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ORDINARY MEETING, MARCH 5, 1888.

H. CADMAN JONES, ESQ., IN THE CHAIR.

The Minutes of the last Meeting were read and confirmed, and the following Elections were announced :—

MEMBERS.—The Right Hon. Lord Halsbury, Lord Chancellor ; Major-General Sir F. W. Grenfell, K.C.B., Sirdar of the Egyptian Army.

ASSOCIATES.—Major-General R. A. Cole, Surrey ; Rev. H. Latham, M.A., Cambridge ; H. L. Mulholland, Esq., M.P., Derry ; Rev. G. B. Richards, F.R.S. (Tasmania), S. Devon ; Rev. J. S. H. Royce, Australia ; W. J. Smellie, Esq., Willesden ; Major T. Varty, Penrith ; The Worshipful T. Wright, Esq., Mayor of Leicester.

Also the presentation to the Library of "Victories and Defeats," by Major-General Anderson, B.S.C.

The following paper was then read by the author :—

ORIENTAL ENTOMOLOGY.

By the Rev. F. A. WALKER, D.D., F.L.S.

Butterflies of Southern Asia.

THE subject-matter of the present paper is devoted to a consideration of the diurnal Lepidoptera of Southern Asia, including Hindostan, Ceylon, and the group of numerous and, in most cases, large islands ordinarily known as the Malay Archipelago,—a wide region indeed, and comprising a correspondingly large and varied Fauna.

Recent Sources of Information.

Our knowledge of the number of species occurring in these tropical lands, of their local forms and varieties, as well as of their geographical range and distribution, has been materially increased and systematised within the last thirty years by the following sources of scientific information :—

Wallace's *History of the Malay Archipelago*, and the extensive collections that he made while travelling in the different islands.

Distant's *Rhopalocera Malayana ; or, Description of Butterflies of the Malay Peninsula*, wherein 503 species are described, and nearly the whole of that number figured.

Moore's *Lepidoptera of Ceylon* and also his *Lepidoptera Indica*, now in course of preparation.

Relationship according to Distant, of the Rhopalocera of the Malay Peninsula to those of Burma and North-Eastern India Also to the islands in the following order of nearness— (1) Borneo, (2) Sumatra, (3) Java and Ceylon.

Distant remarks on page vi. of the preface to his work: "A study of the Rhopalocera of the Malay Peninsula gives unmistakable proof of the relationship, both in genera and species, to those of Burma and North-Eastern India on one side, and to the islands of Borneo, Sumatra, and—in a less degree—to Java at its southern extremity."

And again on pages vii. and viii.: "Our facts are sufficient to show that the Malay butterflies have their nearest relationship with those of Borneo—especially North Borneo; in a lesser degree with those respectively of Sumatra, Burma, and the North-Eastern Indian districts, and in a still much less degree to those of Java and Ceylon."

Wallace's division of the Malay Archipelago into— (1) the Indo-Malayan region; (2) the Austro-Malayan region.

Wallace has divided the Malay Archipelago into an Asiatic and an Australian region,—a division, according to his own account, first indicated by Mr. Earl,—and these two regions he terms respectively the Indo-Malayan and the Austro-Malayan divisions of the archipelago.

(1) Indo-Malayan region—shallow sea.

The Indo-Malayan division consists of the islands Java, Sumatra, and Borneo, all separated from one another, and from the peninsula of Malacca and Siam, by a shallow sea everywhere under 100 fathoms, and in many places under fifty fathoms in depth.

(2) Austro-Malayan region—deep sea.

The Austro-Malayan division consists of the island of Celebes, and, to the east of it, of the islands of Gilolo, Ceram, and Waigiou, Bouru, Mysol, Salwatty, and the Aru Islands, and southward of the islands of Lombock, Timor, &c., and still further to the east and nearest to Australia, of the great island of New Guinea. All these, and several others included in the same division, are separated from one another and from Australia by a deeper sea, over 100 fathoms in depth.

The shallow sea indicates a recent geological change. The deeper sea, a more ancient separation of the islands.

The comparatively shallow sea around the Indo-Malay division indicates, according to Wallace, a recent geological change; the deeper sea around the Austro-Malay division a separation of the islands at a more remote period.

Both mammalia and birds on the more recently formed islands are alliedtothose of Southern Asia, and are more numerous in genera and species than those occurring in the more ancient and easterly formation.

