of France, to make one or two excursions in October or late in September in search of it. During these excursions I often met with the autumn brood of Melitæa Dia, and once I captured Limenitis Sybilla on the 1st of October, in very fine condition. I exhibited the specimen at the Oxford University Entomological Society: it differed in no respect from the type of the species."

Papers read.

Mr. M'Lachlan read a paper entitled "New Genera and Species of Psocidæ."

Mr. Edward Saunders read "Descriptions of six new Species of Buprestidæ belonging to the Tribe Chalcophorides, *Lacordaire*." Four of the species were referred to the genus Chrysochroa, one to Steraspis, and the other to Cyphogastra; the whole were exhibited, together with their nearest allies, for comparison.

New Part of 'Transactions.'

The publication (in September) of Trans. Ent. Soc., third series, vol. iii. part 3, being another instalment of Mr. Pascoe's 'Longicornia Malayana,' and the fourth part issued during the present year, was announced.

November 19, 1866.

Sir John Lubbock, Bart., President, in the chair.

Donations to the Library.

The following donations were announced, and thanks voted to the donors:—'Bulletin de la Société Impériale des Naturalistes de Moscou,' 1865, No. 4; 1866, No. 1; presented by the Society. 'On the Origin of Species by means of Natural Selection, or the Preservation of favoured Races in the Struggle for Life,' by Charles Darwin, M.A., F.R.S., &c.; by the Author. 'Catalogue of Longicorn Coleoptera, collected in the Island of Penang by James Lamb, Esq,' by Francis P. Pascoe, F.L.S., F.Z.S., &c., late Pres. Ent. Soc.; by the Author.

Election of Members.

Percy Bicknell, Esq., of Beckenham, was elected a Member; and G. H. Verrall, Esq., of Lewes, an Annual Subscriber.

Exhibitions, &c.

Prof. Westwood exhibited pupæ of Thecla Betulæ, and remarked that the larva does not spin any silken band or girth, but simply fixes itself lengthwise on the leaf.

Mr. A. F. Sheppard sent for exhibition, on behalf of Mr. Gregson, remarkable varieties of Pieris Rapæ, P. Napi, Leucophasia Sinapis and Anthocharis Cardamines; also Gelechia —— ?, taken by Mr. Hodgkinson in North Lancashire and by Mr. Gregson in South Lancashire; Phycita subornatella of Zeller, taken in the Isle of

Man and in Ireland; and an Acidalia, respecting which the following extract was read from a letter from Mr. Gregson:—

"I send you Acidalia veterata; it may be the same as one named mancuniata by Dr. Knaggs from some aberrant stunted second-brood females, but as the rule is to name from normal males (not females) as types, of course his name falls, especially as his diagnosis may mean anything or nothing. I do not know Dr. Knaggs, and of course have not any wish to offend him, but could not accept his new name for my old insect when based upon an abnormal type."

Mr. Stainton exhibited a living specimen of Stathmopoda Guerinii (*ante*, p. xxxi.), and called attention to the peculiar position of the hind legs, which were elevated and stretched out sideways as in S. pedella (which received the name of pedella from Linné from the peculiar posture of its hind legs) and as in the curious Indian insect Atkinsonia Clerodendronella, of which a drawing by a native artist at Calcutta was also exhibited. With reference to the galls in which the larvæ of S. Guerinii reside, Mr. Stainton referred to a passage in Réaumur (vol. iii. p. 305) in which these galls on the 'terebinthe' and their Aphis-inhabitants were mentioned, the plant which bore them having obtained the name of the fly-tree (*l'arbre aux mouches*) from the pod-like excrescences containing these Aphides. Mr. Stainton referred to the possibility of the larva of S. pedella being an inhabitant of galls, and thought that the habitat assigned by Linné for the larva "*in alni foliis, subcutanea*" might after all be correct: he quoted a passage from a paper by T. Bergmann, who had furnished Linné with the notice of the habit of Tinea pedella, to shew that that observer was aware of the existence of Lepidopterous larvæ in galls, and finally he quoted a passage from the Proceedings of the Entomological Society of Philadelphia, vol. 5, pp. 143, 144, to shew that Mr. Benjamin D. Walsh had bred a small moth (a Batrachedra) in plenty from galls formed by one of the Tenthredinidæ on the leaves of willows.—"Each gall containing a single larva, unaccompanied by the larva of the Nematus which makes the gall, which it must consequently have destroyed or starved out, either in the egg or in the larva state."

Mr. E. G. Meek exhibited Dicrorampha flavidorsana (Knaggs, MS.),* a species new to Science, from North Devon and Haslemere; a species of Noctuina, supposed to be new, taken by Mr. Harrington near New Cross;† and Stigmonota leguminana from Epping Forest.

Mr. Hewitson sent for exhibition some eggs "found upon the grass near some heath" and which were unknown to him: no member present hazarded a conjecture as to the insect to which the eggs were referable.

Mr. Hewitson communicated the following note on the plumules on the wings of butterflies:—

"When I was last at Bowdon, Mr. Watson, who has been studying the plumules from the wings of butterflies, pointed out to me a group of the Pieridæ which he considered ought to be set apart from the rest of the genus, having none of those

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* Since described Ent. Mo. Mag. iii. 176, and figured Ent. Ann. 1867, fig. 5.

† Xylina Zinckenii, *Tr.*; see Ent. Ann. 1867, p. 136.

plumules upon them which abound on the other species. This group consists of P. Thestylis of Doubleday, an undescribed species closely allied to it, P. Clemanthe, *Dd.*, and P. Autothisbe of Boisduval. This is confirmed by another distinctive character which these species possess, the costal margin of the anterior wings being strongly serrated. I felt therefore very much interested, when, on paying a visit to Mr. Wallace, who is now studying the Pieridæ, I found that he has also set apart this group. I send this notice to confirm an opinion I have expressed elsewhere, that a study of these plumules will produce evidence which 'will assist in determining the sexes, as well as in testing the worth of nearly allied species.' I may add that these species have for many years been put together in my collection, having noticed the peculiar serration of the wings."

Mr. E. W. Janson exhibited, on behalf of Mr. T. J. Harris, of Burton-on-Trent, a specimen of Macronychus quadrituberculatus, *Müller*, a Coleopterous insect previously unknown to inhabit Britain, captured by that gentleman, early in the autumn of 1864, in the vicinity of that town.

Mr. S. Stevens exhibited a remarkably fine pair of the rare beetle Eucheirus Duponchelii, and a number of small exotic beetles taken for the most part in ants' nests.

Mr. Weir exhibited a paper-like substance used by a Ceylon ant for lining its nest.

Mr. M'Lachlan mentioned that the galls on the elm which were exhibited by Mr. F. Smith at the previous Meeting (*ante*, p. xxxii.) had been described by Claude Joseph Geoffroy in 1724, and by Réaumur in 1737, the latter of whom gave figures of the gall: De Geer and Etienne Louis Geoffroy (1764) also referred to it, and the insect was the Schizoneura gallarum-ulmi of De Geer.

Prof. Westwood exhibited a highly magnified drawing of a monstrous individual of Pieris Pyrrha, a Brazilian butterfly, from the collection of Mr. Hewitson, of which the two wings on the left side of the body and the fore wing and costa of the hind wing on the right side were coloured as in the male (being white on the upper surface with a black tip to the fore wings, thus resembling Pieris Brassicæ), whilst the remainder of the right hind wing was coloured as in the female, thus resembling one of the Heliconiidæ. Prof. Westwood remarked that such a specimen and such a species afforded ground for some comment on the relationship of those mimetic animals which had recently attracted so much attention, and had afforded Mr. Bates materials for a remarkable and elaborate paper in the 'Transactions of the Linnean Society.' Prof. Westwood, in the first place, considered that every species of animal (except in the instances noticed below) was, so far as its habits and economy were concerned, as *independent* of its so-called allied species as if every individual of the latter had ceased to exist; the same might also be affirmed even of the individuals of each species, except,

1st, in the relations of the sexes of each species, and the result of their union;
2nd, in the relation between an individual or species and the animal or vegetable upon which it subsists; and
3rd, in cases of perfect socialism, where many individuals assist in the economy of the society.

This *independence in economy* was the result of similar independence or *isolation in structural relations*, and implied the *genetic distinction* of each species. But

naturalists had found it convenient to assume closer or wider degrees of structural affinity as the basis of their classification, derived from the most distinctive character of their various groups, of whatever rank. Thus the Mammalia appropriated to the land, the birds to the air, and the fishes to the water, were characterized at once by the organs which were of the greatest use in enabling them to subsist in their respective elements, and hence a primary importance was attached to the organs of locomotion, and thus groups were formed and characterized, which have been termed classes, orders, families, tribes, genera, &c. It was, however, only upon the greater or less degree of *resemblance*, either of the entire animals or portions of their organs, to those which were associated with them in such groups, that these arrangements were based. Various kinds of resemblance were, however, accepted by naturalists as affording grounds for classification, and while some of these were highly natural, others were very artificial in their nature. Species which agreed together in their most essential characters were regarded as related together by affinity, but others, although bearing a general resemblance, might differ widely in their important organisms: this latter relationship, overlookéd by the earlier naturalists, or confounded by them with relations of affinity,* was first clearly pointed out by Mr. W. S. MacLeay, and in fact formed one of the principal key-stones of his system. Instances of this kind of resemblance were then pointed out:

1. Between members of the different kingdoms of nature: Ex. Byrrhus and a bit of earth; the larva of Geometra and a twig; Orchides and insects.
2. Between different classes of the same kingdom: Ex. Humming-bird and humming-bird moth; eel and snake.
3. Between different orders of the same class: Ex. Vespa and Ceria; Trochilium and Vespa; Eristalis and Apis; Tricondyla and Condylodera.
4. Between different sections of an order: Ex. Papilio and Urapteryx; Carabus and Adelium.
5. Between different families of a section: Ex. Papilio paradoxus and Danais; Leptalis and Heliconia.
6. Between different genera of a family: Ex. Species of various genera of Heliconiidæ.

From the latter instances, the Professor thought it was evident that the relation which had been termed mimetic resemblance was only an exaggerated analogy; and as these analogies (more or less complete) were found to occur throughout nature it might be assumed that they formed an element in creation, and hence that it would be unphilosophical and illogical to refer their occurrence in a more striking degree in any one instance to a special cause, although the analogy did certainly in many cases seem to be given to the creature for purposes of protection. In the MacLeayian and Swainsonian systems these analogies were considered as existing as tests of affinities, and without regarding or employing them in the sense adopted by the authors of those systems, it seemed to Prof. Westwood that it was necessary to take them into consideration in endeavouring to arrive at a correct view of the general "System of

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* As where Ascalaphus, with its long-knobbed antenna, was described as a Papilio.

