

April 4, 1864.

F. P. PASCOE, Esq., President, in the chair.

Mr. Pascoe thanked the Society for electing him to fill the Presidential Chair; and nominated as Vice-Presidents Mr. Stainton, Mr. A. R. Wallace and the Rev. Hamlet Clark.

Additions to the Library.

The following donations were announced, and thanks voted to the donors:—*'Sitzungsberichte der Königl. bayer. Akademie der Wissenschaften zu München,'* 1863, II. Hest 4; presented by the Academy. *'The Zoologist'* for April; by the Editor. *'The Classification of Animals based on the Principle of Cephalization. No. III. Classification of Herbivores,'* *'Note on the Position of Amphibians among the Classes of Vertebrates,'* by the Author, James D. Dana. *'Stettiner Entomologische Zeitung,'* 1864, Nos. 1—3; by the Society. *'Exotic Butterflies,'* Part 50; by W. W. Saunders, Esq. *'The Natural History of the Tineina,'* Vol. viii., containing *Gracilaria*, Part i., and *Ornix*, Part i.; by H. T. Stainton, Esq. *'The Intellectual Observer,'* No. 27; by the Publishers. *'The Reader'* for March; by the Editor. *'The Journal of the Society of Arts'* for March; by the Society.

The following additions by purchase were also announced:—Grenier, A., *'Catalogue des Coléoptères de France.'* De Marseul, S. A., *'Catalogue des Coléoptères d'Europe et du Bassin de la Méditerranée en Afrique et en Asie,'* deuxième édition.

Election of Member.

P. H. Harper, Esq., of 30, Cambridge Street, Hyde Park Gardens, was ballotted for and elected a Member of the Society.

Exhibitions, &c.

Mr. Frederick Smith—after remarking that his attention had been called to a note appended by the Editor of the *'Zoologist'* (Zool. 8975) to an extract from his Address to the Society on the 25th of January last, the passage extracted being that relating to the luminosity of *Fulgora*, and the note being in the following words, "I believe the Honduras fire-fly with intermittent light is an *Elater*; if so, the *Fulgora* question remains in *statu quo*,"—said that he had since had supplied the further evidence of another eye-witness of the luminosity of the lanthorn-fly. Mr. James Smith, of 23, Wilton Row, Queen's Road, Dalston, made the following statement:—

"The *Fulgora candelaria* is found most plentifully between the months of May and August; it is occasionally seen in the winter, but these, I think, are hybernated specimens; it is then not luminous, and very much faded. In the summer it has a pale blue or green light at the end of the snout, which may be considerably augmented by a gentle pressure of the insect; it is brightest in the female. It is common throughout all China, and called the *'Star of Eve,'* *'Eye of Confucius,'* *'Spark-fly'*; and the same insect is called, in the winter, the *'Flying Elephant,'* perhaps in reference to its long proboscis. When the insect is settled the light is more luminous than when it is flying, and when the male and female have mated it is wholly extinguished. The

male, I believe, does not survive many hours, as I never caught one in the summer which was not luminous. They fly in swarms, and I have repeatedly taken two or three species in the same swarm. They are most plentiful in gardens, though they are found everywhere. The Chinese ladies catch them and imprison them in a fine gauze net, and wear them in their hair."

Mr. W. F. Evans said that Sir John Barrow's experience was in favour of the luminosity of *Fulgora*.

Mr. Newman remarked that his note on Mr. F. Smith's former statement was confined to that part which referred to the Honduras fire-fly, i. e. to *Fulgora laternaria*, not *F. candelaria*. Nothing that had been adduced that evening had any bearing upon the luminosity of *F. laternaria*.

Mr. Bates said that *Fulgora laternaria* was pretty common on the Upper Amazons; he had been aware of Madame Merian's statement, and had observed the insect closely; but he had never found it luminous, and, what was stronger than the negative evidence of any single observer, there was no rumour or idea existing amongst the natives to the effect that it was luminous. The natives were well acquainted with the insect, which was the subject of fables current amongst them; for instance, a tale was told of one of these insects having emerged from the forest and attacked a boat's crew of nine persons, eight of whom were killed by the poisonous creature, and the pilot only escaped by jumping into the river. But though the fly was thus reputed to be venomous, there was no story current of its being luminous. Mr. Bates himself was of opinion that *Fulgora laternaria* was not luminous, and (strange as it might seem) that the Honduras correspondent on whose statement Mr. F. Smith relied had attributed to the *Fulgora* what, in fact, was the luminosity of a *Pyrophorus*.

Mr. Newman (on behalf of Mr. Butler, who was present as a visitor) exhibited a number of insects embedded in amber and gum-animè differing from those of which an account was given by Hope in the first and second volumes of the Society's 'Transactions.' The amber was from the Baltic, the gum-animè (which, by the bye, was a resin, not a gum) from the East Indies; one of the amber-insects was peculiar from having enclosed with it a globule of air and a globule of water.

