at Claremont, but also to remodel those at Laecken, of which he had charge for some time. But in 1838 he returned to Scotland, to take the management of the Duke of Buccleuch's gardens at Dalkeith; and it was he who planned the magnificent grounds and conservatories belonging to that palace. Having performed the duties of this situation for twenty years, Mr. M'Intosh resigned his appointment, and became a landscape-gardener and garden-architect on his own account—an occupation in which he justly acquired the highest reputation in all parts of England and Scotland.

Mr. M'Intosh was a voluminous writer, and his publications upon several branches of the horticultural profession are numerous. Those, however, by which he will be best and most favourably known are 'The Practical Gardener,' published many years ago, and of which several editions have appeared; 'The Greenhouse;' 'The Orchard and Fruit-Garden,' of more recent date; and the 'Book of the Garden,' which records the results of modern practice, and may be said to form a sort of garden Encyclopædia. He was also a frequent contributor to various horticultural and agricultural periodicals. The Horticultural department of the 'Scottish Farmer' was conducted by him from its commencement.

He died on the 9th of January, in the present year, at his residence, Newcome Villa, Murray-field, in his 70th year.

The Rev. W. Stobbs was born at Roxburgh, on the 13th December, 1799, the son of parents more marked by their piety and worth than by their position in life. The means for his support, therefore, and for the prosecution of his education were dependent solely upon his own efforts. He first taught privately in various families of the sheep-farmers scattered among the Cheviot Hills, and in after-life often adverted with interest to the kindness he experienced, and the pleasures he enjoyed, amid what he called the labours of his boyhood. He subsequently proceeded to Edinburgh, where, during his whole curriculum of study, he taught in a public school. Having in this way passed through the usual university course, he was licensed as a minister of the gospel by the Presbytery of Edinburgh in 1824.

The first call he accepted was that of the congregation of Ellon, where he remained a year before entering upon a wider sphere of usefulness in Stromness, into which cure he was inducted on the 11th of June, 1829, and where he passed the remainder of his days

in the conscientious, zealous, and successful performance of all the duties of his sacred office. Grave, sober-minded, temperate, devout, and wise, his life in all respects adorned the doctrines he preached.

But in the midst of these important labours, Mr. Stobbs, in his remote parish, still found leisure and inclination to devote considerable attention to natural history. With a view to its promotion, he, in cooperation with his friend, the Rev. Mr. Clouston, succeeded in instituting the "Orkney Natural History Society," whose labours are well known, and have been highly appreciated by many naturalists. To this useful institution he actively performed the duties of Secretary up to the time of his death. He was, in fact, during his life its mainspring; and it is chiefly to his unwearied exertions that the Society owes not only the building for a Museum, but also the arrangement of the specimens contained in it. It is much to be hoped that so excellent a work should be continued with equal zeal after the decease of its first promoter.

Mr. Stobbs's death, which took place in March 1863, was rather sudden; and his funeral was remarkable from the circumstance that the company collected to do his memory honour on the occasion was the largest ever assembled together for such a purpose in Orkney, the concourse being estimated at 2000, the procession extending nearly half a mile in length.

The Secretary also announced that twenty-nine Fellows and two Foreign Members had been elected since the last Anniversary.

At the Election which subsequently took place, George Bentham, Esq., was re-elected President; William Wilson Saunders, Esq., Treasurer; and George Busk, Esq., and Frederick Currey, Esq., Secretaries. The following five Fellows were elected into the Council, in the room of others going out: viz.—William Baird, M.D., Daniel Hanbury, Esq., John Lubbock, Esq., George Mac Leay, Esq., and F. P. Pascoe, Esq.

Dr. Alexander Prior, on the part of the Auditors of the Treasurer's Accounts, read the Balance-sheet, by which it appeared that the total Receipts during the past year, including a Balance of £383 9s. 9d. carried from the preceding year, amounted to £1837 16s. 9d.; and that the total Expenditure during the same period (including the purchase of £400 Consols.) amounted to £1298 19s. 4d.; leaving a Balance in the hands of the Bankers of £538 17s. 5d.

June 2, 1864.

George Bentham, Esq., President, in the Chair.