Nature." Applying the preceding observations to the mimicry exhibited by the various Pieridæ (chiefly of the genus Leptalis) of different species of Heliconiidæ described by Mr. Bates, Prof. Westwood contended that Mr. Bates's supposition that the imitation had been assumed by the former in order to enable them to subsist (the Heliconiidæ which possess a strong and disagreeable odour being found to be dominant in South America) was not tenable—

1. Because the mimicking species could barely be said to exist, much less to flourish, in the country where the Heliconiidæ abounded, "not one in a thousand" having been found by Mr. Bates.
2. Because there still occurred numerous species of white Pieridæ in the country of the Heliconiidæ in a flourishing condition.
3. Because there were vast numbers of other groups and species of butterflies in Brazil equally subject to attacks of birds with the Pieridæ, which had never attempted the assumption of forms of the dominant group, Heliconiidæ.
4. Because there were great numbers of instances of mimicry between the different Heliconiidæ themselves, which could not have the inducement to mimicry attributed to the Pieridæ.
5. Because there were species of Pieridæ (such as that to which Mr. Hewitson's monstrous individual belonged) of which only one sex mimicked the Heliconiidæ. It would require a wide stretch of imagination to suppose that natural selection could have led to the assumption of such mimicry by the individuals of only one of the sexes of a species.*
6. Because the theory assumed that the Heliconiidæ existed before the attempt at mimicry commenced on the part of the Pieridæ; whereas Mr. Bates' statement would lead to the inference that the Heliconiidæ were so unstable a group that the manufacture of species is still going on among them.
7. Because, according to the doctrine of chances, it was in the highest degree improbable that a casual variation of any given species of Pieridæ should by constant modification, assisted by hereditary descent, gradually assume the form, colour and markings of another species, especially of so remarkable a type as the Heliconiidæ. But for an entire group to be simultaneously engaged in such a process, each species tending towards distinct and equally peculiar species, would by a logician be pronounced impossible. The admission that the God of Nature created these species in their present mimetic condition for some wise but hidden purpose disposed of all difficulty.

Mr. Alfred R. Wallace followed, with an exposition of the theory of mimicry or adaptive resemblances as explaining anomalies of sexual variation. He began by pointing out what was meant by mimicry; when moths or beetles so closely resembled the bark of the trees they were accustomed to rest on that it was difficult to distinguish them, or when the curious Phasmidæ were undistinguishable from the sticks or leaves among which they lived, no one doubted that the resemblance was serviceable to the creature,—it was a protective adaptation. So with the moths of the genus Trochilium, which resembled stinging Hymenoptera, but were themselves helpless sluggish

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* Papilio Cenea exhibts a double system of mimicry, the male resembling Danais Echeria and the female Danais Chrysippus!

creatures, the protection gained was no less clear; and this was termed mimicry, because one insect was, as it were, dressed to imitate another. Mr. Bates first showed how extensively this prevailed in nature, especially among the Lepidoptera, and argued that if the imitated forms had any special immunity from attack, the species of other groups which resembled them would to some extent be free from attack also, and would thus gain an advantage in the struggle for existence. He then shewed that the forms imitated always belonged to dominant groups, or those excessively abundant in species and individuals, and therefore presumptively free from the attacks of those insect-enemies that kept down the numbers and threatened the extinction of other species; and that in the case of the Danaidæ and Heliconiidæ (the groups most frequently imitated all over the world), the protection was probably the powerful odour they emitted. The theory of natural selection, or the preservation of useful variations, was shown to be fully capable of explaining these facts, and it bore the test of a true theory by also explaining other anomalies as they arose. A species of Diadema was then exhibited, in which the female was glossed with blue, while the male was dull brown, thus reversing the usual sexual characters of the genus; and it was observed that the male in insects was usually more active, the female more sluggish; the male gaily coloured, the female dull; and these facts were connected by the consideration that the female, having to carry a heavy load of ova, and to deposit them in places favourable for their development, required protection for a much longer period than the male, whose duty of fecundation was very speedily performed. Thus dull colours were useful to female insects, since it rendered them less conspicuous. It followed that any other kind of protection would be also more necessary for the female than for the male, and, to show that this really was so, a male specimen of the well-known leaf-insect (*Phyllium*, sp.) was exhibited, having none of that wonderful protective resemblance to a leaf which characterises the female. So in the well-known case of Diadema Bolina, the male was a richly-coloured blue, white, and black insect, while the female was orange-brown, quite differently marked, and resembled most minutely Danais Chrysippus, which had a range nearly coincident with it. It was suggested that the explanation of the anomalous insect which was the origin of these remarks was, that the female, by acquiring the metallic-blue gloss, was made closely to resemble the common Euplœa Midamus which inhabited the same localities; it thus gained an advantage in being mistaken for a species which insectivorous birds did not attack.

Mr. Bates was of opinion that the individual of Pieris Pyrrha described by Professor Westwood presented simply an instance of unequal hermaphroditism, three-fourths male and one-fourth female. As such it was a mere monstrosity, and had no bearing whatever on the question of the origin of species; the Darwinian theory dealt only with variations that were propagated, and not with monstrosities, the peculiarities of which were not transmitted to their descendants. With regard to those cases where the female sex of a species alone was found to mimic species of other families, the male remaining true to the normal type of its group, he thought it was absolutely necessary that an entomologist should have had opportunities of observing the habits of the species before drawing conclusions concerning them. In all such cases he had found that the females had a different mode of life from the males. In Pieris Pyrrha and other allied species the females were confined to the shades of the forest, where they flew near the ground, and were slow in their movements; whilst the males spent the hours of sunlight flying about open places, in company with the males of a great

number of other butterflies; they resorted to the forest shades only towards evening or on cloudy days. The cause of the female of Pieris Pyrrha having been brought to resemble a Heliconid butterfly was the same as that which had drawn out the wonderful mimetic dress of the Leptalides; namely the protection which such resemblance afforded them against the persecutions of insectivorous animals. A more remarkable case than Pieris Pyrrha was that of Papilio Torquatus, a well-known Brazilian butterfly, of light yellow and black colours (in the male). Like the male of Pieris Pyrrha, Papilio Torquatus (male) spent his days in the open sunshine, whilst the female was confined to the shades of the forest, flying heavily and depositing her eggs one by one underneath the leaves of low trees. The female offered the most striking contrast in colours to the male, being black with white spots and crimson macular belt. It was significant that the dominant forms of Papiliones of the forest shades of tropical America had precisely that style of coloration; but the importance of the present case lay in this, that the female Torquatus presented local varieties in the various regions inhabited by the species, the male remaining unchanged, and the varieties were adapted in dress to the species of the dominant Æneas group peculiar to the localities. Thus on the Lower Amazons the form of the female was that which had been named P. Candius by Hübner, having a white spot on the fore wing, and a crimson belt on the hind wing, precisely as in the females of the common species inhabiting the same region, *e.g.* P. Æneas, P. Parsodes, P. Echelus, P. Ergeteles, &c. On the Upper Amazons, the female was very variable, but the commonest varieties resembled closely the females of the species of the Æneas group most prevalent there, namely, P. Lysander and P. Bolivar: the resemblance to the female Bolivar was most extraordinary, for in that species the crimson macular belt was replaced by yellow. Mr. Bates also made some remarks in answer to the objections which Professor Westwood had urged against the explanation of these imitative analogies on Darwinian principles. He said that the case of the Leptalides published by him could not, in his opinion, be explained in any other way. The species of Leptalis in question was found in several distant localities; in some of them it existed under one constant local form only, in others it was exceedingly variable, the common varieties showing a wonderful tendency towards a likeness to the predominant species of Ithomia of the respective localities. If the dress now worn by the Leptalis was given it at its creation, as Professor Westwood believed, how would he explain all these numerous shades of variety found in one and the same locality? To be consistent he must say that each variation was lineally descended from an originally created variety, which would be absurd, as so many species are known to offer numerous similar varieties in one and the same brood. As some of these varieties of Leptalis resembled species of Ithomia peculiar to the locality more than their sister varieties did, the conclusion was simple and natural, that, the imitation being a rule in all other localities, the process was there at work by which the close imitation was brought about. The less exact imitations were in course of time destroyed without bringing forth progeny, and then the state of things was identical with what was found in other localities, namely, one or more constant forms of Leptalis resembling closely their companion Ithomiæ.

Dr. Sharp remarked that whether the resemblances under discussion were purely accidental or not could be determined by a numerical investigation, by ascertaining what proportion the cases in which species resembling one another occurred in company bore to the cases in which species with a similar amount of resemblance

occurred away from one another. He thought, however, that some of the cases of mimicry might be accounted for on other grounds than those supported by Messrs. Wallace and Bates, for if the Darwinian theory of a common descent were true, then the laws and principles of heredity could be applied to different species, as they have heretofore been to individuals. He proposed four classes, under each of which he believed some of these resemblances could be placed:—

1st. Resemblances purely accidental; for the doctrine of chances would show that if there were in the world a sufficient number of species resembling one another, a greater or less number of these would be sure to occur in company.

2nd. Resemblances the result of descent from a common parent; for it being understood that a certain character would be transmitted from parent to offspring through an indefinite number of generations, unless circumstances tending to alter it were brought to bear on that character, it could readily be perceived that some species of Lepidoptera might resemble one another in coloration, by reason of the resemblance of each to a common parent similarly coloured.

3rd. Resemblances the result of exposure to similar circumstances; for undoubtedly, if the Darwinian theory were true, the coloration of species of Lepidoptera must be referred sooner or later to external causes operating on the organism. But the cases where mimicry occurred were cases in which the species, being constantly found together, were necessarily to a very great extent subjected to the same external conditions. Thus in a certain locality a species of Leptalis was found closely resembling a species of Heliconia, and in another locality a second and allied species of Heliconia was found. Mr. Wallace would say that this Heliconia differed from the first Heliconia because of the changed circumstances to which it was exposed: but with this second species of Heliconia was found a second species of Leptalis, differing from the first species of Leptalis in nearly the same manner as the second species of Heliconia differed from the first, and this was easily comprehensible, its companionship with the Heliconia having exposed it to exactly the same disturbing influences.

4th. This class was that to which Messrs. Bates and Wallace referred all these resemblances, and it was the only one that could correctly be spoken of as mimicry; the colour of the Heliconia, without any reference to common descent or to the operation of similar external agencies, being the determining cause of the colour of the Leptalis.

Paper read.

Messrs. Crotch and Sharp read a joint paper entitled 'Additions to the Catalogue of British Coleoptera, with Descriptions of New Species." The additions were no less than seventy-one in number, the whole of which were exhibited; of these sixty had been described by continental authors, and eleven, belonging to the genera Ptilium, Atomaria, Telephorus, Sitones, Anthicus, Gyrophæna, Philonthus, Lathrobium and Stenus, were characterized as new to Science.

December 3, 1866.

Sir John Lubbock, Bart., President, in the chair.

Additions to the Library.

The following donations were announced, and thanks voted to the donors:—'Mémoires de la Société Linnéenne de Normandie,' Vol. xiii. and xiv.; 'Bulletin de la Société Linnéenne de Normandie,' Vol. x.; presented by the Society. 'Etudes Hymenopterologiques,' par J. Sichel; by the Author. 'Memoir of the late Stephen Stone, Esq., F.S.A., &c., of Brighthampton, Oxon;' by Prof. Westwood. 'The Zoologist' for December; by the Editor. 'The Entomologist's Monthly Magazine' for December; by the Editors.

The following additions by purchase were also announced:—'Zoological Record,' Vols. i. and ii. 'British Beetles,' by E. C. Rye. 'British Bees,' by W. E. Shuckard.

Election of Members.

E. T. Higgins, Esq., of 24, Bloomsbury Street, and Andrew Swanzy, Esq., of 122, Cannon Street, were elected Members; H. L. Schrader, Esq., of Shanghai, a Foreign Member; and F. Lovell Keays, Esq., of 4, Harringay Villas, N., and Walter Thornborrow, Esq., of 4, Provost Road, N.W., Annual Subscribers.

Exhibitions, &c.

Mr. Stainton exhibited living specimens of Gracilaria scalariella, bred from larvæ mining in the leaves of Echium vulgare at Cannes, which he had received a fortnight ago from M. Millière.

Mr. Stainton also exhibited a flat pouch-like gall formed on the leaves of Pistacia lentiscus, apparently by Aphides, but which was inhabited by a Phycideous larva. This he had received from Mr. J. T. Moggridge, who met with it at Mentone.