The President exhibited several new Australian Longicornia, presented to him by Mr. F. G. Waterhouse, of Adelaide, some of which were taken by that gentleman during the recent exploring expedition under Stuart; among the more interesting was a new genus, in some respects connecting those remarkable and isolated forms *Bimia* and *Hesthesia*. Also a considerable number of new species from Gawler, near Adelaide, part of a large collection for which he was indebted to Mrs. Kruesler and Mr. Odewahn; one of these had the appearance of a Malacoderm, for which, at the first glance, it might very readily be taken. It might, in fact, be regarded as another case of "mimetic resemblance"; but if so, there was this peculiarity about it, that the stronger insect was here imitating the weaker, which seemed not quite consistent with the theory that the imitated form was copied with a view to the protection of the imitating.

Mr. A. R. Wallace said that the case was quite consistent with the theory of mimetic resemblances, and that that theory did not depend upon the relative strength or weakness of the imitated or imitating forms; an insect might be very weak in structure, and yet be a proper subject for mimicry; many insects of weak structure were extremely abundant, were, in fact, dominant species; such species no doubt possessed some protection against their enemies with which we were unacquainted,

and of which other species of stronger structure were deprived; and having that protection, whatever it might be, they were on that account fit and likely subjects for imitation. So far from conflicting with the theory, he felt no surprise whatever at finding a structurally-stronger insect mimicking a Malacoderm.

The President also exhibited diagrams of the under surface of the abdomen of the females of *Obrium cantharinum* and other *Longicornia*, showing the presence of large lumps or tufts of hair on particular segments; he was anxious to ascertain whether such a structure was invariably present in the female; he had reason to believe that in some Australian genera (*Penthea* and *Symphyletes*) it was not invariably present, but further observation was required. If it should prove that it was not invariably present in the female, this would furnish another instance of "dimorphism," by which he (Mr. Pascoe) meant a case where there was an addition to or alteration of a part or organ; the term, in his opinion, ought to be confined to such a phenomenon, and was not applicable to simple variation, such, *e. g.*, as variation in colour.

Mr. A. R. Wallace exhibited specimens of *Papilio Memnon*, *P. Pammon*, *P. Theus*, *P. Ormenus*, *P. Erectheus* and *P. Tydeus*, for the purpose of illustrating his views on "polymorphism." Mr. Wallace remarked that he did not apply the term "dimorphism" to simple variation; on the contrary, he regarded "polymorphism," of which "dimorphism" was but the first and least complicated stage, as a totally different phenomenon from "variation," and one which required a separate name. Under the common term "variety" many distinct phenomena were confounded; he proposed to confine that term to those cases in which there was indefiniteness and irregularity in the variation. "Variation," then, was an indefinite and inconstant phenomenon, the instances of which passed from one to the other by irregular, often by insensible, gradations; "polymorphism," on the other hand, consisted in the existence of several distinct forms of the same insect which do not graduate into each other. Thus, in *Papilio Memnon*, the male was in each locality constant; it had rounded hind wings, and was always nearly black, with a few ashy rays; the female, however, existed under two distinct forms; the first had the wings shaped like those of the male, but had a very different colouration, being more or less olive-coloured, and often banded on the hind wings with whitish yellow, and with marginal black spots; the second form of female differed remarkably from the first, the hind wings being produced into a large spatulate tail, and marked with white patches radiating from the base. Both these forms exhibited varieties in the same locality, but there were no connecting links between them. The males paired with both forms of female, and in each case the resulting brood assumed the distinct forms above described. This was a case of dimorphism. *Papilio Pammon* was a parallel case; there was a form of female resembling the male, and there was a second aberrant form of female, *viz.* the form which had been called *P. Polytes*: he believed that *P. Romulus* would prove to be a third form of the female of *P. Pammon*, though of this he had not evidence at present; but the male of *P. Romulus* had never been found, whilst the females occurred along with *P. Pammon* in every collection from India: if that were so, then *P. Pammon* would exhibit an instance of trimorphism. *P. Ormenus* was certainly trimorphic, for three distinct forms of female were found, all differing greatly from the male; and Mr. Wallace had reason to believe that to some males of *Papilio* as many as four distinct wives must be assigned. These forms had hitherto been classed as varieties, but the physiological differences presented by them were striking.

Mr. Wallace further distinguished between a "variety" and a "local form" or

"race," denoting by the latter term a form which kept distinct from the parent stock and propagated itself independently: such a form was not a "variety" by reason of its constancy and the absence of intermediate links, and could not be considered a "species" by reason of the comparative unimportance of the characters in which it differed from the type-form. The subject of Mr. Wallace's remarks had been treated by him at length in a paper recently read before the Linnean Society: he further illustrated the phenomenon of polymorphism by the following hypothetical case:—Imagine the discovery of an island inhabited by white men, and black (negro), red (Indian), and yellow (Chinese) women, and in which the union of these variously-coloured parents produces children which always resemble one or other of the four above-mentioned forms, no intermediate forms ever occurring; the boys are always white, whilst the girls are black, red or yellow, but without any necessary connexion with the colour of the mother, so that a black girl may be the offspring of a white father and of either a black, red or yellow mother. Such a phenomenon would certainly be an extraordinary one, but it was exactly parallel to what took place with the exhibited species of *Papilio*.