Wallace proceeds to prove this statement more elaborately and in detail by reference, first, to the mammalia, and, secondly, to the birds found in the two divisions respectively, and their great diversity accordingly. The native mammalia of the Indo-Malay region are closely allied to those of Southern Asia, and are far larger in size, and much more numerous in species, than those of the Austro-Malay region. Similarly, the genera of birds are mostly different in the former localities to what they are in the latter.

Java and Sumatra, both islands of the Indo-Malay division, are separated by a strait only fifteen miles wide, yet Java

possesses numerous birds never found in Sumatra. Again, Bali, the easternmost island of the Indo-Malay division, and Lombock, the westernmost island of the Austro-Malay division are only separated from each other by a strait fifteen miles wide, yet practically even this narrow sea constitutes too wide a barrier, it would seem, for birds to wing their way across, and so the diversity above recorded is maintained accordingly.

Birds equally with mammalia are confined to their own islands. The possession of wings gives them no advantage in this respect, even when the separating strait is only fifteen miles in width.

As regards butterflies, the remarks made about the birds apply to them as well, for, to take the great Ornithoptera, or "Bird-wings," which will be discussed more fully and in detail anon, by way of examples, the green, gold, and blue species are confined to the Eastern or Austro-Malay division; the very characteristic and unique O. Brookeana to the islands of Borneo and Sumatra in the Western or Indo-Malay division; and, though the yellow Ornithoptera occur in both divisions alike, yet in these instances, it must be remembered, many of the islands possess, if not each its own separate yellow species, yet a distinct local variety or form.

What has been said about the birds applies to the butterflies as well.

It by no means follows, if a butterfly succeeds in crossing the sea from the continent to an island, or from one island to another, that, when previously unknown in its new locality, it should manage to survive the first season, or to propagate its species, should the climatal conditions be unfavourable, or the requisite food-plant be not forthcoming for the larva.

Some butterflies casual visitors only, and not to be regarded as additional species of insular Fauna.

It has been asserted that butterflies first existed on the continent, and thence they or some of the species spread to the islands. It would probably be more correct to state that some of the species had continued on the islands ever since the period when the said islands formed a part of the nearest continent, and that other kinds had died out on the islands since their formation in consequence of great changes of temperature in the lapse of ages, or, and in more special reference to the physical geography of the Malay Archipelago, that numerous islands had once formed one continent, or an extension of the great continent of Asia in a south-easterly direction, and that the increase or already-existing multitude of the foes of insect-life, or the disappearance of various plants, or an unfavourable climate, or all these causes combined, caused the extinction of certain species in particular localities, whereas on other islands where the above hindrances did not exist the said butterflies were perpetuated and preserved.

Theory that butterflies spread from the continent to islands.

Some of the species continued on the islands ever since those islands formed a continent.

Increase of foes of insects, disappearance of plants, unfavourable climate—one or all of these causes caused the extinction of certain species.

That the gradual separation into a group of islands of what was formerly continent would tend to an increased humidity of climate is certain, and that the said humidity

Development of islands causes humidity of climate.

Prevalence, disappearance, modification of species in consequence.

would conduce to the prevalence of certain species, as well as to the disappearance of others is probable, as also the local modifications in consequence of the change of weather of several kinds in process of time.

Celebes.

No account of the Fauna of the Malay Archipelago is complete without reference to such kinds as occur in the central island of Celebes, which, from its geographical position, might seem at first sight to be likely to contain the kinds that are found in the islands east and west of it, and to be fairly representative of the whole group. But the fact is, to employ Wallace's description once more, it is the poorest in number of species and the most isolated in the character of its productions of all the great islands in the Archipelago.

Papilios of Celebes and Borneo compared.

By way of further explanation and illustration, Borneo possesses twenty-nine species of Papilio or Swallow-tail, Celebes only twenty-four; but then only two out of the twenty-nine in Borneo are not found elsewhere. In Celebes, eighteen out of the twenty-four are absolutely peculiar to the island.

Pieridæ of Celebes and Java compared.

Java possesses thirty-seven species of Pieridæ, and Celebes only thirty, but only thirteen of the thirty-seven of Java are peculiar to that island, whereas nineteen of the thirty of Celebes are not found elsewhere.

Danaidæ of Celebes and Borneo compared.

Wallace collected fifteen species of Danaidæ in Borneo, and sixteen species in Celebes. Of the fifteen from Borneo only two were confined to the island, but fourteen of the sixteen kinds in Celebes are found nowhere else.