Mr. Janson exhibited a collection of insects, chiefly Coleoptera, made by Mr. W. Hume in the neighbourhood of Rio de Janeiro.

Mr. W. F. Evans sent for exhibition a number of insects found in wool imported from New Zealand, accompanied by the following note:—

"Some time ago I brought under the notice of the Society the circumstance of the large number of Pyronota festiva found in wool imported from New Zealand. Since then I have requested my friend to continue sending me every insect which might be found in the fleeces from that locality, and now beg to exhibit the various insects, larvæ, animals, a seed and a shell, &c., &c., which have been thus found. The Pyronota seems to be in the greatest profusion, and the specimens vary very much in colour."

Mr. Duer (who was present as a visitor) exhibited a pupa of Vanessa, having some extraordinary projections from both wing-cases.

Dr. Sharp exhibited specimens of Stenus major, *Mulsant*, taken at Southend: this insect was new to our Fauna, and was hitherto known only as a native of the South of France.

Prof. Westwood mentioned that the late Mr. Stephen Stone, of Brighthampton, had bequeathed his valuable collection of wasps' nests and other natural objects to the Oxford Museum.

Prof. Westwood read the following letter from Mr. Edward Holdsworth, dated Shanghai, July 20, 1866:—

"I trust you will pardon my taking this liberty, but my excuse is this,—reading your revised edition of Dru Drury's 'Exotic Entomology,' the other day, I noticed you remarked that no authenticated description of Actias Luna had been sent to you: as I have reared several specimens this summer I am able to give you a correct description of this larva. As soon as hatched the worm is reddish brown, with two black bands round its body and several black spots: after the first change it is reddish brown, with fleshy points all over its side and back, each point surmounted with a black spot and one thin white hair. In two or three days the larva changes to a yellowish red colour, a sign that it is about to pass to its second skin: after this change it appears of a light yellowish green colour, the fleshy points (mentioned before) are yellow, and each is surmounted with one brownish hair. On the head are four large fleshy points, which are each surrounded by a black ring, below the extreme tip, which is yellow. After the next change the four major spots on the head and the one at the end of the back are now very large, and have seven short hairs or bristles sticking out at the ends. This is the last change, and the larva is now about two and a half or three inches in length, and fully one inch in diameter. It is fairly common in the neighbourhood of Shanghai, and always found feeding on privet. Those I reared I fed with willow, and they thrived very well on it. It spins a very large cocoon, fully two and a half inches long, but with too much gum about it to allow the silk to be made use of. The caterpillar has down its back two straight lines or ridges of fleshy lumps, which terminate with a single lump placed over the joint of the last leg and in the centre of the back: along each side and just above the legs is a yellowish line, running the length of the body and terminating at the fleshy lump placed on the side of the last leg. The vent and out sides of the two last legs (right and left) are of a very deep plum-colour. In this change the black rings on the four major fleshy lumps on the head almost fade away, and the caterpillar is well covered all over with thin hairs about one-eighth of an inch long: at the base of each leg is a yellow spot, and over the mouth are four spots or fleshy lumps forming a crescent. Now comes the fourth change, and the larva is now about two inches long: the fleshy lumps on the back and sides have changed to reddish yellow, with a black ring on the top of each lump and four black short hairs also: on each side of the light-coloured line on the side of the larva are little reddish yellow spots, and on the line at the base of each leg are diamond-shaped marks, the inside yellow and the outer mark dark red: the legs and under part of the body are of a beautiful dark green, the sides a lighter green, and the back much lighter still and covered with white hairs; the legs are covered with black hair, and all the fleshy lumps with four or five black bristles.

"There can be no mistake about the larva I have described, for those I have reared have now come out of their cocoons, and the moth is a white-green, with one spot on each wing, two under-wings swallow-tailed; a pink or rather reddish pink line borders the top of the upper wings and crosses the head; the body covered with white down."

Prof. Westwood added that Mr. Holdsworth had mistaken the Asiatic Actias Selene for the North American A. Luna: the larva of the Indian species was figured in the fifth volume of the Society's 'Transactions' (pl. v.), from a drawing by Captain Hutton: it was desirable to see the perfect insect, as there appeared to be several local races of it.

Prof. Westwood exhibited a series of specimens of Liparis dispar, reared from the egg-state by Mr. Briggs, of St. John's College, Oxford, illustrating not only a remarkable variation, according to the nature of the food of the larvæ, but also showing a strong tendency to degeneration. The progenitors of these specimens, two or three generations back, had been obtained wild in Yorkshire, and were of moderate size (not so large, however, as the specimens formerly taken in such quantities at Whittlesea Mere). The eggs were received in October, 1865, and the caterpillars hatched during the first half of the following May. The caterpillars were divided into two groups, those composing one of which were fed exclusively on elm, and the others exclusively on whitethorn. The caterpillars spun up between the 5th and 18th of July. No perceptible variation was observed in the larvæ, cocoons, or pupæ of the two divisions. The males in both divisions began to hatch on the 18th of July, but the females did not appear until half the males were already hatched. Almost all the males in both divisions were fully developed, only two cripples appearing out of the thirty-two fed upon elm. The males fed on elm averaged one inch and five-twelfths in the expansion of their fore wings: they were uniformly coloured, much darker and richer than the males fed on the whitethorn, the dark markings on the fore wings were strongly defined, the ground colour of these wings was also darker; the hind wings were reddish brown. The males fed on the hawthorn were considerably smaller, averaging only one inch and two-twelfths in expanse; the ground colour of all their wings was paler and grayer than in the others, but the markings of the fore wings were generally well defined. A few of the males in each division were considerably smaller than the specimens exhibited. In the elm-fed females fourteen out of sixteen were crippled, with their wings not properly developed, and even the other two were slightly crippled: they were not so large as those of the hawthorn-fed larvæ. Having been impregnated by the males, none of these females deposited eggs, although they pulled off the down from their tails and fixed it in tufts in the box, after the manner adopted by ordinary females of this species in the act of oviposition. Of the whitethorn-fed females less than one half were crippled, and these were not generally so much crippled as the elm-fed females. This experiment seemed to prove that had the species depended solely on the existence of the elm-fed individuals it would have become extinct; whilst the smaller size of the males of the hawthorn-fed group showed that even amongst them (the females of which were so much better developed than the elm-fed ones) the principle of degeneration had set in, and that it would have been very improbable that a distinct phytophagic race or sub-species would have been effectually produced.

Mr. M'Lachlan remarked that Liparis dispar was scarcely a fair subject on which to experimentalize and theorize, inasmuch as it now existed in this country only in a semi-domesticated state.

Mr. Bates, referring to the discussion which had taken place at the previous Meeting (*ante*, p. xl.) respecting mimetic resemblances, introduced Mr. T. Belt, the gentleman who had favoured him with many of the facts, as to the aversion of insectivorous

birds to the Heliconiidæ, which were referred to on the former occasion, and in Mr. Bates' paper in the Linnean Transactions.

Mr. T. Belt gave a detailed narration of his observations on this subject, and stated that not only were the perfect insects of Heliconia protected by their unpleasant odour, but that the larvæ also were rejected by fowls.

Mr. Stainton remarked that a curious instance of the dislike which birds seemed to have for certain insects had come under his observation some eighteen years previously. When he was attracting moths by light, he had often such numerous attendances that he had frequently captured fifty Noctuæ, or more, in a quarter of an hour; whatever came must be caught, or it was in the way, and, in order to ascertain most readily whether there was anything of value, Mr. Stainton adopted the plan of smothering the whole lot with the fumes of sulphur. When the operation had been performed, more than nine-tenths of the dead insects would probably be Agrotis exclamationis. He thus had a vast store of useless dead moths, which he disposed of by giving them to the poultry, the young turkeys particularly enjoying them in spite of their flavour of sulphur. On one occasion, amongst a number of A. exclamationis, there was one specimen of Spilosoma Menthastri, and though not one of the young turkeys rejected a single A. exclamationis, they each in succession took up the S. Menthastri and put it down again, and it was left, conspicuous as it was, on the ground. This insect, it was well known, had a peculiarly disagreeable odour.

Mr. J. J. Weir had frequently noticed that cage-birds refused the larvæ both of Spilosoma Menthastri and S. lubricipeda.

Prof. Westwood stated that a fluid of very disagreeable odour was emitted by those insects from behind the collar; this was probably similar to that ejected by many of the Chrysomelidæ. He inquired whether anything of the kind had been observed in the Heliconiidæ.

Mr. Bates said that one group of Heliconiidæ was furnished at the apex of the abdomen with a process from which, when the abdomen was pressed, a very disagreeable odour was exhaled; but he had never seen any fluid ejected.

Mr. McLachlan remarked, as bearing upon the theory of Natural Selection, that having recently been engaged in an examination of the British Psocidæ, in which family the generic or sectional characters were principally grounded on the neuration, he had found occasional instances of aberration in the arrangement of the veins: these aberrations consisted in one wing of an insect which belonged to a particular genus or section assuming, entirely or partially, the neural characters of another genus or section; in no case, among several hundred examples, did he find neural variation which was strictly abnormal.

Dr. Sharp offered some criticisms on the theory advanced by Messrs. Bates and Wallace, and argued —

1st. That natural selection was a power of differentiation, and, although it was quite possible that a differentiating power might work so as to produce resemblances, it was at first sight improbable that it should do so; and more evidence was required of the truth of a paradox than of a truism.

2nd. It must be shown that animals possessing the so-called mimetic resemblances occurred far more frequently in company with one another than away from one another. But if this were shown, a single case of such resemblance between animals living in different localities would throw doubt on the theory, by suggesting that there was

probably some more comprehensive law which would account for *all* those resemblances.

3rd. It must be shown that the cause of the rarity of the Leptalis was one acting on the insect entirely or chiefly while it was in the perfect state; this had not been done, and it was improbable that it could be; for the most critical periods in the life of Lepidoptera, as regarded their enemies, were the larval and pupal states.

4th. It must be shown that the enemy (whatever it might be) which attacked the Leptalis sought its prey principally by the sense of sight; but this suggested another improbability. If the Heliconia, which the Leptalis resembled, was protected by its nasty odour, surely the bird or other enemy of the Leptalis must be very foolish to let *it* escape when it smelt nice, because it *looked* like the Heliconia. The purpose of protection would have been better accomplished by the Leptalis mimicking the Heliconia in that point by which the Heliconia was protected.

5th. A forcible objection to the mimicry theory (as already pointed out by Prof. Westwood) was the rarity of the mimicking species. The theory involved the hypothesis that there was a time when the Leptalis differed in pattern from the Heliconia; was the Heliconia then commoner than now, or as rare? If commoner, it was curious that, when not protected, it flourished better than now, when protected. If as rare, how could it have survived at all before and during its transmutation? It would, perhaps, be suggested that the Leptalis was formerly commoner than now, and that some enemy arose, rendering it necessary that the Leptalis should find a new means of defence. This, however, was mere supposition, and it was almost impossible to adduce facts to prove it; but supposing it to be the case, why did not the enemy exterminate the Leptalis when it did not resemble the Heliconia, as (according to the theory) it would now, but for this resemblance. The further supposition must be made, that the enemy was not at first very dangerous to the Leptalis, and that in proportion as it grew dangerous, the Leptalis grew more and more to resemble the Heliconia: it was certainly very fortunate for the Leptalis that spontaneous variations, bringing it to resemble the Heliconia, should occur in the exact proportion required for its safety.

6th. Again, taking the time when the Leptalis differed in pattern from the Heliconia, it was said that specimens exhibiting small variations approximating to the Heliconia were selected for the preservation of the species. But a small variation in marking would be of no practical service to the Leptalis, especially as it was by its nasty *odour* that the Heliconia was protected; to which it might be added that on the theory of Natural Selection no reason or fact was brought forward to induce the belief that variations of the required sort should occur at all.