Gen. Sir John Hearsey remarked that so long ago as 1831 he had captured *Papilio Pammon* and *P. Polytes* in *copulâ*, had killed the pair in *situ*, and so sent them to Prof. Westwood; in which position they were to be seen at Oxford to this day.

Mr. Waterhouse enquired whether there was any evidence of the fertility of the abnormal females, since on theoretical grounds it might almost be expected that they would be unproductive.

- Mr. Wallace replied that he believed one of the abnormal females then exhibited could be seen to be full of eggs.

Prof. Westwood exhibited a butterfly recently received at the Oxford Museum from M. Snellen van Vollenhoven; the specimen was from Ceram, and it appeared to him to differ from *Papilio Peranthus* only in its large size and to some extent in its colouring; he found no structural difference whatever, and he begged to exhibit it as *P. Peranthus*, var.; it seemed to him to be precisely one of Mr. Wallace's "local forms," but Mr. Wallace informed him that he should describe it as a new species.

Mr. A. R. Wallace said that if structural difference was necessary to constitute a species, two-thirds, or probably nine-tenths, of the existing species must be abolished; the difference between a local form and a species was one of degree only, and in his opinion the butterfly exhibited possessed characters sufficient to entitle it to specific rank.

Prof. Westwood read the following descriptions of two new species of *Phasmidæ*:—

HETEROPTERYX HOPEI, Westw.

Lata, subdepressa, mesothorace conico; fulvo-lutea (viridis? dum viva), tegminibus opacis, pallide stramineis; spinulosa, spinis parvis, capitis vertice spinis octo coronato, mesonoto in medio partis posticæ spinis duabus minutis armato; parte detecta supra oviductûs segmento nono dorsali abdominis fere duplo longiori, elongato-lanceolata, angusta, sensim ad apicem attenuata, apice ipso furcata. (Fœmina.)

Long. corp. lin. 6; prothor. lin. 7; mesothor. lin. 9½; metathor. lin. 9; abdom. segm. 6 basal. lin. 27; segm. 3 apic. lin. 11; oviduct. lin. 6 = long. tot. circ. unc. 6½.

In Mus. Hopeiano Oxoniæ (Coll. Bell). Habitat ———?

Closely allied to *H. Grayii*, but much larger, though with the spines much smaller;

the tegmina and wings extend to the extremity of the second dorsal segment of the abdomen.

PHYLLIUM FEEJEEANUM, Westw.

Parvum, late viride, tegminibus fulvo-maculatis; capite et prothorace granulatis; abdomine subheptagono, lateribus segmentorum haud lobatis; femoribus anticis elongato-ovalibus, dimidio apicali marginis interni lobo semi-rotundo denticulato armatis; tibiis omnibus gracilibus; femoribus intermediis elongato-ovalibus, nec intus angulatis. (Fœmina.)

In Mus. Hopeiano Oxoniæ. Habitat Ins. Feejee.

Closely allied to and of the same size as *P. lobiventre*, but differs in the form of the abdomen and legs. The male is very slender, having the abdomen elongate-lanceolate, with the margins entire, and the terminal joints of the antennæ somewhat thickened.

Mr. S. Stevens exhibited a box of insects recently received from Mr. Diggles, of Moreton Bay, Queensland; they consisted principally of Lepidoptera, with a few Orthoptera, admirably preserved.

Mr. Sharp exhibited a single specimen of a beetle new to this country, the *Stenus Kiesenwetteri*, which he had captured at Wimbledon. The species appeared to be a rare one, but had occurred in Spain and in Bavaria.

Capt. Cox sent for exhibition some photographs of insects, the execution of which excited the admiration of all; they were very nearly, but rather under, the natural size.

The Secretary mentioned that the name of *Sosxetra*, proposed by Mr. F. Walker for a new genus of Hymenoptera (Chalcididæ), Trans. Ent. Soc. Ser. 3, vol. i. p. 370, must, according to the ordinary rules of nomenclature, be sunk, since the same author had, at p. 84 of the same volume, described a new genus of Lepidoptera under the same name.

Mr. Frederick Smith said that in stating the contents of the late Mr. Curtis's British Collection, in his Address to the Society at the last Anniversary Meeting, he had made a serious mistake. See 'Journal of Proceedings' for 1863, p. 198. The actual number of specimens was as follows:—Coleoptera, 9405; Lepidoptera, 7200; Hymenoptera, 7716; Diptera, 5878; Neuroptera, 1165; Hemiptera, 1673; Homoptera, 244 specimens.