The President nominated J. J. Bennett, Esq., J. D. Hooker, M.D., John Lubbock, Esq., and W. W. Saunders, Esq., Vice-Presidents for the ensuing year.

Dr. Welwitsch, A.L.S., exhibited a series of *Aroideæ* from Angola, principally to show the successive metamorphoses which occur in the leaves of *Amorphophallus* and some allied genera.

The following Papers were read, viz. :—

1. "On the *Conanthereæ*;" by John Miers, Esq., F.R.S. and L.S. (See 'Transactions,' vol. xxiv. Part 3.)

2. "On the Individual Sterility and Cross Impregnation of certain species of *Oncidium*;" by Mr. John Scott. Communicated by Charles Darwin, Esq., F.R. & L.S. (See 'Botanical Proceedings,' vol. viii.)

3. "Notes on British Fungi;" by Frederick Currey, Esq., F.R. & L.S. (See 'Transactions,' vol. xxiv. Part 3.)

4. "On *Sloëtia*, a new genus of *Moraceæ*, from Sumatra and Singapore;" by Mr. Salpig Kurz, Curator of the Herbarium, Botanic Garden, Calcutta. Communicated by T. Anderson, M.D., F.L.S., with a Note by Dr. Anderson. (See 'Botanical Proceedings,' vol. viii.)

5. "Descriptions of new species of Hymenopterous Insects collected by Mr. A. R. Wallace in the islands of Sumatra, Sula, Gilolo, Salwatty, and New Guinea;" by F. Smith, Esq., Assistant, Zoological Department, British Museum. Communicated by W. W. Saunders, Esq., V.P.L.S. (See 'Zoological Proceedings,' vol. viii.)

6. "On the Structure and Homologies of the Renal Organ in the Nudibranchiate *Mollusca*;" by Albany Hancock, Esq., F.L.S. (See 'Transactions,' vol. xxiv. Part 3.)

7. "Descriptions of new tubiculous Annelides in the Collection

of the British Museum, part 2 ;" by W. Baird, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)

June 16, 1864.

George Bentham, Esq., President, in the Chair.

Mr. Mivart, F.L.S., exhibited a specimen of a curious Monstrosity of *Digitalis purpurea*, apparently a fusion of several of the terminal flowers into one cup-shaped corolla, and median floral proliferation; the adventitious branch just about to pass through the open carpels.

The following Papers were read, viz. :—

1. "Description of the Skeleton of a *Dinornis* presented by Dr. Gibson to the Museum of the Yorkshire Philosophical Society;" by Thomas Allis, Esq., F.L.S. (See 'Zoological Proceedings,' vol. viii.)
2. "On the Sexual Relations of three Forms of *Lythrum Salicaria*;" by Charles Darwin, Esq., F.R. & L.S. (See 'Botanical Proceedings,' vol. viii.)
3. "Notes on the Sterility and Hybridization of certain species of *Passiflora*, *Disemma*, and *Tacsonia*;" by Mr. John Scott. Communicated by Charles Darwin, Esq., F.R. & L.S. (See 'Botanical Proceedings,' vol. viii.)
4. "On the Œsophagus of the Ruminantia;" by William Rutherford, M.D. Communicated by John Anderson, M.D., F.L.S. (See 'Zoological Proceedings,' vol. viii.)
5. "On a Peloria and semidouble Flower of *Ophrys aranifera*;" by M. T. Masters, M.D., F.L.S. (See 'Botanical Proceedings,' vol. viii.)

Receipts and Payments of the Linnean Society from May 1, 1863, to April 30, 1864.

	£	s.	d.	£	s.	d.
Balance in the hands of the Bankers at the last audit	383	9	9			
Admission Fees	150	0	0	15	2	0
Compositions	510	0	0	41	10	5
Annual Contributions of £2 2s.	33	12	0	112	19	1
Do. of £3	490	0	0	196	0	0
Transactions and Journal sold	111	8	1	425	17	6
Sale of Collections	128	15	3	108	10	5
Dividends on Consols	30	11	8	18	9	3
				11	5	8
				£929	14	4
				369	5	0
				588	17	5
				£1837	16	9
				Purchase of £400 Consols		
				Balance in the hands of the Bankers		
				£1837	16	9

W. WILSON SAUNDERS, *Treasurer.*

The foregoing Accounts have been examined, and the Balance in hand found to be correctly stated at £538 17s. 5d.