In conclusion, whilst admitting the impossibility that such a theory as that of mimetic resemblances could ever be shown by facts to be correct at all points, Dr. Sharp was of opinion that the evidence as yet adduced was insufficient to convince an unprejudiced observer. The most that could at present be said of the theory was, that it was very ingenious, and might or might not be true.

Mr. Wallace, in replying to Dr. Sharp, remarked that it was very easy to make objections to any theory, and many of those advanced were of such a general nature that it would require the whole subject to be again fully gone into to answer them in detail. The first objection was one of those vague and general statements which was really no objection at all; it was said that natural selection, being a power of *differentiation*, was therefore not likely to produce *similarity*! But natural selection was more

than a power of differentiation; it was the preservation and accumulation of *useful variations;* and the moment it became useful to one creature to resemble another, all variations which tended to make it so would be preserved, and would accumulate till an outward similarity was produced. In answer to the second objection, Mr. Wallace admitted that it must be shown that pairs of mimetic insects occurred together more frequently than apart, and maintained that this had been shown: he denied that a single case of mimicry by insects of different countries would discredit the general explanation; since in *one case* the resemblance might easily be accidental, or recent changes of distribution might have parted creatures that once lived together. But, however this might be, even one case of mimicry among insects from distinct countries (as complete and striking as many of those adduced by Mr. Bates and the speaker) had not yet been produced by the opponents of the theory. Dr. Sharp, as a third objection, required proof that the scarcity of Leptalis was owing to persecution in the perfect state, not in the larval or pupal conditions; probably Dr. Sharp could not give such proof in the case of a scarce British insect which he had studied for years, and it was quite immaterial to the question. The Leptalides alone of all Pieridæ were universally scarce in individuals, and almost all the Leptalides, and they alone, mimic Heliconiæ. As to requiring proof that birds seek their prey by the sense of sight, it was so generally admitted that insectivorous birds captured their prey by sight, that if Dr. Sharp denied it he should rather prove that they do not. In the next place, it was asked, "Was the Leptalis, before it resembled the Heliconia, abundant or rare? If abundant, then it was better off without protection than with it. If rare, how did it survive at all before and during transformation?" The reply was, that before the Leptalides began to mimic the Heliconiæ they were more abundant than now, and like nations and individuals, they were better off when they did not require protection, than now when they cannot exist without it. The Leptalides were not now the same insects they were then, and their conditions of existence had also materially changed since that remote epoch. Lastly, it was said that as the Heliconiæ were protected by their disagreeable odour, a superficial resemblance to the Heliconiæ could not be at first a sufficient motive power to change the species of the Leptalides. Mr. Wallace thought, on the contrary, that it would, because it was self-evident that under all circumstances "the fittest must survive," and any variation which caused but a small percentage of individuals to escape destruction would to that extent benefit that variety, and might, when the species was struggling for existence, cause that variety alone to survive. To deny this would be to deny that insectivorous birds could ever be deceived by slight resemblances, although it was well known that very rude resemblances sometimes deceived animals and even men. Mr. Wallace thought, therefore, that the theory of the "survival of the fittest" (or natural selection) did offer an explanation of almost every fact connected with mimicking insects, and that the objections that had been made to it were of a vague nature, and such as could be made against any theory whatever that attempted to explain the phenomena of organic life. Our knowledge of the present life-history of insects was exceedingly imperfect, and how many questions might be asked concerning them that no one could answer. In the long life-history of species how much more must ever remain unknown; yet because our knowledge was thus incomplete we should be the more thankful for such a theory as that of Mr. Darwin, which supplies a real cause of modification of species, and enables us to correlate so many of the most curious phenomena of organic

existences, and to comprehend the series of actions and reactions by which they have most probably been brought about.

Prof. Westwood reiterated, with further illustrations, some of the objections to the theory stated by him at the previous Meeting, and the discussion was brought to a close by a few remarks from the President.

Paper read.

Mr. M'Lachlan read a paper entitled "A new Genus of Hemerobidæ, and a new Genus of Perlidæ." The former was described under the name of Rapisma, and the type was the Hemerobius viridipennis of Walker; the latter under the name of Stenoperla, and the type was the Chloroperla prasina of Newman.

January 7, 1867.

Sir John Lubbock, Bart., President, in the chair.

Additions to the Library.

The following donations were announced, and thanks voted to the donors:—'Mémoires de la Société de Physique et d'Histoire Naturelle de Genève,' Vol. xviii. pt. 2; presented by the Society. 'Exotic Butterflies,' Part 61; by W. W. Saunders, Esq. 'Notes on the Zygænidæ of Cuba,' by Augustus Radcliffe Grote; by the Author. 'Lepidopterological Contributions,' by Aug. R. Grote and Coleman T. Robinson; by the Authors. 'Note on the Japan Silkworm,' by Captain Thomas Hutton; by the Author. 'De Tunnelgravende Biller Bledius, Heterocerus, Dyschirius og deres Danske Arter,' 'Danmarks Cerambyces,' 'Danmarks Buprestes og Elateres,' 'Krebsdyrenes Sugemund, I. Cymothoæ,' 'Phthiriasis og Mundens Bygning hos Pediculus,' by J. C. Schiödte; by the Author. 'Danmarks Geophiler,' by Bergsöe and Meinert; by the Authors. 'Om Slaegten Stalita,' by the Editor of 'Naturhistorisk Tidsskrift.' 'The Entomologist's Annual;' by H. T. Stainton, Esq. 'The Zoologist' for January; by the Editor. 'The Entomologist's Monthly Magazine' for January; by the Editors.

The following addition by purchase was also announced:—Bericht über die Wissenschaftlichen Leistungen im Gebiete der Entomologie während der Jahre 1863 und 1864,' von Dr. A. Gerstaecker; Erste Hälfte.

Election of Subscriber.

Samuel Alfred Davis, Esq., of 4, Durham-place West, Holloway, was ballotted for, and elected an Annual Subscriber.

Exhibitions, &c.

Prof. Westwood exhibited a number of butterflies, chiefly Heliconiidæ, collected by Dr. Burchell in Central South America, and observed that the Burchell collection was peculiarly interesting, from the fact that each specimen bore a ticket giving the date

(sometimes even the hour of the day) and the precise locality of capture, so that the range of particular forms could be traced, and the limits thereof fixed with accuracy.

Mr. M'Lachlan asked the reason why humming-bird hawk-moths (*Macroglossa stellatarum*) chased up and down stone walls, banks, or cliffs, but particularly stone walls near the sea; dozens of specimens might frequently be seen so doing, and in positions far removed from any flowers. Mr. A. E. Eaton suggested that the habit might result from the extra heat afforded by the walls. And Mr. F. Smith mentioned that he had had sent to him from the Isle of Wight some clay nests extracted from a wall, which eventually produced hymenopterous insects, but which were said by the sender to be formed by the humming-bird-hawk; it seemed probable that his correspondent had noticed the moths performing in the manner described by Mr. M'Lachlan in the neighbourhood of the nests, and had thence erroneously inferred that the nests were the workmanship of the moths.

Mr. A. E. Eaton mentioned that he had, during the past season, found near Lyndhurst a hornet's nest in a very unusual situation, namely, in a bank composed of sandy soil where no wood was near. The colony was a strong one, and the nest so deeply imbedded in the bank that he had been unable to take it.

Mr. M'Lachlan said that, since the previous Meeting, at which he had stated that Liparis dispar existed in this country only in a semi-domesticated state (*ante*, p. xliv.), he had written to Mr. Doubleday on the subject, and that gentleman replied as follows:—"I do not know of any locality in Britain where it occurs in a state of nature, and I am strongly of opinion that it has only been found in the fens round Yaxley; when I was there in 1839 the larvæ swarmed on the gale and dwarf sallows. English was there in 1846, and he found the larvæ pretty common, but not so abundant as they were in 1839. Haworth simply says, 'In salicetis, rarissime.' I believe all the specimens which were placed in the old collections were continental, or reared from eggs brought from the Continent, as they were very different from the fen specimens, and just like those found in France; and I think most of those now bred in this country are of continental origin. I once collected a great quantity of the pupæ in Paris, and brought them home to Epping. The following spring I turned out thousands of larvæ, but they did not establish themselves, although I saw plenty of the moths in one field in August. In 1846 I obtained an immense quantity of eggs from moths bred from larvæ brought from Yaxley. Next spring great numbers of larvæ were turned out on the dwarf sallows growing among the gravel-pits in the Forest. A few larvæ were seen the following year, but not afterwards. It is very strange that a moth which frequents towns and suburban gardens on the Continent should be found in such a very different locality here. In France the larvæ appeared to feed principally on the elm."

Prof. Westwood repeated that Mr. Briggs' specimens (*ante*, p. xliv.) were the descendants, only three or four generations removed, of ancestors which were captured in a state of freedom.

Captain T. Hutton, of Mussooree, communicated a "Note on the Japan Silkworm," in which he expressed his opinion that the Japanese mulberry-feeding form yielding green cocoons is nothing more than a hybrid between a sickly and degenerate race of Bombyx Mori and the little monthly-worm, B. Sinensis, and repeated his conviction that, for the purpose of renewing the European stock, experienced entomologists should be deputed to visit different parts of China, with a view to the re-discovery of the silkworm in its natural state of freedom.

Papers read.

The following papers were read: "Choreutidæ and Crambina collected in Egypt in 1864, and Crambina, Pterophorina, and Alucitina collected in Palestine in 1865, by the Rev. O. Pickard-Cambridge; determined and the new species described, by Professor Zeller; the German descriptions translated into English by H. T. Stainton;" and "A Monograph of the genus Hestia, and descriptions of forms not hitherto noticed; with a tabular view of the Danaidæ and remarks on their natural affinities. By A. G. Butler, F.Z.S., Assistant in the Zoological Department of the British Museum."

New Part of 'Transactions.'

Part 4 of Vol. v. of the "Transactions" (third series), published in December, 1866, and being the fifth Part issued during that year, was on the table.

ANNUAL GENERAL MEETING,

January 28, 1867.

Sir John Lubbock, Bart., President, in the chair.

The President announced that one of the Prizes offered by the Council for Essays on Economic Entomology had been awarded to Dr. Wallace, of Colchester, for an Essay on the Oak-feeding Silkworm from Japan.

An Abstract of the Treasurer's Accounts for 1866 was read by Dr. Sharp, one of the Auditors, and showed a balance in favour of the Society of £79 15*s.* 1*d.*

The Secretary read the following:—

Report of the Council for 1866.

In accordance with the Bye-Laws the Council begs to present the following Report:—

Perhaps the most important event in the history of the Society during the past year has been the removal of our Meetings to Burlington House. Other scientific bodies were desirous of obtaining like privileges to those granted to us by the Linnean Society, but the Council was fortunately able to make arrangements compatible with the retention of our usual day of meeting, the first Monday of the month. It is hoped that the inconvenience necessarily caused by any change of locality to some of our Members will be compensated by greater convenience to others; the unquestionable superiority of the present over our late gathering place, and the diminution of our rental in Bedford Row, are material advantages gained; the Society has returned to the locality in which it flourished during the first eighteen or nineteen years of its existence; and additional *prestige* will attach to us as a body from assembling within these walls, the scientific centre of London.

France and Sweden have filled the places in our Honorary List vacated by France and Germany: Guérin-Méneville and Boheman are the chosen successors of Dufour and Schaum. During the year 1866 one Member died, another resigned; of Ordinary Members and Subscribers twenty-four have been elected; and the muster-roll of the Society contains the hitherto unequalled number of 207 contributors.