The Rev. Hamlet Clark communicated extracts from a letter recently received from Mr. John Gray, who was collecting insects at the Cape de Verdes. The letter was partly written from the Island St. Nicholas, under date 22nd of February, 1864, and partly from Porto Grande, St. Vincent, 29th of February, 1864. Eight days had been spent in St. Nicholas, but as regarded Entomology the expedition was a failure; it was the mid-winter of that country, and more beetles could have been got out of any turnip-field on any Christmas-day in England than he had been able to procure there from the whole of the vegetation put together. Nevertheless a few nice beetles were captured—a handsome *Dytiscus*, a large tropical *Gyrinus* (*Dineutes*?), and eight or ten species of *Harpalidæ*, taken high up on the mountains (*Nebria*, &c.). Altogether, however, a list could not be made of more than twenty species, of which about five were *Heteromera*, several species of which were in profusion under every stone. There were no signs anywhere of abundant insect-life; nothing was seen upon the walls of the houses, nothing upon the flowers, nothing anywhere except the *Heteromera* under stones. A few fine spiders had been obtained, and carefully preserved in spirits.

Mr. Douglas C. Timins, under date of Cannes, March 29, 1864, communicated the following notes of his entomological observations made during the winter months in the Departement des Alpes Maritimes:—

“During the early part of November *Papilio Podalirius* and *Gonepteryx Cleopatra* appeared, though in small numbers. *Cynthia Cardui* and *Vanessa Atalanta* were extremely abundant, and continued on the wing throughout the winter. Orthoptera were very numerous in November and December: amongst them I noticed *Acridium lineola*, *Gryllis maculata*, *G. azurea*, *G. Italica*, *G. cærulescens*, &c., *Mantis religiosa* and others. *Cicindelidæ* were very abundant (the common *C. campestris* and *C. hybrida*, as well as several other species). In the beginning of December I took a great many specimens of *Polyommatus Bœticus* and the allied *P. Telicanus*: both these species fly round the tops of bushes, very much after the manner of the *Theclæ*, between which genus and *Polyommatus* they form in habits, as well as in appearance, a connecting link. *P. Unionalis* appeared in fir-plantations and *Lycæna Phlœas* abounded everywhere, as did *Lasiommata Ægeria*, *L. Megæra*, *L. Mæra*, *Argynnis Lathonia* and *Macroglossa Stellatarum*. The larvæ of *Papilio Machaon* and *P. Podalirius* continued feeding until the middle of December, and this was also the case with numerous other species which in England assume the pupa state some three months earlier. During January few species of *Lepidoptera* were seen; *Pieris Daplidice*, however, appeared, and also fresh specimens of *Colias Edusa* and *C. Myrmidone*, and battered ones of *Vanessa Io*, *V. Atalanta*, *V. Antiopa*, *V. Cardui* and *V. Urticæ*. Examining moss appears to be of little or no use in this locality; probably the *Coleoptera* rarely hibernate in so mild a climate, and yet few were taken on the wing or crawling about, except *Carabus monilis* and *Chrysomela Populi*, and some of the genus *Aphodius*. This neighbourhood seems poor in *Dytiscidæ*, for I met with few, and these only the commonest species. In February the weather was extremely bad, and the only *Lepidoptera* which appeared were *Lasiommata Ægeria*, *L. Mæra* and *Colias Edusa*; early in March *Papilio Podalirius* reappeared and *Gonepteryx Rhamni* and *G. Cleopatra* also. During this month *Colias Edusa*, *C. Myrmidone*, *Pieris Daplidice* (very common), *Anthocharis Belia*, *Vanessa C-album*, *V. L-album*, *Pontia Brassicæ* and *P. Chariclea*, *Thais Rumina*, *Thecla Rubi* (very common), *Polyommatus Alcon* (?) and *Saturnia Carpinii* appeared; also *Vanessa Io* and the other common *Vanessidæ*. Several species of *Cicindelidæ* occur now (March 24th) in the rocks, but I have not yet been able to identify them all; and of *Libellulæ*, *Æshna grandis*, *Libellula forcipata*, *L. depressa*, &c. A good many species of *Hemiptera* occurred in December and January, but I have been obliged to reserve their nomenclature for some future time, as I can obtain here no books on that order. Among the larvæ found in December were *Deilephila Euphorbiæ*, *D. Galii* and *Acherontia Atropos*. The pine woods have been full of the larvæ of one of the processionary moths, living in society under white silky nets, and proceeding in lines or chains, sometimes thirty feet long (each larva is hardly an inch and a half in length), to bury themselves preparatory to assuming the pupa state: on reaching a suitable place for this purpose, the chain of larvæ disperses, and each one proceeds to bury himself, usually, however, near his comrades, so that when one pupa was found by digging, more were certain to be obtained within a few inches of the same place.”

Paper read.

Mr. Frederick Smith read a paper “On the construction of Hexagonal Cells of Bees and Wasps.” This was illustrated by the exhibition of a collection of nests,