The largest percentage of peculiar species in Celebes, exceeding those of any island or group of islands in the Archipelago.

Further reference to Wallace's scientific statistics will establish the fact that it has a larger percentage of peculiar species not only than any island, but than any group of islands in the Archipelago.

Species of Celebes larger than those of other islands, and with a different outline of wing. Compare the Papilios and Pieridæ as examples of this fact.

Again, many of the species occurring in Celebes are much larger, and have a strongly-curved costal margin, compared with the smaller butterflies and their much straighter outline of wing in the surrounding islands. Compare P. gigon of Celebes with P. demolion of Singapore and Java, P. miletus of Celebes with P. Sarpedon, as occurring in all the rest of Southern Asia, T. zarinda of Celebes with T. Nero closely allied to it, and found in all the islands to its west.

Wallace's explanation of the local peculiarity.

The smaller and more obscurely-coloured groups of butterflies, be it noted, have not elongated wings: so possibly the more showy species needed a stronger and more pointed wing once when the abundance of insectivorous creatures rendered the means of escape a necessity.

The number of species on an island is usually smaller than

that of those occurring on an adjacent continent. Thus almost every British insect is also found on the continent, and the number of species occurring in Corsica and Ceylon is fewer than those of the mainland of Europe and of India respectively, although Corsica possesses some and Ceylon several kinds peculiar to itself.

Insular species fewer in number than continental.

In reference to insular and continental forms of the same species, where there is a difference in size, the insular form is, as a rule, the smaller of the two,—as, for example, the Cingalese type of the orange and sulphur coloured Thestias Rhexia, and that of the Nicobar Islands are considerably less than the Nepaul and Borneo type in my own collection.

Insular and continental forms of the same species

If it be objected that several of the islands of the Malay Archipelago (both from the number of species they possess, and also from the fact of those species including many grand and peculiar kinds not also found on the mainland of Asia) would appear to be an exception to this rule, the great size of some of these islands must be borne in mind, exceeding the dimensions of ordinary islands, and equivalent almost to a small continent. This will be best understood by a reference to the following table :—

Great size of some of the islands of the Malay Archipelago.

Comparative dimensions.

	Length.	Maximum Width.	Area.
New Guinea	1,490 miles by	430 miles.	306,000 square miles.
Borneo	730 ,, ,,	—	289,000 ,,
Sumatra	1,047 ,, ,,	230	170,744 ,,
Java	622 ,, ,,	121	49,176 ,,
Celebes	580 ,, ,,	530	70,000 ,,

Borneo	More than double the size of Great Britain and Ireland.
Sumatra	Thirteen times the size of Holland.
Java	Four times the size of Holland.

Eighteen more islands, according to Wallace, are as large as Jamaica, more than 100 as large as the Isle of Wight, and isles of smaller size innumerable. Java, Luzon, and Celebes are also each about the size of Ireland.

The Eastern tropics possess by no means such a variety of species as the Western, as no country in the world is so rich in butterflies as South America ; and if I am not mistaken, many of the Asiatic and African kinds have a wider range and distribution across their respective continents than is the case with the same proportion of species in the New World, which are confined to the limits of one valley or mountain range, not occurring outside or beyond.

Eastern tropics not so rich as the Western in variety of species.

More genera of butterflies common to Asia and Africa than to America also.

That there should be more genera of butterflies common to tropical Africa and Asia than to tropical America as well will be readily understood from the greater proximity of the two first-named continents; but the identity of their respective species is another matter, although there are a few exceptions; but these few exceptions are liable to still further diminution when it is borne in mind that some of the few butterflies common to Asia and Africa are not, properly speaking, tropical kinds, but either cosmopolitan, as our own V. Cardui, or subtropical, and found likewise in the south of Europe, like Danais Chrysippus and Lycæna Bætica. These facts will appear only what in all likelihood might be expected from the circumstances of the wide extent of ocean along the line of the equator, which, stretching across the northern end of the great lake, Victoria Nyanza, and thence extending to the eastern coast of Africa, traverses no more land whatever until it bisects the important island of Sumatra in two nearly equal portions, and also because the distance of 100 miles only where the continent of Africa is united along its north-eastern extremity to that of Asia, and only separated from it by the Suez Canal, is far removed from the tropics.

Only a few species common to Asia and Africa.