GEORGE BENTHAM, *President.*
 R. C. A. PRIOR,
 JOHN VAN VOORST.

H. F. STANTON,
 GEORGE BUSK, *Secretary.*

May 20, 1864.



ADDITIONS

TO THE

LIBRARY OF THE LINNEAN SOCIETY.

RECEIVED FROM JULY 1, 1863, TO JUNE 30, 1864.

[Continued from Vol. VII., page lxxxiv.]

	TITLES.	DONORS.
ACADEMIES and SOCIETIES.		
Amsterdam :—		
	Kon. Akademie van Wetenschappen, &c. Jaarboek voor 1862. 8vo. Amsterdam. Verslagen en Mededeelingen. Afdeling Letterkunde, deel 7. 8vo. Amsterdam, 1863. Afdeling Natuur- kunde, deel 15 en 16. 8vo. <i>Ib.</i> 1863-64.	THE ACADEMY.
Basel :—	Naturforschende Gesellschaft. Verhandlungen, Theil 3, Heft 4. 8vo. Basel, 1863.	THE SOCIETY.
Batavia :—		
	Bataviaasch Genootschap van Kunsten en Wetenschappen. Verhandelingen, deel 29. 4to. Batavia, 1862. Tijdschrift voor Indische Taal-, Land-, en Volkenkunde, deel 11 en 12. 8vo. <i>Ib.</i> 1861-62.	THE SOCIETY.
	Kon. Natuurkundige Vereeniging. Natuurkundig Tijdschrift voor Nederlandsch Indië, deel 24 (=5 ^{de} serie, deel 4), afl. 1-4, en deel 26 (=6 ^{de} serie, deel 1), afl. 1 en 2. 8vo. Batavia, 1862-63.	THE ASSOCIATION.
Berlin :—		
	Kön. Akademie der Wissenschaften. Abhandlungen, aus dem Jahre 1862. 4to. Berlin, 1863. Monatsberichte, aus dem Jahre 1863. 8vo. <i>Ib.</i> 1864.	THE ACADEMY.

- | | TITLES. | DONORS. |
|---|---|-------------------------------------|
| ACADEMIES and SOCIETIES. | | |
| Berlin (<i>continued</i>):— | | |
| | Verein zur Beförderung des Gartenbaues in den kön. Preuss. Staaten. Wochenschrift, redigirt von Prof. Dr. Karl Koch, &c., Jahrg. 2, Nr. 1–52, und Jahrg. 6, Nr. 8–52. 4to. Berlin, 1859–63. | THE SOCIETY. |
| Bombay:— | Government Observatory, Magnetical and Meteorological Observations made at, in the years 1861 and 1862. 4to. Bombay, 1862–63. | SECRETARY OF STATE FOR INDIA. |
| Bonn:— | | |
| | Botanischer Verein am Mittel- und Nieder-Rhein. Jahresbericht 1. 8vo. Bonn, &c., 1837. | THE LATE JOSEPH WOODS, Esq., F.L.S. |
| | Naturhistorischer Verein der Preussischen Rheinlande, &c. Verhandlungen, Jahrg. 20. 8vo. Bonn, 1863. | THE ASSOCIATION. |
| Boston, Mass.:— | | |
| | American Academy of Arts and Sciences. Memoirs. New series, vol. 8, pt. 2. 4to. Cambridge and Boston, 1863. | THE ACADEMY. |
| | Proceedings, vol. 5, sheets 49–58, and vol. 6, sheets 1–10. 8vo. <i>Ib.</i> 1862. | THE ACADEMY. |
| | Museum of Comparative Zoology. Annual Report of the Trustees for 1862. 8vo. Boston, 1863. | PROFESSOR LOUIS AGASSIZ. |
| | Society of Natural History. Journal, vol. 7, nos. 2 and 3. 8vo. Boston, 1861–62. | |
| | Proceedings, vol. 7, sheet 26, and vol. 9, sheets 4–11. 8vo. <i>Ib.</i> 1861–63. | |
| | Constitution and By-laws; with a List of the Members, 1855. 8vo. | THE SOCIETY. |
| Brünn:— | Naturforschender Verein. Verhandlungen, Band 1 (1862). 8vo. Brünn, 1863. | THE SOCIETY. |
| Caen:— | Société Linnéenne de Normandie. Bulletin, vol. 8. 8vo. Caen, 1864. | THE SOCIETY. |
| Calcutta:— | Asiatic Society. Journal, vol. 32, and vol. 33, no. 1. 8vo. Calcutta, 1863–64. | THE SOCIETY. |
| Canada:—v. <i>Montreal</i> and <i>Toronto</i> . | | |
| Christiania:— | Kong. Norske Frederiks Universitet. Aarsberetning, for 1861. 8vo. Christiania, 1862. | |
| | Halvhundredaars-fest, September 1861. 8vo. <i>Ib.</i> 1862. | |