among which were those of *Icaria guttatipennis*, *Nectarina Lecheguana*, *Tatua morio*, *Polistes tepidus*, *P. Tasmaniensis*, *Vespa vulgaris*, *Apis mellifica*, &c.: among the most remarkable was a nest of *Polistes Tasmaniensis*, in which a single central cell had been prolonged and carried to a considerable distance above the level of the surrounding cells; this prolongation was alleged to be hexagonal, and much use was made of this in the course of Mr. Smith's argument. Mr. Bates, however, took issue with Mr. Smith on the hexagonality of this part, and declared it to be, in his opinion, as nearly circular-cylindrical as possible. In contradistinction to the "circular theory" expounded by Mr. Waterhouse at the previous Meeting, Mr. Smith's might be termed the "hexagonal theory," but it will give a better idea of the main argument, if we denote his view of the construction of the cells as the "intentional theory." The hexagonal form of cell was described as "the ground plan laid down by the Great Architect," and the bees were the builders who carried out his designs: it was argued that both bees and wasps began instinctively and with a primary intention to construct hexagonal cells; and so strong was the "hexagonal principle" guiding them in their operations, that one wasp, *Apoica pallida*, not only built hexagonal cells, but occasionally formed the entire comb of a hexagonal shape. Reference was also made to the artificial bases or foundations for cells used by the German bee-keepers, such foundations being hexagonal; and from this it was argued that these hexagonal ground-plans must be exactly such plans as bees were accustomed to erect their cells upon, or at all events that the fact of bees at once accepting the plan furnished them was strongly in favour of the supposition that bees when left to their own resources construct a precisely similar basement. In fine, Mr. Smith could not regard bees and wasps as creatures that would instinctively construct circular-cylindrical cells, but whose labours always eventuated in the production of hexagonal ones; on the contrary, he regarded them as creatures that would instinctively construct hexagonal cells, and the hexagons actually produced were only the carrying into effect the original intention of the builders.

Mr. Marshall (who was present as a visitor) asked Mr. Smith whether he thought a hexagonal foundation would be laid in a case where it was not in contemplation to form other cells in immediate juxta-position? or would a cell be hexagonal if there were no other cells adjoining to force it into that form? In his opinion, the hexagonal shape was due to the fact that there were other, as it were, competing cells around, and to the pressure of such competing cells on that whose form they thus determined: this also accounted for the fact that the exterior cells were circular. Competition and pressure were the causes of the hexagonal shape of the cell.

Mr. Newman enquired to what extent Mr. Smith would carry his principle of intention? Would he apply it equally to the case of the larva-cells of *Microgaster alvearius*? Was it applicable to the aggregation of lenses in the eyes of insects? or could it afford any explanation of the hexagonal form of pillars of basalt?

Mr. Waterhouse thought he had, in his paper, anticipated and answered most, if not all, of Mr. Smith's objections to the circular theory; he admitted, however, that the nest of *Polistes Tasmaniensis* presented a difficulty, but thought an isolated instance of unnatural formation was insufficient to overthrow the theory; he admitted also Mr. Smith's greater practical acquaintance with the nests of bees and wasps; but he considered the vice of Mr. Smith's paper to be that it overlooked or did not give sufficient attention to the circular marginal cells: according to the "intentional theory," the marginal cells ought to be as exactly hexagonal as the rest, but this was

not the case; it was upon observations of the marginal cells that the "circular theory" was grounded, and for their form, as well as for the hexagonal form of the surrounded cells, the circular theory accounted, whereas the intentional theory of Mr. Smith applied to the central cells only, and left the other case entirely unexplained. At any rate the two theories were before the Society, and he hoped the two papers would be published together, so that Members, caring naught for either theory as such, might impartially draw their conclusions for themselves.

New Part of the 'Transactions.'

A new Part of the 'Transactions,' Series 3, Vol. i. Part 9, being the concluding part of the volume, and the first published during the present year, was on the table.

May 2, 1864.

F. P. PASCOE, Esq., President, in the chair.

Donations 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. xvi. Parts 1 and 2; Vol. xvii. Part 1; presented by the Society. 'Proceedings of the Royal Society,' Vol. xiii. No. 61; by the Society. 'Journal of the Proceedings of the Linnean Society,' Vol. vii. No. 28; by the Society. 'Notes on Sphærolaria Bombi,' by John Lubbock, Esq., F.R.S., Pres. Ethn. Soc.; by the Author. 'Sitzungsberichte der Königl. bayer. Akademie der Wissenschaften zu München,' 1863, II. Heft iv.; by the Academy. 'The Journal of Entomology,' No. 8; by the Proprietors. 'The Journal of the Society of Arts' for April; by the Society. 'The Reader' for April; by the Editor. 'The Zoologist' for May; by the Editor. 'Stettiner Entomologische Zeitung,' 1864, Nos. 4—6; by the Society. 'Descriptions of New Genera and Species of Phytophaga,' by J. S. Baly; by the Author.

Exhibitions, &c.

Mr. Dunning (on behalf of Mr. R. S. Scholfield, who was present as a visitor) exhibited a specimen of *Hydrilla palustris*, captured by Mr. Scholfield in Quy Fen, Cambridgeshire; the specimen was a male, and was disturbed from grass on the afternoon of the 29th of May, 1862. This *Noctua* was introduced into the British List on the authority of an example in the possession of Mr. Allis, taken some years ago near York; but the species was not included (or rather was given as a "Reputed British Species") in Mr. Doubleday's 'Synonymic List of British Lepidoptera' (ed. 1859).

Captain Cox exhibited various coloured drawings of Lepidopterous larvæ; and the original of his "larva-index" or "larva-dictionary," the plan of which was described by him at a recent Meeting of the Society. (See 'Journal of Proceedings' for 1863, p. 186.)