(1) Genera common to Asia, Africa, and America; (2) to Asia and Africa only; (3) peculiar to Asia.

The following are some of the genera common to Asia and Africa, and America:—

Diadema*	Papilio	Callidryas
Danais	Pieris	Terias
Charaxes*	Vanessa	Acræa*

The following are some of the genera peculiar to Asia:—

Euplœa Cethosia Athyma

Acræidæ only represented by Acræa Vesta in Asia.

As regards the Acræidæ,—a tribe which is represented by numerous species in Africa and Madagascar, red, orange, tawny, or brown, some with the wings partially transparent, and many profusely spotted with black dots,—these butterflies are only represented by the dun-coloured Acræa Vesta of Nepaul in Asia.

Diadema, whence so called.

Genus Diadema is so named from a row of white spots round the margin of the wings of many of its species, like gems forming the border of a crown. The ground-colour of several species is dark brown, blue, or purplish black.

Danais.

Genus Danais is a subdivision of the Danaidæ, which have of late years been separated into Danais and Amauris. Most of the species of Danais are tawny, black, and white.

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* Those marked with an asterisk are only found in Asia and Africa.

Charaxes.

This is an instance of a genus which, besides occurring in the before-named localities, is also found, as is that of Diadema likewise, in North Australia. It is represented in Southern Europe by one species only, Charaxes Jasius, a dark and tawny kind. By far the greater number of species of this genus are found in Africa, and in West Africa in particular. Such as are met with in Southern Asia, with which we are more immediately concerned, are for the most part cream-coloured or tawny, some of the cream-coloured presenting a white, satiny appearance, diversified by elegant markings on the under side. The female of one tawny species was, I believe, new when it came into my possession, and, as such, was named Charaxes Wallacei by Mr. Butler, after the writer of the *Malay Archipelago*. Most of these butterflies have four short tails, and their strong and sinewy wings furnish them with the power of rapid flight, and make a rustling or crackling noise, according to the testimony of those who are well acquainted with them in their native habitat. Their larvæ also have a very peculiar appearance.

Its range.

Its peculiarities.

Vanessidæ. Vanessa. Junonia.

J. œnone.

J. orithya.

Such species of the Vanessidæ as Vanessa (or, perhaps, more strictly speaking, Junonia) œnone and orithya, eyed somewhat similarly to our Peacock, furnish instances of butterflies common to Asia and Africa, though the markings of the local varieties are somewhat different in Africa, Madagascar, India, and Australia. Among the Vanessidæ peculiar to Asia may be mentioned two Himalayan species, V. Kumaon, closely allied to our Polychloros, and V. Kaschmirens to our Urticæ. The V. Calirrhoe or Indica, from the same region, also somewhat resembles our V. Atalanta, but the black ground-colour of the latter is replaced by a dusky brown in the wings of the former insect. There are also the blue and black Vanessidæ, of which three species, at any rate, are known, one found in Ceylon, another, V. Charonia, in Southern Asia, and another, V. glauconia, in Japan.

V. Kumaon.

V. Kaschmirensis.

V. Indica.

V. Charonia

V. glauconia

Genera Callidryas and Terias.

As regards the genera Callidryas and Terias, these are common to the Eastern and Western tropics as well, and being orange, yellow, or white, do not possess nearly as much variety of colouring and markings as the Papilios. Like our own Garden Whites, they are ranked under the great sub-family of Pierinæ, and are of various sizes, several species of Terias being of the size of our Orange-tip, or smaller, and some of Callidryas far exceeding any European Pieris, or White, in size. Butterflies of genus Callidryas congregate in immense numbers in certain spots (for instance, a pool or puddle in

the forest), rising up like a perfect cloud of pieces of white paper fluttering in the breeze when a horseman approaches. This I state as I heard it from the testimony of an eye-witness in Ceylon.

Euplœa, Cethosia, Athyma peculiar to Asia.

The genera Euplœa, Cethosia, and Athyma are peculiar to Asia. The greater number of species of Euplœa are dark brown, some pencilled or shot with glossy blue or purple, some with cream-coloured markings. The species of Cethosia are either brick-red or white, with a curious and elaborate pattern round the border of the wings. There is no striking similarity between many of the kinds of Athyma, which are variously coloured.

Genus Papilio essentially tropical.