The Library grows apace; the stream of donations flows continuously, and considerable additions have been made by purchase.

The publications of the year extend to 450 octavo pages, illustrated by thirteen plates; and the sum derived from the sale of the 'Transactions' exceeds that of any recent year. The Council regrets the non-appearance of a second instalment of Mr. Baly's "Phytophaga Malayana;" further delay on the part of the author must necessarily lead to the abandonment of the scheme by which a separate volume of the 'Transactions' was devoted exclusively to that subject.

The financial operations of the year may be exhibited in the following classified form:—

Receipts.	£	Payments.	£
From Members	232	Publications	196
Sale of 'Transactions'	87	Library	37
Interest on Consols	3	Prize Essay	5
Donations	16	General Management	100
	£338		£338

The actual income has exceeded the actual outgoing by 3*s*. 3*d*.; and a comparison of the pecuniary position of the Society now and last year gives the following result:—

	Jan. 1, 1866.	Jan. 1, 1867.
Cash in hand	£11 14 10	£11 18 1
£109 14*s*. 9*d*. Consols (say)	100 0 0	100 0 0
	111 14 10	111 18 1
Liabilities	56 5 0	50 0 0
Balance	£55 9 10	£61 18 1

In conclusion, the Council ventures to submit that the increased number of Members, the sustained interest of the Meetings, the growth of the Library, the scientific value of the publications, the undiminished funds, and the lessened liabilities, are indicative of an administration characterized alike by activity and prudence.

January 28, 1867.

The following gentlemen were elected to form the Council for 1867, namely:—Messrs. Bates, Dunning, Sir John Lubbock, M'Lachlan, Moore, G. S. Saunders, Dr. Sharp, A. F. Sheppard, Frederick Smith, Stainton, S. Stevens, Weir, and Prof. Westwood.

The following officers for 1867 were afterwards elected, namely:—President, Sir John Lubbock, Bart.; Treasurer, Mr. S. Stevens; Secretaries, Mr. Dunning and Dr. Sharp; and Librarian, Mr. Janson.

The President read the following Address:—

THE PRESIDENT'S ADDRESS.

Gentlemen,—

The Reports made annually to the Society by the Council relieve the President from the duty of addressing you on our internal affairs, our progress in the past year, or our prospects for the future; leaving him, therefore, the more free to bring before you the state of our Science itself, the principal observations which have been recorded, the most important works which have been published, and the most interesting discoveries which have been made during the past year.

So rapid, however, is the progress of Entomological Science, that it would be impossible for your President, even if he had the requisite knowledge—which I have not—to give you within the limits of an Address anything like an exhaustive *resumé* of the entomological literature for the past year. This is the less to be regretted because the reports of Pr. Gerstäcker and Mr. Dallas, in Wiegmann's 'Archiv' and the 'Zoological Record,' leave little to be desired in this respect, and we owe those two gentlemen much gratitude for the admirable and careful manner in which their reports are worked out.

The prize offered by the Council for the best Essay on the anatomy, economy, or habits of any insect, or group of insects, especially serviceable or obnoxious to mankind, has been again awarded to Dr. Wallace, whom I have to congratulate on having carried off the prize in two successive years. His memoir on Ailanthiculture, to which the prize was awarded last year, forms the second Part of the fifth Volume of our 'Transactions.' The other Parts published during the year 1866 have been no less than four in number, and contain the following papers:—

1. Characters of a new Genus and Species of Chalcidites. By Mr. F. Walker.

2. Remarks on Capt. Hutton's paper "On the Reversion and Restoration of the Silkworm." By Capt. J. Mitchell.

3. On the British Species of Agathidium. By Mr. D. Sharp.

4. Observations on some remarkable Varieties of Sterrha sacraria, with General Notes on Variation in Lepidoptera. By Mr. M'Lachlan.

5. Description of Papilio Godeffroyi. By Mr. G. Semper.

6. New Genera and Species of Gallerucidæ. By Mr. Baly.

7. Descriptions of new Hesperidæ. By Mr. Hewitson.

8. Longicornia Malayana, Part 3. By Mr. Pascoe.

9. Descriptions of new or little known Genera and Species of Exotic Trichoptera; with Observations on certain Species described by Mr. Walker. By Mr. M'Lachlan.

10. List of the Longicornia collected by the late Mr. P. Bouchard, at Santa Marta. By Mr. Pascoe.

11. Catalogue of Buprestidæ collected by the late M. Mouhot, in Siam, &c., with Descriptions of new Species. By Mr. Edward Saunders.

11. Notes on some Hymenopterous Insects collected by Mr. Peckolt at Catagallo, South Brazil. By Mr. Frederick Smith.

12. Notes on the Butterflies of Mauritius. By Mr. Trimen.

13. New Genera and Species of Psocidæ. By Mr. M'Lachlan.

The various objects, moreover, exhibited at our Meetings, and the observations to which they have given rise—which, thanks to our very excellent Secretary, Mr. Dunning, are carefully reported in our 'Proceedings'—have been both numerous and interesting. I trust, however, that I shall not be exceeding my duties as President, if I point out that the attention of our Members seems to be almost exclusively devoted to Systematic Entomology, and I cannot help wishing that we more frequently received communications relating to the anatomical and physiological departments of our Science.

Nevertheless our Members have been anything but idle during the past year, and our own publications can by no means be taken as a measure of their activity, for the 'Proceedings of the Zoological Society,' the 'Zoologist,' the 'Entomologist,' the 'Entomologist's Monthly Magazine,' and Mr. Stainton's 'Entomologist's Annual' contain many papers contributed by Members of our Society.

With the exception of a paper of my own, to which our late President referred in terms too complimentary on the occasion of his last Annual Address, the Number of the Linnean 'Transactions' for 1866 contains no entomological matter. The 'Proceedings' are, on

the contrary, enriched as usual by numerous contributions, principally from Members of our Society. These comprise Mr. Smith's descriptions of Hymenopterous insects collected by Mr. Wallace in New Guinea, Sumatra, Sula, Gilolo and Salwatty; Mr. Walker's descriptions of Diptera from New Guinea, Salwatty and other Islands of the Eastern Archipelago; Mr. Hewitson's list of the Diurnal Lepidoptera collected by Mr. Wallace in the same Archipelago; Mr. Butler's list of Diurnal Lepidoptera collected by Mr. Whitely in North Japan; and Mr. Pascoe's memoir on the Australian Longicorns. Mr. Blackwall also communicates a short paper on the means by which insects move on dry, polished, vertical surfaces, and brings forward additional arguments in favour of his opinion that this is effected, not by the creation of a vacuum, but by means of an adhesive fluid emitted from the under surface of the feet. Dr. Kirk has a paper on the Tsetse; and Mr. Haliday a short notice of Dicellura, a remarkable genus allied to Prof. Westwood's curious Campodea.

In the 'Quarterly Journal of Microscopical Science' the late Mr. R. Beck, whose death is deplored by all lovers of Science, announced that he had observed a case of agamic reproduction, extending over three generations, in an Acarus belonging apparently to the genus Cheyletus. This is the first time that agamogenesis has been observed in the Arachnida. Mr. Tuffen West has, in the same excellent periodical, two short notices, one on the egg of Scatophaga, and the other on the cast-skin of an Ephemeron. They are illustrated by one of those beautiful plates for which Mr. West is so justly celebrated.

Mr. A. S. Packard has communicated to the Boston Natural History Society an interesting memoir "On the Development and Position of the Hymenoptera." His observations were made on a species of Bombus, and he shows that there are three changes "of skin during the so-called pupa state, in distinction from the larva and imago state, and it is highly probable that there are more. During the larval condition it would be safe to say that there are four distinct moultings. . . . . The genus Bombus, therefore, may be considered to undergo a series of at least ten moultings of the skin, and we are inclined to think further observations will tend to increase the number." Mr. Packard's observations certainly show that the transitions from the larva to the pupa on the one hand,

and from the pupa to the imago on the other, are more gradual than most entomologists would have been inclined to suppose. There is, he concludes, "no pause in the metamorphosis for a special biological design, such as obtains in the Lepidoptera and majority of the lower insects. The terms larva, pupa and imago are not therefore absolute terms." I need hardly say that even to the Lepidoptera the same observations might, in my opinion, be applied.

Mr. Packard is perfectly satisfied that Audouin, Latreille and Newman were correct in believing that the terminal portion of the so-called thorax in Hymenoptera is in reality abdominal. During this stage, he says, "the basal ring of the abdomen is plainly seen to be transferred from the abdomen to the thorax."

M. Balbiani, already so well known for his researches among the Infusoria, has communicated to the 'Comptes Rendus' a very remarkable memoir on the generation of the Aphis. If we consider that almost every one who has studied the anatomy of the Invertebrata must have had his attention particularly directed to the very interesting phenomena presented by the agamic reproduction prevalent in this family, and if we remember the numerous memoirs on the subject by Bonnet, Réaumur, Degeer, Kyber, Duvau, Morren, Steenstrup, Leydig, Leuckart, Owen, Huxley, and many others, we might well have thought that this problem if any in Natural History had been thoroughly exhausted.

Nevertheless, in opposition to the now almost unanimous opinion that the production of young by the viviparous females is a case of parthenogenesis, M. Balbiani comes forward and asserts that the viviparous specimens are hermaphrodites after all.

As regards the first stages in the formation of the egg, up to the appearance of the blastoderm, he agrees in the main with other observers.

Commencing with the viviparous individuals, he has satisfied himself that the whole inner surface of the blastoderm is lined with a delicate membrane, which extends like an envelope round the central vitelline mass. This membrane, with a portion of its contents, bursts through the posterior part of the blastoderm, and protrudes in the form of a hernia. This portion by degrees detaches itself from that remaining in the vitelline vesicle, and engrafts itself to the epithelial cells lining the ovarian chamber. The vitelline vesicle

then separates into two secondary vesicles. These two vesicles or cells are the rudiments of the future male and female generative organs. Each of them becomes gradually covered by a generation of small cells, which, when once produced, continue to increase in size, and multiply on their own account. The group produced by the herniated vesicle engrafted on the epithelium represents the male element, and *gives origin to the fecundating corpuscles;* that which originates from the free vesicle remaining within the blastoderm produces the future female generative organs. The generative vesicle of the male mass increases its size, attaches itself to the female generative apparatus, and becomes the reservoir for the fecundating corpuscles. That of the female group, on the contrary, gradually disappears.

The colouring of the two groups is also very different. The female elements remain colourless, while the males cells are either yellow or green.

The contents of these cells become converted into a number of small daughter-cells, furnished with a membrane and a nucleus. These daughter-cells are after awhile replaced by innumerable small dark corpuscles, much resembling minute Amœbæ, but their form does not change. The large mother-cells lose their colour and transparency, *and break up into a sort of powder.* In many cases the Amœboid corpuscles undergo a further evolution into "small unequal bacilli, which are straight or diversely flexuose, immobile and colourless." We might, he adds, "easily be led to regard them as a parasitic vegetable production, if we had not before our eyes all the successive phases of the transformation of these elements." In addition to which he adds that they are readily soluble in alkaline fluids.

It would be a mistake to suppose that the process now described by Balbiani as the male generative organ has altogether escaped earlier observers. It was observed both by Huxley and Leydig, as indeed Balbiani points out, but was regarded as a pseudo-vitellus. I myself had observed a mass of small green cells in the pseudovum of Coccus,* but I regarded them as parasitic vegetable cells, and, as we have seen, the same idea occurred independently to M. Balbiani, but was not adopted by him for the reasons already given. My "green cells," however, do not correspond with the "pseudo-

* "On the Ova and Pseudova of Insects," Phil. Trans. 1859, pp. 362, 363.

vitellus" of Prof. Huxley, but the description given by M. Balbiani of the development of the bacilli suggests, in many respects, a disintegration of the natural tissues, and a development of parasitic growth, rather than the ordinary and natural production of sexual elements.