Captain Cox also exhibited a number of Lepidopterous larvæ which had taken possession and were consuming the contents of a large bin of bran; in the previous year he had found *Aglossa pinguinalis* extremely abundant in his stables and out-houses, and hence thought it probable that the larvæ were of that species; it was,

however, remarkable that the larvæ of so fat and greasy a moth should be nourished on so dry a substance as bran. Mr. Dunning thought the larvæ were more probably those of *Pyralis farinalis*; and Mr. Newman suggested *Ilithyia sociella*.

Prof. Westwood exhibited nine species of *Charaxes* (three of which were unique specimens) from the Zambesi, whence they had been sent by the Rev. H. Rowley; each specimen was placed in a separate envelope, a considerable number might thus be placed in a box, and the whole had travelled in this manner without sustaining material injury.

Mr. A. R. Wallace exhibited various species of *Papilio*, *Eronia* and *Pieris*, with the intention of showing the effect of locality in producing change of form in insects. Numerous species inhabiting the island of Celebes were produced, and in each case in juxtaposition therewith was its nearest ally from the adjoining islands. The Celebes insects, in every instance exhibited, had the costa of the anterior wings much more strongly arched than was the case with their congeners with which they were compared. Mr. Wallace remarked that changes in colour which were due to locality had been frequently noticed, but of instances of a change of form only few had been recorded; Mr. Bates, however, had mentioned some as having come under his observation in South America. In the Eastern Archipelago, he (Mr. W.) had found that the butterflies inhabiting the islands which formed the eastern half were generally larger than those in the western half; and, especially in the Papilionidæ, that Celebes and Amboyna produced the largest specimens. Some species which in India were found with a large tail appended to their hind wings, possessed only a small tail in the Indian Islands, which ceased altogether or was reduced to a mere tooth in the islands of the Pacific; of this *Papilio Agamemnon* was an example. The island of Celebes was as nearly as might be the centre of the Eastern Archipelago, and the butterflies of that island, especially the Papiliones, possessed the peculiarity in the form of their wings to which he had invited attention; sixteen or seventeen species of *Papilio* were found in Celebes, and, with a single exception to be afterwards noticed, all were distinguished from their allies in the other islands by having the upper wings strongly arched, in lieu of a gentle and gradual curve, or, if he might so term it, a flat bend. The same distinction existed also in many *Pieridæ* and in a few *Nymphalidæ*, but he had not observed it in other groups of butterflies. Mr. Wallace had a theoretical explanation to offer of this phenomenon; he conceived that the insects had become modified in form by the external circumstances to which they had been subjected, and that this modification was to be accounted for by some physical or organic change which had occurred in Celebes, but not in the now adjacent isles. Rapidity of flight was generally supposed to be the consequence or a property of the falcate form of wing; he (Mr. W.) was inclined to think that the falcate form gave greater facility in twisting or turning about; if that were so, the Celebes form of butterfly-wing would give the insect this additional facility, and thus enable it more easily to escape from its enemies. If, then, the Celebes insects were supposed to have been formerly subject to great persecution, those with the arched form of wing would have the best chance of escaping, the less favoured forms would be gradually killed off, those that survived would owe their existence to the form of their wings, their offspring would resemble and some few would exceed them in the possession of the advantageous shape, and the specimens with the best developed wings being naturally selected in each succeeding generation would lead to the gradual and regular increase of the peculiarity. But then it might be asked, How is it that only a few of the butterflies have the peculiarity in question?

The answer was, that different insects preserve their existence by different means; one may escape by means of its power of flight, the habits of a second may enable it to avoid its foe, a third may owe safety to its colour, whilst a fourth may be positively distasteful to animals which prey upon insects. Thus the Danaidæ, though slow of flight, were very abundant and were the subjects of mimicry or imitation by other species; in all probability they owed their immunity from destruction to the strong and unpleasant odour which they indubitably possessed. It was manifest that where another means of escape already existed, the principle of selection would not be brought into play; the peculiar form of wing would not be wanted, and therefore would not be acquired. The obscure Satyridæ were doubtless protected by their colour; the majority of the Nymphalidæ had already sufficient power of flight, and those of that group which had acquired the arched form of wing were precisely the species which possessed only about the same power of flight as a Papilio. The single Celebesean Papilio which had not assumed the arcuate form of wing was one belonging to the Polydorus group, a group which was itself imitated by other Papiliones, and which therefore was doubtless provided with some special defence, though the nature of it was unknown to us.

Prof. Westwood, after remarking upon the pleasure he always derived from Mr. Wallace's speculations, whether he agreed with them or not, said that he was unable to follow Mr. Wallace in tracing the phenomenon to the causes assigned by him; arched wings were not necessarily, or even generally, accompanied by the greatest rapidity of flight; and if the original form of the butterfly must be varied, if one species must imitate another, he (Prof. Westwood) thought it far more probable that the variation would consist in getting stronger muscles to their bodies, as in the species of *Charaxes* he had that evening exhibited, rather than in a minute change in the curve of the wing.