To assert that a large number of species of the genus Papilio occur in Southern Asia is only to state that the whole of that region forms a portion of the tropics, for the genus Papilio, or Swallow-tail, is essentially a tropical tribe, some hundreds of species having been recorded from the tropics, but only four from the whole of Europe, and a few, but not many, additional ones from Japan, and also from North America.

Name "Papilio given by Linnæus to all butterflies alike.

Linnæus formerly bestowed the name Papilio on all tribes of butterflies alike, but in more recent days the appellation has been exclusively restricted to the Swallow-tails. A decidedly large proportion of Oriental Papilios, or Swallow-tails, are of

Many of the Oriental Papilios dark-coloured.

a dark and sombre tint, being either black or else dark brown, relieved by cream-coloured patches or markings. Take, for example, such butterflies as P. Helenus, Severus, Pammon, Nephelus, Erectheus, Ormenus, Euchenor, Nox, Varuna, Memnon, and many more. Of these species P. Memnon and Pammon are subject to great variation, the former more especially as regards colour, the latter in its markings. It must be borne in mind that by no means all

All Eastern Papilios not possessed of tails.

the Eastern Papilios, any more than those of Africa or South America, are possessed of tails, but are classed among the Swallow-tails all the same, in consequence of the nervation of their wings, which furnishes the chief mark of distinction between all genera of butterflies. Thus, in some cases, neither sex ever has tails; in other instances there are two varieties of the male, or of the female, or of both, of which one has and the other is without tails. In one or more

P. Doubledayi, females both tailed and tail-less.

African species, the tailed is of quite a different colour to that of the tail-less variety, and with regard to Oriental Papilios, with which we are more especially concerned, the

Some groups of Papilios known by the name of one well-known species which they include.

eggs of the tail-less female of P. Doubledayi will produce both tailed and tail-less females too, and similarly those of a tailed one will generate tailed and tail-less alike. It has become the fashion to designate a certain group of Papilios

that are inter-connected by affinity of colouring and markings by the name of some one common and well-known species of the said group. Thus the "Paris" group is the name given to the group including P. Ganesa, Polyctor, Paris, Arjuna, Crïno, Brama, Blumei, and the like. All the said Papilios have the appearance of having their wings thickly covered with a fine golden-green dust, and have also a blue band or patch, with a magenta-coloured ocellus at or towards the base of the lower wings. Papilio Blumei, from the island of Celebes, is a particularly large and beautiful species, with azure blue spoon-shaped tails. To this class also are referred such butterflies as Papilio Ulysses from New Guinea, P. Telegonus from Batchian and Gilolo, P. Montrouzieri from New Caledonia, and P. Joesa (whether species or variety of Ulysses) from Queensland, though these last four kinds, having wings of an azure blue and glossy black, are of a different hue to the remainder. Then there is the "Memnon" group, including such species as P. Protenor, Rhetenor, Agenor, Memnon, Deiphobus, Ascalaphus, &c. Several of these are dark, or, at all events, dusky; some, as the very variable Memnon itself, are with or without a red patch near the base of the fore-wings, and are either almost black, with an appearance of slate-coloured dust over their wings, or black intermingled with a little white, so gradually shading off in different specimens, that some individuals of this species have the interior of the wings almost completely white. Then there is the "Bathycles" group, including such very common species as P. Bathycles, Sarpedon, and Agamemnon, the rarer P. Arycles, and the P. Miletus of Celebes, which is either a local variety of Sarpedon or a species closely allied to it. These have a ground-colour of black or else dark brown, numerously spotted with green in the case of the Agamemnon, and with stripes, patches, or markings of the same colour in Bathycles, Eurypylus, Sarpedon, and Miletus. Arycles, which is a rare Borneo species, looks as if it was a sort of hybrid between Bathycles and Agamemnon. Among individual species that are singularly distinct in appearance, and not so easily referable to any particular group, may be mentioned the Papilio Evan, with hooked wings of the colour of a withered vine-leaf, from Northern India; Papilio Semperi, with black velvety wings and scarlet body, like that of a Tiger Moth, &c.; while Papilio Polymnestor is a large and handsome species, occurring commonly in India and Ceylon, its colour black and lavender blue, spotted with black—the said blue paler or greyer in the female; and Papilio Mayo, black, with a band of lavender blue at the base

"Paris" group.

"Memnon" group.

"Bathycles" group.

P. Evan.

P. Semperi.

P. Polymnestor.

P. Mayo.

of the lower wings, is also a fine kind, recently discovered in the Andamans, where Lord Mayo was assassinated, and named after him on that account.