TITLES.	DONORS.
ACADEMIES and SOCIETIES.	
Christiania (<i>continued</i>) :—	
K. N. F. Universitets Stiftelse; af. M. J. Monrad. 8vo. <i>Ib.</i> 1861.	THE UNIVERSITY.
Dresden :—Academia Cæs. L.-C. Germanica Naturæ Curiosorum. Nova Acta, tom. 30. 4to. Dresdæ, 1864.	THE ACADEMY.
Dublin :—	
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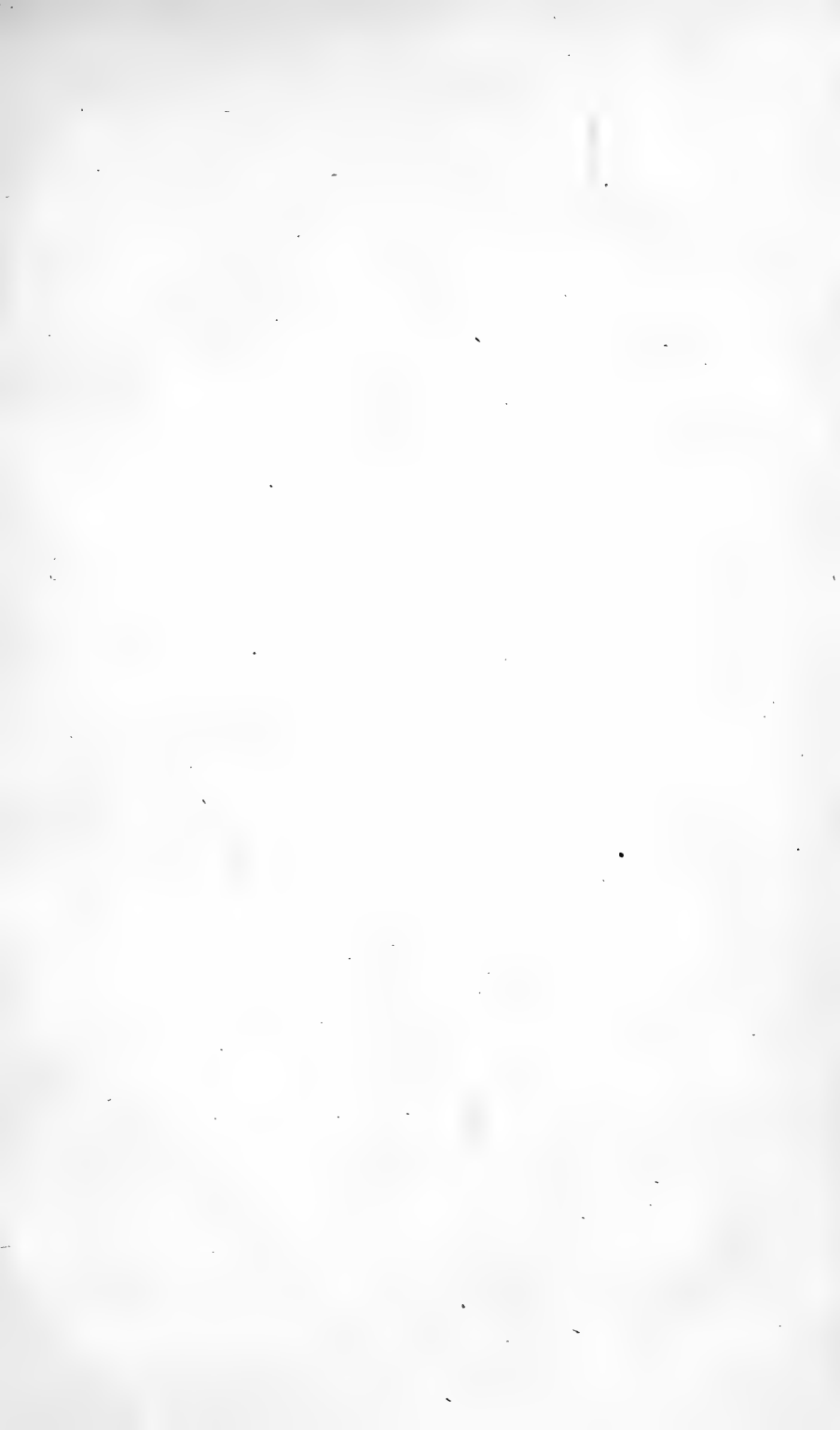
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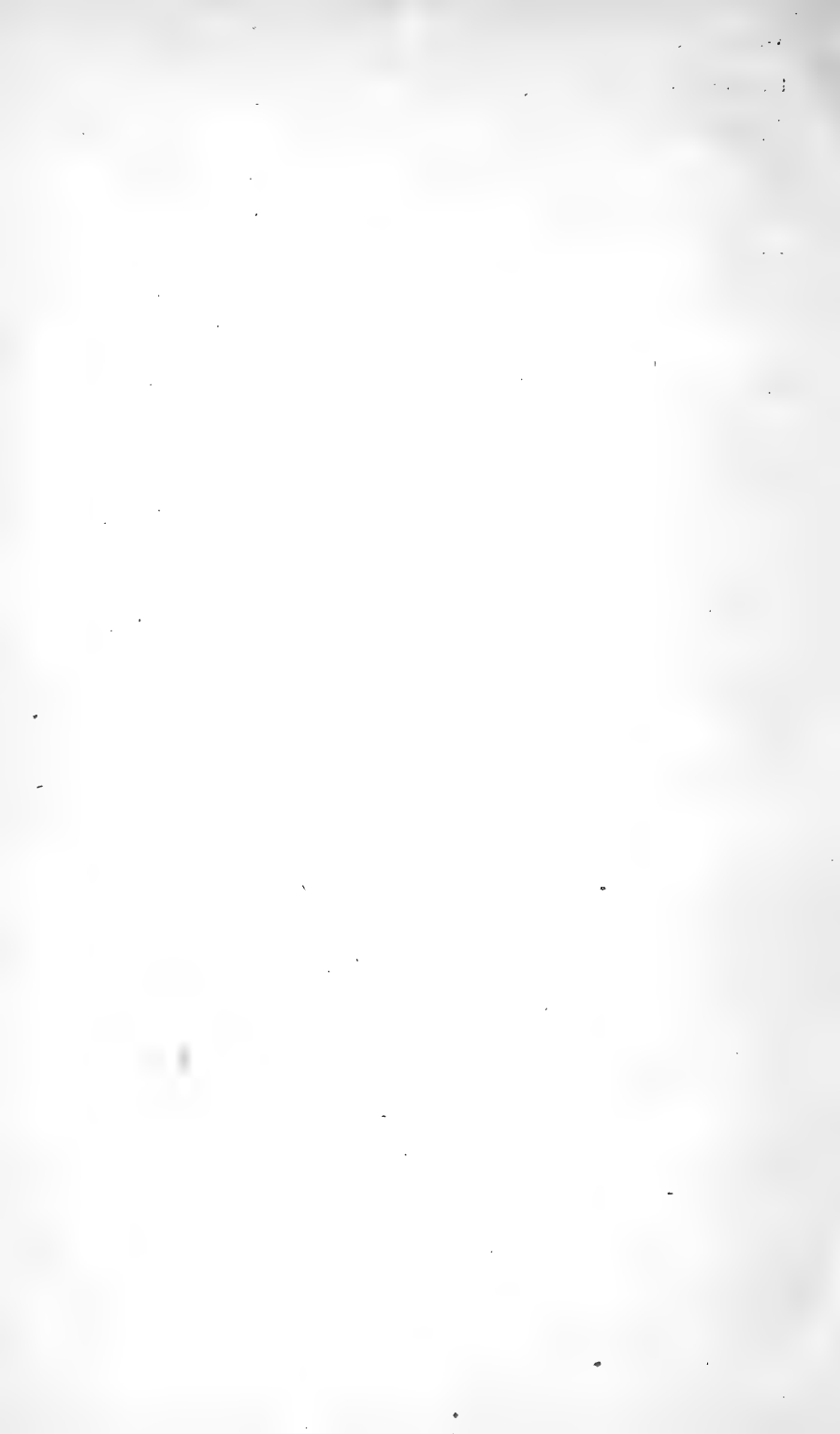