Captain Cox thought that the swiftest fliers had the straightest wings, as, *e.g.*, the Sphinges, where the costa was scarcely arched at all.

Mr. Newman also was unable to connect an arcuate wing with rapidity of flight, and instanced the straight costæ of the swift-flying Diptera.

Mr. F. Smith referred to some of the swiftest Hymenoptera, which had pointed wings, but with perfectly straight costæ.

Mr. Baly said that the arched form of wing might be advantageous in giving a greater power of twisting and turning about, rather than in giving greater rapidity of flight; and this, he thought, was what Mr. Wallace had suggested.

The President observed that the theory seemed to be based upon the supposition of a gigantic persecution to which the butterflies had been subject; but was there any evidence of the existence of such persecution? had Mr. Wallace ever seen the insects actually pursued by birds or other enemies? It seemed to him that persecution, to the extent to which it now occurred, was altogether inadequate to account for the magnitude of the result attributed to it.

Mr. Bates said that he had frequently observed in South America that the paths were strewn with the wings of butterflies; and in this country it was not an uncommon sight to see the Pontidæ pursued by birds, and sometimes escaping by means of their tortuous or "dodging" flight.

Captain Cox had recently seen forty or fifty specimens of *Brephos notha* destroyed by tom-tits in a single morning.

Mr. F. Smith remarked that, on the persecution principle, great change must be impending in the shape of wing of the butterflies of the London district.

Prof. Westwood asked whether Mr. Wallace had observed the twisting or "dodging" flight to be conspicuous in the butterflies which have largely-developed wing-tails? or whether the tails contributed to or affected the flight in any, and, if any, in what manner?

Mr. Wallace replied that he had not observed that the wing-tails had any influence upon the flight of the insect; he did not think they affected the rapidity, or that they acted as a rudder, and he was at a loss to assign any use to those appendages. With respect to the other points which had been touched upon, there was in some cases an increase of muscular power as well as an increase of curvature of the wings, but the wing of a butterfly was far more liable to variation than the body of the insect; that organ was therefore more accessible to the operation of the principle of selection, and a modification of its form was consequently more readily produced. Most of the instances of swift-fliers with straight wings which had been adduced (as *e.g.* the Sphinges) were insects with the strongest bodies and the greatest muscular power; moreover, he did not maintain that any insect with arched wings would have a more rapid flight than any other with straight wings; all that he had argued was, that, as between two closely allied species, the one which had the wings most arched would have the flight most rapid; for instance, he should expect a Sphinx with arched wings to fly more rapidly than a Sphinx with straight wings. But in truth, though he had referred to the supposed concomitancy of falcate wings and a rapid flight, his own notion was (as had been correctly stated by Mr. Baly) that the arched form was chiefly useful in giving greater power of turning or twisting. As to the enquiry whether he had seen the butterflies actually pursued, he admitted that he had not to any great extent; he offered his explanation as a theoretical one; but he thought it could scarcely be doubted that butterflies were subject to the attacks of numerous depredators.

Paper read.

The Secretary read a paper, "On the Reversion and Restoration of the Silkworm," by Captain Thomas Hutton, F.G.S., of Mussooree, N.W. India.

The author attributed the enormous loss of silkworms by "muscardine" and other diseases, and the consequent diminution of the crop of silk, to the combined effects of bad and scanty food, want of sufficient light and ventilation, too high a temperature, and constant interbreeding for centuries of a debilitated stock. He asserted that there was no such thing now in existence as a perfectly healthy domesticated stock of silkworms; and moreover, that it was useless to seek for healthy seed, for whether in Europe, Persia, India-or China, the worms were all equally degenerated, or, if there were a difference at all, it was in favour of the European race. He had for several years been experimenting upon *Bombyx Mori*, with a view, if possible, to reclaim the worms, to restore to them a healthy constitution, and to induce them to *revert* from their present artificial and moribund condition to one of vigour and permanent health. The occasional occurrence in a brood of one or more dark gray or blackish-brindled worms—the "*vers tigrés*" or "*vers zébrés*" of the French—contrasting strongly with the pale sickly hue of the majority, must have been noticed by all who have had experience in rearing silkworms; such occurrences have been always spoken of as indicating variety arising from domestication. The author had endeavoured, by a series of experiments, to ascertain the cause of this phenomenon, his conviction being, either that the species had at some time or other been crossed by another of different colours, and that Nature, as sooner or later she always would do, was making an effort