On passing to the oviparous form we shall meet with additional difficulties.

The "male apparatus," as already described, occurs alike in both sexes, in the males as well as in the females, and with characters scarcely differing from those which it presented in the viviparous specimens. The true male generative organs are homologically the same as the female. There are not two rudimentary organs of which one is developed in one sex and the other in the other; but there is a single original rudiment, which is developed in one manner in the female, in a different manner in the male, and which in both cases contains the so-called "embryonic male organ."

This "embryonic male organ" is evidently, therefore, a perfectly distinct organ from an ordinary testis, and, as M. Balbiani has observed it in other animals besides Aphides, we shall await with interest some further communications on the subject. In the female Aphis he describes it as contained in the ovary, and as producing cells which evidently correspond with the seminal corpuscles of the viviparous form. "These facts," he concludes, "evidently indicate that the egg has already, while in the ovary, undergone a first fecundation, *with which the male has nothing to do*, and the effect of which is limited to the production of the generative elements of the future animal."

Some years ago* I attempted to show that there are two distinct kinds of Spermatozoa among the Annulosa, and I ventured to suggest that their functions were probably different. But however much I might be tempted to claim these observations of M. Balbiani as confirmatory of my views, I cannot but feel that fresh evidence is required that his "embryonic male organ" has really the nature and functions which he attributes to it.

Although our late President, Mr. Pascoe, alluded briefly, in his last Address, to the remarkable discovery made by Prof. Wagner that certain dipterous larvæ possess the power of agamic repro-

* Phil. Trans. 1861.

duction, the fact is one so remarkable that I think I need not apologize for returning once more to the subject. It has been almost an axiom among entomologists that no larva possesses the power of reproduction; and when therefore M. Wagner, Professor of Zoology at Kasan, announced that he had discovered a case of asexual reproduction in the larva of a fly belonging to the genus Cecidomyia, his statement was received with an astonishment bordering on incredulity. Indeed the Editors of the 'Zeitschrift für wissenschaftliche Zoologie,' to whom Prof. Wagner had forwarded his memoir, kept it back for two years, because the statements made by him seemed to them almost incredible. These statements have now, however, been confirmed by other excellent observers, namely, Meinert, Pagenstecher, Leuckart and Von Siebold; and there seems no doubt about the main facts; namely, that the larvæ of certain flies continue, throughout the autumn and winter, to produce a series of successive generations of larvæ, the last of which are finally developed into perfect and sexually mature individuals. The females then, after coputation, lay eggs, and thus the cycle commences again.

I say "certain flies," because it is now almost certain that the different observers have had different species under notice, and Prof. Wagner even believes that he has met with five distinct forms. Two only, however, have yet been obtained in a perfect state, one of which appears to have been bred both by Prof. Wagner and by M. Meinert, the other by M. Meinert alone. The first is a new species, which has received the name of Miastor Metraloas, and is most nearly allied to the genus Heteropeza, from which it is principally distinguished by the structure of the tarsus. The second is named by M. Meinert, Oligarces paradoxus.

Wagner and Meinert believed that the young larvæ originated from the general fatty tissue, and before the appearance of any special generative organs. Pagenstecher first called this in question, and expressed his belief in the existence of a proper "germ-stock" or ovary. Leuckart has clearly shown that this is the case, and that the early stages in the development of the pseudova, from which the secondary larvæ are produced, are the same as in the production of an ordinary dipterous egg. I entirely agree with him when he says that "Every one who is acquainted with the developmental history of insects, or who consults the existing observations on that subject by Stein, myself, Lubbock, Claus, and others, will agree with me when I assert that the germ-balls of our larvæ, with their contents,

precisely reproduce the conditions of one of the so-called germ-chambers from the ovarian tubes of a female insect."

It is therefore evident that the developmental history of these pseudova follows the same course as other insects' eggs, which indeed I have elsewhere attempted to show is the case in all other groups of insects which possess the power of agamic reproduction:

It may be added that the subsequent development accords in essential points with that which has been observed in other insects. Miastor appears indeed to be a very favourable subject for such investigations, and has yielded to M. Mecznikoff the remarkable discovery that the mysterious "polar cells," which have been observed by so many naturalists and in such different groups of animals, re-enter the blastoderm, and finally pass into the germ-stock of the young larva. They thus apparently answer to the so-called "embryonal male organ" of M. Balbiani.

Prof. Leuckart, as we have seen, has clearly shown that the reproductive bodies in the larvæ of Miastor arise in the ovary, that they possess the rounded form, the germinal vesicle and spot, the vitelligenous cells, and in fact "all their first stages of development, in common with eggs." He is not, however, yet prepared to follow out his own views to their logical conclusion, but, as he says, "cannot quite determine to describe them as eggs. . . . . Just as the larval forms of an animal cannot be placed on the same level with the fully developed creatures, and regarded as such, so we must not transfer the denomination 'eggs' to structures which have only their first stages of development in common with eggs." These first stages, however, comprise just the special characteristics; the subsequent changes, such as the development of the chorion, &c., are mere external adaptations for the purpose of enabling the egg to brave its exposure to external circumstances. The ovum in Mammalia needs no such protection, and is not more specialized in this direction than that of Aphis or of Miastor; but no one would deny that the reproductive bodies of Mammalia are true ova.

If, moreover, we examine the reproductive bodies throughout the animal kingdom, we may find every gradation from the most specially developed egg—that, say, of a bird—to that of the viviparous Aphis or Coccus. One great difference between an egg and a bud is the place of origin, to which, as it seems to me, Prof. Leuckart does not attach sufficient importance.

He is, however, inclined to adopt the name of pseudovum for the

reproductive bodies in Aphis and other similar cases, but he blames Huxley for attributing the same term to the "true eggs, which are capable of spontaneous development."

Now between a normal egg and the pseudovum of Aphis every intermediate term exists. No important morphological line of demarcation can be drawn. On the other hand, a body which is capable of spontaneous development, whatever its form may be, and whether it is susceptible of impregnation or not, is very different from one which requires impregnation as a necessary antecedent to development. Herein, then, lies a true difference, and I certainly think, therefore that (as, indeed, I suggested in the year 1856) it is convenient to have some term for self-fertile ova, whether susceptible of impregnation or not, whereby they may be distinguished from other ordinary eggs, to the development of which impregnation is a necessary antecedent.*

Prof. Leuckart's criticism, however, derives a certain amount of support from the name which Prof. Huxley has given to these reproductive bodies. The name "pseudovum," or "false egg," may be appropriate enough in the case of Aphis, or Coccus, or even of Daphnia. It is not, however, well adapted to that of Cynips, and still less to those of the bee or the silkworm moth. The so-called "pseudova" in these cases are not "false eggs;" they are, on the contrary, true eggs —and something more. They possess, in fact, all the characters of true eggs, combined with a greater amount of vital energy. "Euova" would seem therefore to be a more appropriate term for them than "pseudova."

Mr. Darwin's last edition of the 'Origin of Species' contains many illustrations from Entomology which were not present in the first. Several of these are of great interest. As an example, I take his remarks on the influence which insects have exercised on the beauty of flowers. If bees owe their honey to the flowers, flowers, on the other hand, it would appear, owe their beauty to the bees. "Flowers," says Mr. Darwin, "rank amongst the most beautiful productions of

* Even here, however, intermediate stages appear to occur. Many cases have been observed in which yolk division commences in unimpregnated eggs, and in insects the embryo is sometimes formed, before the vital energy of the ovum is exhausted and the process stops. It is even stated that young born from agamic eggs are particularly weakly, as if even after birth the absence of male influence showed itself in a want of vital energy.

Nature; and they have become, through natural selection, beautiful, or rather conspicuous, in contrast with the greenness of the leaves that they might be easily observed and visited by insects, so that their fertilization might be favoured. I have come to this conclusion from finding it an invariable rule that when a flower is fertilized by the wind it never has a gaily-coloured corolla. Again, several plants habitually produce two kinds of flowers; one kind open and coloured so as to attract insects; the other closed and not coloured, destitute of nectar, and never visited by insects. We may safely conclude that if insects had never existed on the face of the earth, the vegetation would not have been decked with beautiful flowers, but would have produced only such poor flowers as are now borne by our firs, oaks, nut and ash trees, by the grasses, by spinach, docks and nettles." Moreover, we obtain from these facts the best evidence that insects possess the faculty of perceiving and distinguishing colours. For as regards the vision, and indeed the other senses of insects, we have yet much to learn. We do not yet thoroughly understand how they see, smell, or hear; nor are entomologists entirely agreed as to the function or the structure of the antennæ. This interesting subject offers a most promising field for study, and I would particularly call the attention of entomologists to a remarkable memoir by Hensen on the auditory organ in the decapod Crustacea, which first appeared in the 'Zeits. f. wiss. Zool.,' vol. xiii. p. 319, and of which an abstract has been given in the 'Quarterly Journal of Microscopical Science,' vol. v. p. 31. Hensen has shown that (as had been stated by M. Faivre) the otolithes in the open auditory sacs of shrimps are foreign particles of sand, *introduced into the organ by the animal itself.* He proved this very ingeniously by placing a shrimp in filtered water without any sand, but with crystals of uric acid. Three hours after the animal had moulted he found that the sacs contained many of these crystals.

M. Hensen has also shown that each hair in the auditory sac is susceptible of being thrown into vibration by a particular note, which is probably determined by the length and thickness of the hair. It may be experimentally shown that certain sounds throw particular hairs into rapid vibration, while those around them remain perfectly still.

M. Baudelot has published, in the 'Annales des Sciences Naturelles,' a short memoir on the influence of the nervous system on the

respiration of insects. M. Faivre had attempted to show that the respiratory movements depend entirely on the metathoracic ganglion, and that the posterior part of the ganglionic chain acts merely as a conductor. M. Baudelot has arrived at a very different conclusion: he experimented on the larva of the dragon-fly, and after cutting off the head found that for six hours the respiratory movements were strong and regular, while even after a lapse of twenty-one hours they were apparent, though weak, nor did they cease entirely until twenty-seven hours after the operation. Secondly, he bisected a specimen immediately behind the metathorax, notwithstanding which respiratory movements were continued in the abdominal portion for something more than twelve hours, and in one case even for twenty-four hours. Moreover, he arrived at similar results in the dragon-fly itself, and he concludes therefore that the respiratory movements of insects are not, like those of Vertebrata, under the rule of one special part of the nervous system, but that each ganglion acts for itself as a centre of force.

Prof. Faivre has also published, in the 'Annales des Sciences Naturelles' (New Series, vol. i.), some interesting investigations into the nervous system of insects. It is hardly necessary for me to remind the Society that we owe to our great entomologist Newport the interesting discovery that the nervous column in Articulata consists of two parts, an upper band with motor functions, and a lower ganglionic cord of sensitive nerve matter. He suggested, moreover, that the nerves had a double origin as well as a double function.

M. Faivre has succeeded in proving by experiment the accuracy of these views. After carefully exposing the prothoracic ganglion, he found that on irritating the under surface of the ganglion he obtained unmistakeable signs of pain, indicated by general movements; while irritation of the upper surface merely produced movement in the corresponding leg, action on the right side of the ganglion always affecting the right leg, that on the left side the left leg. But further than this M. Faivre found it possible to isolate the power of motion from that of sensation, so as to paralyze either at will without affecting the other. If he made a longitudinal section through the *upper* part of the ganglion on the side, the leg on that side lost all power of motion. If the insect walked the leg took no part in the movement, and if the leg itself was pinched it remained equally motionless. Yet its sensibility was unimpaired, and any irritation of it produced reflex

actions *in the other legs*, and all the usual signs of discomfort, excepting indeed in the leg itself. Thus then the excitability was destroyed, though the sensibility was unaffected. After awhile, however, the former gradually returned.