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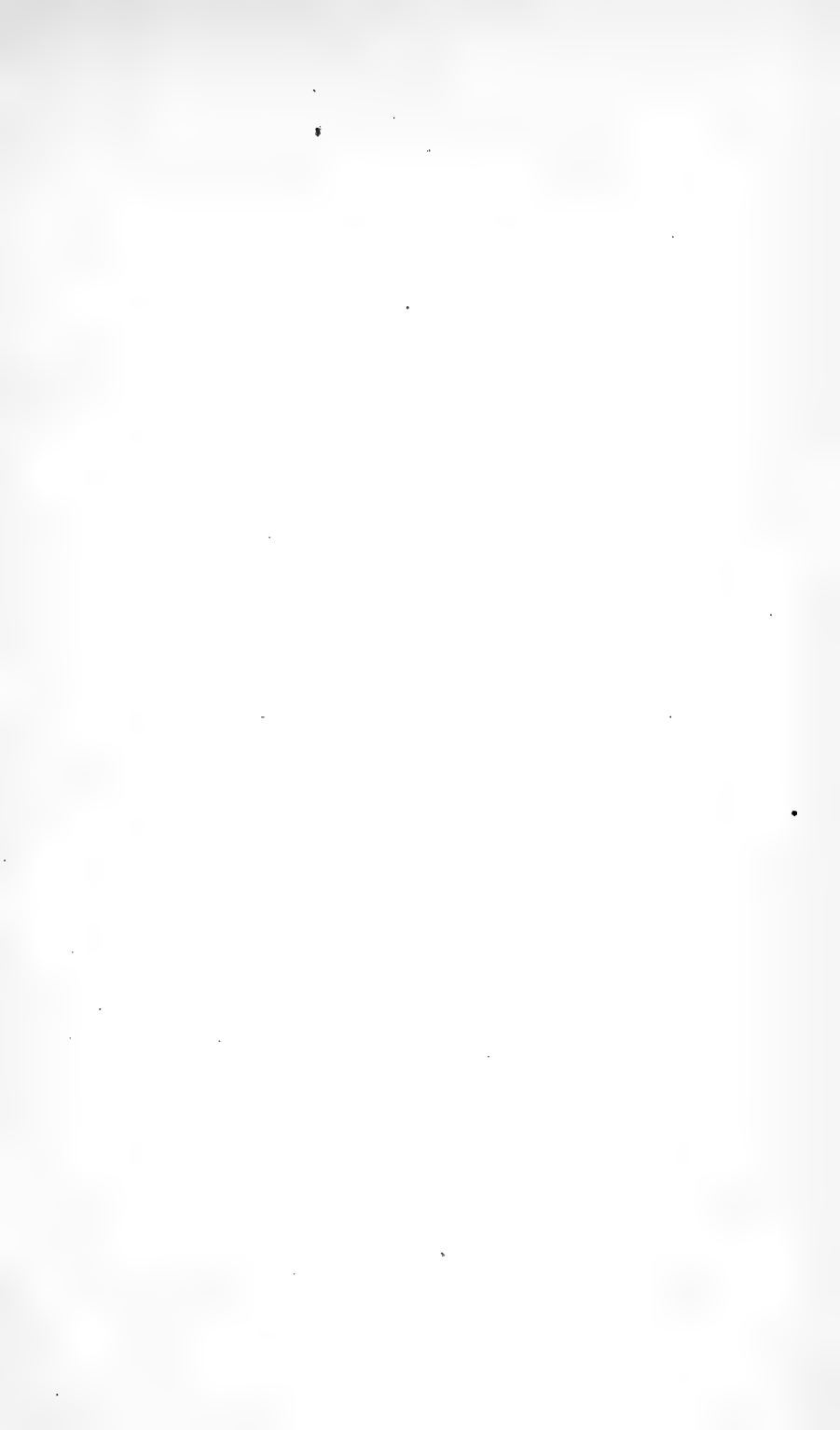
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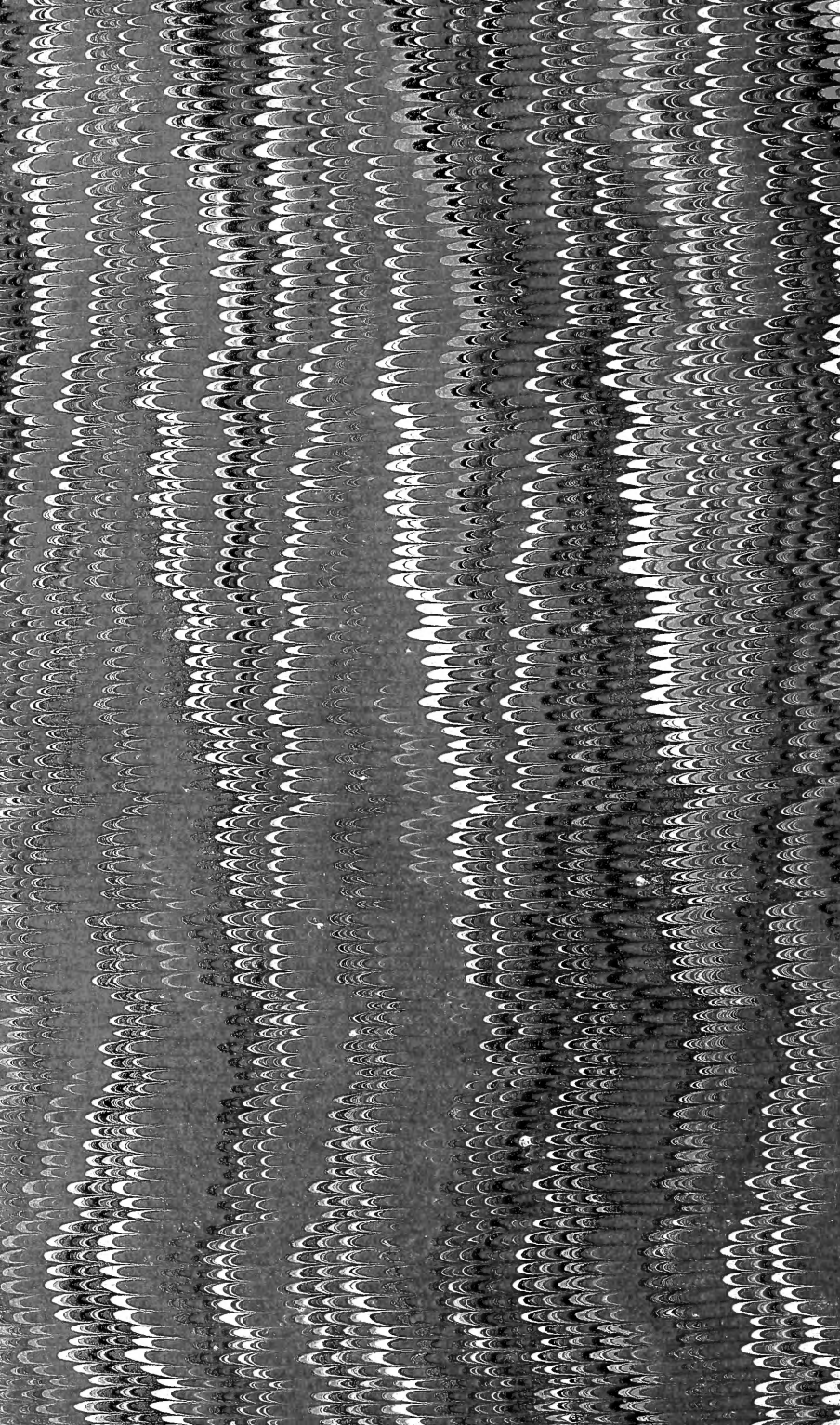