to separate them, or that the original colour of the worm had been dark, and an effort was being made to *revert* from a sickly condition to the original healthy starting-point. He accordingly picked out all the dark-coloured worms and reared them separately, allowing the moths to couple only *inter se*, and the same with the white worms. In the following spring the one batch of eggs produced nearly all dark brindled worms, whilst the other batch produced white worms, sparingly interspersed with an occasional dark one; these latter were removed into the dark batch, which was also weeded of its pale worms. In the third year the worms were still darker than before, and were always larger and more vigorous than the pale ones, giving larger and better-stuffed cocoons. Just as the eggs of the third year had been collected, a violent gale of wind upset the whole, but in the spring of 1862 the author recommenced *de novo*, and went over the same ground again. The few dark worms picked out escaped disease altogether, though reared in the same manner, in the same room, in the same temperature, on the same quality of food as, and in close contiguity with the others. In due time they spun cocoons, and produced moths, which, coupling *inter se*, deposited a fair stock of eggs, with which the experiments were continued in 1863. The eggs began to hatch on the 16th of March, and no sign of disease was apparent until the moths came forth, when many still showed defects in the malformation and dark spotting of the wings. As compared, however, with the previous year there was decided improvement; still there were too many white worms in the brood, but there was no symptoms of disease, the worms attained a larger size by a quarter of an inch and produced larger cocoons, and the moths laid good-sized eggs, great numbers of which adhered firmly to the paper upon which they were deposited, and many of the male moths displayed unusual vigour in flying in search of the females. But still more extraordinary was the fact that some of the eggs of *Bombyx Mori* of the spring crop of 1863 began to hatch again for a second crop on the 7th of August; these were all of the dark stock. The hatching continued throughout August, and occasionally even to the 23rd of September, when, through fear that the supply of leaves might fail, the eggs were removed to a temperature below 70° Fahr., in order to check the hatching. The worms which were then hatched thrived and spun good cocoons, superior in size to those of the spring crop; in due time the moths appeared and were fully twice as large as those of the spring, depositing large well-formed eggs. In the beginning of December, to the author's dismay, more worms were hatched from the spring batch, and they continued to come forth at the rate of forty or fifty daily in a temperature of 53° Fahr., until, there being no more leaves upon the trees, the remaining eggs were placed in the open air at night, in order that the hoar frost might put a stop to further hatching. The whole of these worms were of the dark kind, and no white ones appeared amongst them as in the spring. This circumstance, so unusual with *Bombyx Mori*, the author attributed entirely to an accession of health and strength in the black worms; he regarded the occasional occurrence of the dark form in domestication as an attempted return on the part of Nature to the original colours and characteristics of the species, and considered the whiteness of the generality of the worms as a positive indication and proof of the destruction of the original constitution; in fact, the dark worms were the original and natural worms. This conclusion was further supported by arguments deduced from the strong similarity in the disposition and arrangement of the markings to those of the existing wild races in India, and by analogy to the general fading in domestic stocks of the original colour, to give place to piebald and finally to white. The author had long

entertained the idea that the production of white cocoons (except in those cases where the white was permanent and constant in all climates) was a strong sign of degeneracy, the white cocoons being more abundant where the temperature was high than in more temperate climes; the whiteness of the worms and the white cocoons were both indications of failing constitution, evidencing the existence of a higher temperature and more artificial treatment than was conducive to the health of the insect. The author proceeded to argue that the good quality of the silk produced was no proof of the general health of the insect; it was the quantity, rather than the quality, of the silk that was affected by the present maladies; too great fineness of the silk was, in fact, an indication of too high a temperature, and of the consequent degeneracy of the worm. After considering at some length the question "What species of mulberry-tree is best adapted for the nourishment of the silkworm and for the production of good silk?" the author concluded by recommending the sericulturist to separate his dark worms from his general stock, to set them apart for breeding from, and to annually weed out all the pale-coloured worms; in the course of three or four years he would be able to cast aside his present sickly stock, and would have a stock far healthier than had ever before been seen in Europe.

June 6, 1864.

H. T. STAINTON, Esq., V.P., in the chair.

Donations to the Library.

The following donations were announced, and thanks voted to the donors:—
 'The Journal of the Royal Agricultural Society of England,' Vol. xxv. Part 1; presented by the Society. 'Verhandlungen der Kaiserlich-Königlichen Zoologisch-botanischen Gesellschaft in Wien,' Band xiii.; by the Society. 'Monographie der Oestriden,' von Friedrich Brauer; by the Author. 'The Transactions of the Entomological Society of New South Wales,' Vol. i. Part 2; by the Society. 'Histoire Naturelle des Araignées (Aranéides)' par Eugène Simon; by the Author. 'Sitzungsberichte der Naturwissenschaftlichen Gesellschaft Isis zu Dresden,' Jahrgang 1863; by Herr L. W. Schaufuss. 'The Zoologist' for June; by the Editor. 'The Intellectual Observer,' Nos. xxviii. and xxix.; by the Publishers. 'The Journal of the Society of Arts' for May; by the Society. 'The Athenæum' for April and May; by the Editor. 'The Reader' for April; by the Editor. 'The Entomologist's Monthly Magazine,' No. 1; by the Editors. 'The Entomologist,' Vol. ii. Nos. 1 and 2; by the Editor.

Election of Member.

Edward Revett Sheppard, Esq., of Rutland Lodge, Lee Park, Lee, was ballotted for and elected a Member of the Society.

Exhibitions, &c.

The Secretary exhibited some leaves of the sugar-cane from Mauritius, with numerous specimens upon them of an insect (a species of *Coccus*) which had lately committed great ravages among the plantations of that colony: they had been sent to