M. Faivre was also able to effect the converse operation—*i. e.*, to destroy the sensibility without affecting the power of motion. To do this it was necessary to cut the inferior side of the ganglion, and especially to avoid going deep. In this case, as in the preceding, action on the right side of the ganglion affected the right leg, that on the left side the left one. Under these circumstances if the paralyzed leg is pinched no movements are produced either in it or in any other parts of the body; while, on the contrary, the paralyzed leg does move in the same manner as the others, under the stimulus of irritation applied to *any other* part of the body. Thus then if a superior longitudinal section be effected through the side of the ganglion, the leg is rendered motionless, but other parts can be stimulated through it. On the contrary, if an inferior longitudinal section be made, the leg can be moved by stimulus applied elsewhere, but is rendered incapable of transmitting sensation.

There is yet another manner in which the ganglion may be treated. If a lateral longitudinal section be carried through each side, the corresponding legs are completely paralyzed; and yet, the conducting properties of the ganglion being unaffected, irritation of the antennæ produces evident movements of the posterior feet, and, *vice versa*, irritation of the posterior legs produces movements in the head.

M. Faivre has made several experiments on other portions of the nervous system. The supra-œsophageal ganglion he finds to be quite without sensation. It may be pinched, pricked or torn, without any pain being manifested, thus presenting a remarkable contrast with other ganglia, and a not less remarkable analogy with the cerebral hemispheres of the, so-called, higher animals. It is curious that the commissures appear to gain sensibility as they quit the brain and approach the first subœsophageal ganglion.

The subœsophageal and other ganglia, so far as they have been examined by M. Faivre, present the same phenomena as the prothoracic; that is to say, they are motor above and sensory below; and an injury affects always the corresponding side of the body. He found the mesothoracic ganglion the easiest of all to examine, it being necessary for the purpose to remove only the membrane which unites the ventral surface of the prothorax with the mesothorax.

Finally, M. Faivre draws these principal conclusions:—

First. That even among the lower animals the distinction between sensibility and excitability holds good, proving thus the constancy and the generality of the physiological plan upon which the nervous system is established.

Secondly. The ganglionic chain of insects is the analogue of the spinal chord, and like the latter is divisible into motor and sensitive portions.

These investigations show clearly the correspondence which exists between the nervous system of insects and that of the higher animals.

Strictly perhaps the struggles and contortions of an insect when it is wounded are no absolute proof that it is capable of suffering, yet there are few who can entertain a doubt on the question. And so also, strictly speaking, no proof has yet been adduced that insects possess the gift of reason; still the study of their actions and habits leaves, to my mind, as little doubt in the one case as in the other.

Trees must be judged by their fruits and animals by their actions. Look, then, at the ants: they build houses, they keep domestic animals, and they make slaves; if we deny to them the possession of reason we might almost as well question it in the lower races of Man: insects cannot speak, indeed, but they evidently communicate by means of their antennæ, just like certain North-American Indians who cannot understand one another's language, but who can yet converse together with ease and fluency by a code of signs which are the same over a large area and among tribes whose spoken languages are entirely dissimilar.

In the face of the facts recorded by the Hubers and other observers, nothing but the force of preconceived ideas could make us hesitate to regard the ant or the bee as reasoning beings.

It is manifestly unfair to compare an insect with man, or even with the horse or dog. Reason is based on experience, and this the insect can never acquire owing to the shortness of its life. If the comparison is made at all, the ant or bee should be compared with a puppy or an infant, and it may well be questioned then to which an impartial observer would attribute the highest nervous organization. Every one knows that the movements of the body can be regulated only by long practice; a baby cannot command its arms or legs any more than its thoughts, and the power of regulating them is acquired as gradually in the one case as in the other.

Although, therefore, it cannot be denied that on the whole even the lowest savages have made more progress and shown more ingenuity, in many cases, than the ant or the hive bee, it may well be questioned whether this is owing to any superiority in their nervous organization, and whether it may not be accounted for by other causes, and especially by the shortness of insect life, which offers an insuperable obstacle to the accumulation of experience.

Of all living animals the chimpanzee and the gorilla, in their bones, muscles, viscera, &c., most nearly approximate to man, and the "determination of the difference between Homo and Pithecus" is, in the words of Prof. Owen, "the anatomist's difficulty;" but if we judge animals by their intelligence, as evidenced in their actions and mode of life, we may fairly claim for Entomology a high rank in Biological Science, for in that respect it is not the gorilla or the chimpanzee, but the bee, and, above all, the ant, which approach the nearest to Man.

A vote of thanks to the President was carried by acclamation.

A vote of thanks to Mr. Edwin Shepherd, on his resignation of the Secretaryship, an office which he had held for twelve years, during seven of which he was the principal acting Secretary, was carried by acclamation; and thanks were also voted to the other officers for 1866.

Abstract of the Treasurer's Accounts for 1866.

RECEIPTS.

	£	s.	d.
By Balance in hand, January 1st, 1866	11	14	10
Arrears of Subscriptions	22	1	0
Subscriptions for 1866	153	6	0
Admission Fees	25	4	0
Compositions	31	10	0
Tea Subscriptions	10	15	6
Sale of 'Transactions,' at Rooms £49 15 3			
„ at Longmans' 37 8 1			
	87	3	4
Dividend on £109 14*s.* 9*d.* Consols	3	5	10
Donation from W. W. Saunders, Esq.	5	5	0
	£350	5	6

PAYMENTS.

	£	s.	d.
To paid arrears for 1865:—Rent to Christmas	11	5	0
Fire Insurance to Lady-day, 1867	1	4	0
Librarian, 53 attendances	18	11	0
Tea, 13 Meetings	13	13	0
Attendance, Coals, Collector's Commission, &c.	5	2	4
Parcels, Postage, Stationery, &c.	11	11	4
Removal of Library	2	4	0
Printing 'Transactions,' 5 Parts	112	10	3
„ 'Proceedings,' Circulars, &c.	12	6	9
Plates for 'Transactions,' Engraving, Printing and Colouring ...	74	19	3
Books purchased	24	12	0
Bookbinding	11	8	6
Rent, 3 quarters, to Michaelmas, 1866	33	15	0
Prize, for Essay on Ailanthiculture	5	5	0
Balance in hand	11	18	1
	£350	5	6

Liabilities and Assets of the Society.

Liabilities.

	£	*s.*	*d.*
Rent to Christmas	5	0	0
Loan from Mr. Dunning ...	45	0	0
	£50	0	0

Assets.

	£	*s.*	*d.*
Arrears of Subscriptions :— good,—(say)	17	17	0
Ditto, doubtful, £31 10*s.* 0*d.*			
Consols, £109 14*s.* 9*d.* (say)	100	0	0
Cash balance in hand	11	18	1
	£129	15	1
Less amount of Liabilities	50	0	0
Balance	£79	15	1

JOURNAL OF PROCEEDINGS

OF THE

ENTOMOLOGICAL SOCIETY OF LONDON.

1867.

February 4, 1867.

Professor Westwood, Vice-President, in the chair.

The President (by letter) nominated as his Vice-Presidents Messrs. Westwood, Stainton, and Frederick Smith.

Donations to the Library.

The following donations were announced, and thanks voted to the donors:—'Proceedings of the Royal Society,' Vol. xv. Nos. 84—88; presented by the Society. 'Journal of the Linnean Society,' Zoology, No. 35; by the Society. 'On the Development of Chloëon (Ephemera) dimidiatum,' by Sir John Lubbock, Bart.; by the Author. 'Catalogue of the Longicorn Coleoptera of Australia,' by F. P. Pascoe, Esq.; by the Author. 'Catalogue des Lépidoptères des Environs de St. Pétersbourg,' par N. Erschoff; by the Author. 'The Zoologist' for February; by the Editor. 'The Entomologist's Monthly Magazine' for February; by the Editors.

Election of Members.

Herbert Edward Cox, Esq., of Croydon, was elected a Member; and Yeend Duer, Esq., of Cleygate House, Esher, an Annual Subscriber.

Prizes for Essays on Economic Entomology.

The Chairman announced that the Council had again resolved to offer two prizes of five guineas each for Essays, of sufficient merit and drawn up from personal observation, on the anatomy, economy or habits of any insect or group of insects especially serviceable or obnoxious to mankind. The Essays must be sent to the Secretary at No. 12, Bedford Row, on or before the 30th of November, 1867, when they will be referred to a Committee to decide upon their merits; each must be indorsed with a motto, and be accompanied by a sealed letter indorsed with the same motto and inclosing the name and address of the Author.

Exhibitions, &c.

Mr. Bond exhibited four specimens, two males and two females, of a Lasiocampa bred by Mr. Robert Mitford from larvæ found on the coast of Kent; he regarded them as merely a variety of Lasiocampa trifolii, differing from the normal form in colour and in the antennæ of the male, though he was informed that the larvæ also differed and were of a golden colour. The insect might be supposed to bear the same relationship to L. trifolii that L. Callunæ bears to L. quercus, and had very much the appearance to be expected in a hybrid between Lasiocampa trifolii and Odonestis potatoria. Other bred specimens of L. trifolii, from Cumberland, Hants, Dorsetshire and Devonshire, were produced for comparison.

Mr. Bond also exhibited several Fritillaries with unequally developed wings; and a remarkable variety of Dianthœcia capsincola from York.

Mr. Bond offered an explanation of the curious habit of Macroglossa stellatarum, frequenting stone walls, &c., as to which an enquiry was made at the previous Meeting (*ante*, p. xlix.). The object was to secrete itself in some hole or crevice: he had often noticed that the insect had a morning and an afternoon flight, but in the middle of the day grew tired, when it would seek out a wall or bank and creep up it until it found a hole or cranny wherein to rest.

Dr. Wallace corroborated this: when residing in the Isle of Wight he had observed the humming-bird hawk-moth resting in crevices of mud banks, &c., and on one occasion he had captured in a limpet-shell a specimen which was thus reposing.

Prof. Westwood exhibited a singular variety of Mamestra brassicæ caught by Mr. Briggs, of St. John's College, Oxford. Mr. Bond mentioned that he possessed a similar specimen.

Dr. Wallace said that on recently looking through Dr. Bree's collection of British Lepidoptera he had detected a Platypteryx Sicula mixed up with P. falcataria. The insect did not bear any label, and Dr. Bree had not any recollection of the capture of the particular specimen, though he had no doubt that it had been taken by himself some years ago along with P. falcataria in the neighbourhood of Stowmarket. If so, this was a new locality for the species, which in this country had hitherto been known to occur only in the neighbourhood of Bristol.

Mr. G. S. Saunders exhibited a nest formed by social caterpillars among the leaves of a Brazilian tree, a species of Zeyhera; it was about a foot in length, and formed a compact web between two small branches. The nest was collected in 1866 by Senor J. C. de Mello, at Campinas, Province of S. Paulo, and by him sent to Mr. Daniel Hanbury.

Mr. Wormald exhibited a collection of insects sent from Shanghai by Mr. William Pryer, amongst which was a single specimen of a wild Bombyx, having some resemblance to B. Huttoni.

Dr. Wallace exhibited an English cocoon of Bombyx Yamamai, one of two reared in 1866, at York, by Mr. Dossor.