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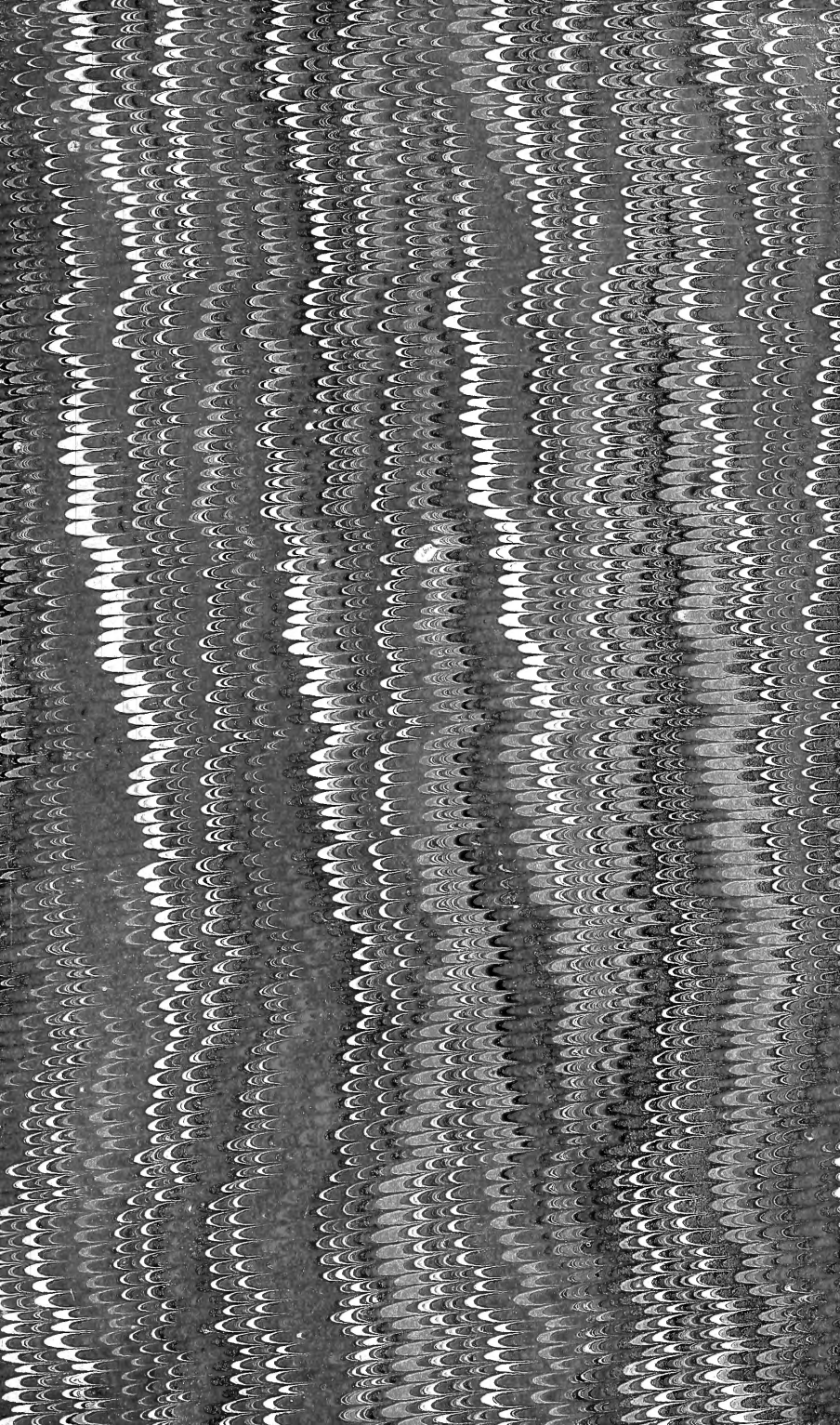
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