Dr. Wallace also exhibited numerous specimens of the cocoon and imago of Bombyx Cynthia, and the silk thereof. One was a double cocoon, the joint work of two larvæ. Another cocoon, formed in 1865, and which in due course ought to have produced a moth in 1866, contained a still living pupa, which would probably hatch in

1867. He mentioned that though the moths were greedily eaten by fowls and other birds, the larvæ, though not hairy, were rejected; and that when Ailanthus leaves were not procurable the larvæ had been found by Captain Hutton to thrive on honeysuckle. The moths of B. Cynthia were subject to considerable variation in size and coloration. He had invariably found that at the commencement of the hatching out of a brood the males greatly outnumbered the females, whilst at the end the reverse was the case: he argued that in proportion as the individual was finer the time required for its metamorphosis was longer; hence in general the female, which was the larger and heavier insect, was preceded by the male, which was smaller and had less to mature. He thought Bombyx Guerinii and B. Ricini were probably only varieties or local forms of B. Cynthia. Lastly, Dr. Wallace mentioned that he had frequently observed a sound to proceed from the eggs of B. Cynthia, "a sort of click, a single sound, generally in the second week," which was attributed to "the parchment-like shell being pressed out with a spring by the effort of the larva within, and returning to its concave form."

Mr. F. Moore exhibited Bombyx Guerinii, of which only three or four specimens were known, and Bombyx Ricini, with its cocoons and silk, for comparison with the produce of Dr. Wallace's Ailanthery.

Mr. Alfred R. Wallace remarked that Dr. Wallace's theory on the relation between the size of the specimen and the period of development satisfactorily accounted for the fact that as a rule in Lepidoptera the male was smaller than the female. Owing to the precarious tenure of life of a Lepidopterous insect, which was not only exposed to the attacks of many enemies, but was also liable to destruction from mere change of temperature, it was important that the female should be impregnated almost as soon as hatched, and therefore that males should be in readiness at the time of her emergence. The males which first hatched became the parents of the future progeny; the progeny inherited the qualities of the parent; and thus in process of time the males which had a tendency to early hatching, the small specimens which required a shorter period for their development, predominated, while those which hatched later, the larger males, being without mates and therefore leaving no offspring, would constantly tend towards extinction, and finally leave the smaller males in possession of the field.

Mr. Janson exhibited a collection of Coleoptera from Vancouver's Island, amongst which Mr. Pascoe pointed out some fine Longicorns, a form resembling the Australian Hesthesis, Plectrura, Purpuricenus, Exops, &c.

Mr. C. A. Wilson, of Adelaide, South Australia, communicated the following notes on Cerapterus Macleayii and Calosoma Curtisii:—

"*Cerapterus Macleayii*.—Of the genus Cerapterus we have three species in this colony, C. Wilsoni, C. Macleayii and C. Hopei. The first of these is much the most rare, and from twice to three times the size of the others. Some years ago C. Macleayii was found frequently between the town (Adelaide) and the sea, at about two miles from the former and five from the latter, and always under dry cow-dung: after this, on nearing the sea, or rather gulf (St. Vincent), it gave place to C. Hopei. It has also been taken around Gawler under the same circumstances, that is, on land never yet turned up, where cattle, horses, &c., have long grazed, and under cow-dung of a particular age or state of dryness—dropped some days, but before all moisture had

gone from it. Specimens of this beetle have, however, become scarce in all the former spots, on account of the traffic and disturbance of their places of rest; but on the 17th of November, 1866, I searched a large untilled paddock of about 134 acres, west of Adelaide, where cattle had grazed for some years, and obtained seven specimens of this Cerapterus; this was one specimen to about thirty or forty of their domiciles that I turned over, and all were found alone. I am not aware of any account of the habits of these Paussidæ having been published. There is a note in the Addenda to Westwood's 'Modern Classification,' stating that Mr. Macleay's brother had found an Australian species of Cerapterus residing in ants' nests: it is not said what kind of ant, the white (Termes) or the common (Formica): I suppose the former; if otherwise, the circumstance is quite unknown to me. Should the habits of the Cerapterus (of N. S. Wales?) be the same as here, I fancy this remark is an error from cursory observation. I think the Cerapteri only use their dry coverings as places of shelter, though how they come there and why first found there I confess I cannot tell. Perhaps they fly at night and hide in the day. I observed on this and former occasions the following facts: the white ants are in these plains found nowhere but under drying cow-dung; still hundreds of pieces in the most favourable conditions are without them. In the present case four of the pieces under which the Cerapteri were found had white ants under them, and three had not. Each of the beetles was lying under his canopy in a small depression of the ground, or with the earth slightly raised round him, and was always perfectly still: where there were ants they appeared to have no connexion with the beetle or in any way to disturb him or be aware of his presence, though running about when the coverings were raised. I also observed that where no ants were with the other Cerapteri there evidently never had been any. Nearly all these seven specimens on being disturbed or lifted by me crepitated several times, some as many as three times, before immersion in the methylated spirit I had with me, at the same time discharging from some part of the body a yellow fluid, which stained the abdomen and last pair of legs, but disappeared on immersion in the spirit.

"*Calosoma Curtisii*.—To obtain this species of Carabidæ I had to go three miles nearer to the gulf, to a place called the Reed Beds, a large tract of land several miles square, extending in some parts nearly to the gulf, and obtaining its name from several acres of reeds still growing at its furthest extremity. I have before given some remarks on the habits of this species, which I beg to refer to (see Proc. for 1864), and will now supplement. Though formerly, as there mentioned, rather numerous, and one year particularly so, at the foot of the North Adelaide hills, they seem almost entirely to have deserted them. As with the Cerapterus, the presence of cattle seems necessary to their maintenance, and though on the former occasions I found them mostly running about, and very seldom under dry cow-dung, I have reason from this day's observation (November 17, 1866) to think that they lay their eggs beneath it. In November, 1864, I captured near the Reed Beds as many as twenty-two; this was at a farm where many cows were kept, sandy in some parts, but good soil in others. Rather late in November, 1865, I repaired to the same spot, but did not find a single specimen; that, however, was a year of drought. The favourable and long-protracted rains of this year made me hope better things, and I was not disappointed. I took in about an hour and a half, from a space somewhat less than an acre, sixty-five of the Calosoma. Nearly all of them were under the half-dried cow-dung; under the first I lifted were

four; under one as many as twenty. But few were running about, and these either round the deposits or from one to another. As usual they never once attempted to fly, though they have ample wings, and the day was sufficiently warm: they ran, but not very fast, and were easily taken. Under the piece of cow-dung where the largest number were found only two or three were at first seen, but others had gone below the surface of the ground, and on watching a slight kicking or disturbance of the earth took place, and the beetle was easily captured. The males and females, slightly differing in size, the latter being the largest, were much together, and I conclude it was late in their season, and that the eggs were being deposited beneath the surface under the cow-dung. There were not any larvæ about, though I had seen them at this time of year on a previous occasion. The beetles smelt strongly of the substance under which they burrowed, and I think they fed on it.

"Our large five-horned Copris has of late years spread in the Gawler districts from the same cause, *viz.* the numerous deposits from the cattle. Through this, while in a moist state, they pierce during the dark hours, going often a foot down, making large holes, and throwing up the earth behind them; and I have dug out from under one piece from twenty to thirty specimens, male and female. They first appear in June, when rain has fallen, up to September when leaving off."

Prof. Westwood observed that, in the note referred to, in the 'Modern Classification,' he undoubtedly was speaking of Formicidæ, and not of Termitidæ. Mr. Wilson did not seem to be aware that Paussidæ had been repeatedly found in ants' nests, and that several species had been sent from the Cape of Good Hope by Guienzius with the nests of the particular species of Formicidæ which they frequented.

Mr. A. R. Wallace remarked upon the rapidity with which the insects mentioned by Mr. Wilson had adapted their mode of life to the altered circumstances in which they found themselves placed; thirty years ago there was not a cow in South Australia, and yet members of three families of Coleoptera, so widely separated as the Paussidæ, Carabidæ and Copridæ, had already become habitual frequenters of cow-dung; and this was the more remarkable in the Calosoma, whose British congener was arboreal in its habits.

Mr. Gould exhibited Hylurgus piniperda, which was doing considerable mischief to Pinus insignis in several parks and plantations in Cornwall.

Mr. Pascoe called attention to an article on Atropos pulsatoria in Hardwicke's 'Science Gossip,' of the 1st of February, 1867, in which Mr. W. Chaney wrote as follows:—

"My first acquaintance with Atropos, or as it is generally called here the wood-louse, commenced about thirteen or fourteen years ago: at that time I lived in an old house in Brompton, near Chatham, and in my bed-room, which was also my library and museum, I had a very *olla podrida* of Natural History hanging about the walls; among the rest was a honey-comb. It was soon after the introduction of this to my list of curiosities that the strange ticking sound (which at the time sorely puzzled me) commenced, and that led me eventually to the investigation of the cause. I soon found that the noise proceeded from the comb, and on closer examination I saw a number of wood-lice travelling about from one cell to another, and appearing very busy in their explorations. After awhile the ticking commenced, which I quickly traced to a particular cell, and by the aid of a common convex lens I could perceive Atropos

beating with its head against the side of the cell, the noise produced being quite as loud as the tick of an ordinary watch, thus confirming Mr. Derham's observations, 'and viewing them with a convex lens, I soon perceived some of them to beat or make a noise with a sudden shake of their body,' &c. From this time the honey-comb, which perhaps from its peculiar sonorous nature suited them so well, became the head-quarters of Atropos, and night after night, and sometimes by day, might be heard the tick, tick, tick, by the hour together; sometimes one, sometimes two or more, ticking away with all their might, as if to out-tick each other. At any time by carefully approaching the comb, and waiting a second or two quietly, they might with the aid of a lens be seen at their peculiar pastime. Since then I have lived in my present house, a comparatively new one, for about twelve years, and during that time have constantly heard the familiar tick from time to time, twice during the last week, October 8th and 10th. Atropos is very numerous here, seeming to prefer the mantel-piece, upon which are several vases filled with artificial flowers, and any night they may be seen by the dozen prying into any little crevice, or minutely surveying petal after petal of their floral habitation."

Mr. F. Smith said that he had a number of living Atropos which he had been observing for some time, but he had not yet been able to detect them making any sound.

Mr. M'Lachlan reiterated his disbelief that so soft an insect could be the author of the tapping noise attributed to it; and with reference to Mr. Chaney's observations, he should scarcely have thought that honey-comb was of a "peculiar sonorous nature."

Paper read.

Dr. Wallace read a paper "On some Variation observed in Bombyx Cynthia in 1866."

February 18, 1867.

Sir John Lubbock, Bart., President, in the chair.

Donations to the Library.

The following donations were announced, and thanks voted to the donors:—'Bulletin de la Société Impériale des Naturalistes de Moscou,' 1865, No. III., 1866, No. II.; 'Annales de la Société Entomologique de France,' 4e Sér. Tome v., 1865; 'Stettiner Entomologische Zeitung,' 1867, Nos. 1—3; 'Proceedings of the Natural History Society of Dublin,' Vol. iv. Part iii.; presented by the respective Societies. 'Beskrivelse over Lophogaster typicus, en mærkvædig Form af de Lavere Tifœddede Krebsdyr,' by Dr. Michael Sars; 'Norges Ferskvandskrebsdyr, Fœrste Afsnit, Branchiopoda. I. Cladocera Ctenopoda (Fam. Sididæ & Holopedidæ),' and 'Beretning om en i Sommeren 1863 foretagen Zoologisk-Reise i Christiana Stift,' by G. O. Sars; 'Entomologiske Undersœgelser i Aarene 1864 og 1865,' by H. Siebke; presented by the respective Authors.