Genus Ornithoptera.

Any paper professing to deal with the diurnal Lepidoptera of Southern Asia would be manifestly incomplete without full and special mention of that magnificent tribe of butterflies known as Ornithoptera or Bird-wings, alike from their shape, and the dark colour of the upper wings of many kinds in both sexes, and of still more kinds in the case of the female only. This tribe has pre-eminently a claim to be regarded as Oriental, as the range of every species that it includes is confined to Southern Asia and Australia. In the expanse of wing from tip to tip that its different species possess, it exceeds every other genus or family of butterflies, taken as a whole, from the Old or the New World either, although there are a few exceptions to this rule in the case of individual species of Papilio or Hestia or Morpho; still, my assertion with regard to the entire tribe that the Ornithoptera are unrivalled in their expanse of wing holds good. The range of the genus extends over Hindostan, Ceylon, the Malay Archipelago, New Britain, New Ireland, and Australia. Only the yellow Ornithoptera, however, are found on the mainland of Southern Asia and in Ceylon, the gold and the blue species, and some of the green ones being confined, some to one, others to two or more of the islands further East. The female of every species belonging to this group is larger than the male, saving only in the instance of O. Brookeana, where the sexes are of equal size. The whole of the Ornithoptera, as regards natural affinities, may conveniently be classed under three heads :—

"Bird-wings."

Expanse of wings.

Geographical distribution.

Females larger than males.

1. The green, the gold, and the blue.
2. O. Brookeana, a very distinct species.
3. The yellow.

The green, gold, and blue.

As regards the green, gold, and blue, these constitute several species, or many varieties of one species, according to the different opinions entertained by various entomologists. Mr. Kirby is disposed to regard them as constituting different varieties of one and the same species, and enumerates fifteen varieties of one kind accordingly. In support of his view it must be admitted that the colour of the gold O. Crœsus has a greenish tint, and that of the green O. Pronomus, for example, a golden one when seen in a certain light; the blue D'Urvilliana also has a golden tinge, and that the green, gold, and blue of O. Pronomus, Crœsus, and

The blue variety, O. D'Urvilliana

D'Urvilliana respectively occupy precisely the same position in the wings of all three species. The blue is only represented by one kind, O. D'Urvilliana, from New Ireland, and, owing to the fact of there being cannibals in that island until within the last twenty years, this species was only known by a unique specimen in the Paris Museum. Of the gold, there are, at any rate, now three species or varieties known, namely, O. Crœsus, discovered by Wallace in Batchian, and afterwards found likewise in Ceram; O. Lydius, of a deeper orange, from Gilolo; and O. Tithonus from Papua, which is said to have more gold bands than Crœsus, and to be a larger and finer insect. I cannot refrain from quoting Wallace's account of his first capture of O. Crœsus in the island of Batchian, page 51, vol. ii., of his *Malay Archipelago*:—

The gold O. Crœsus, O. Lydius, O. Tithonus.

"The next day I went again to the same shrub, and succeeded in catching a female, and the day after a fine male. I found it to be, as I had expected, a perfectly new and most magnificent species, and one of the most gorgeously-coloured butterflies in the world. Fine specimens of the male are more than seven inches across the wings, which are velvety black and fiery orange, the latter colour replacing the green of the allied species. The beauty and brilliancy of this insect are indescribable, and none but a naturalist can understand the intense excitement when I at length captured it. On taking it out of my net, and opening the glorious wings, my heart began to beat violently, the blood rushed to my head, and I felt much more like fainting than I have done when in apprehension of immediate death. I had a headache the rest of the day, so great was the excitement produced by, what will appear to most people, a very inadequate cause."

Wallace's discovery and capture of O. Crœsus.

The green varieties are very numerous—twelve, at least, in number. Of six of them, not possessing them in my own collection, I know little or nothing, as O. Euphorion, Boisduvallii, Oceanus, Triton, Pegasus, Archideus. Of the remaining six, four, I consider, may be classed as local varieties of one and the same species, namely, O. Pronomus from Queensland, O. Aruanus and Poseidon from the Aru Islands, and O. Cassandra from New Britain. O. Priamus is so much larger and O. Richmondia so much smaller than these four varieties, as to entitle the former, from the Island of Amboyna, and the latter, from the Richmond River, Australia, to be regarded as distinct kinds.

The green.

In Hewitson's collection—from Amboyna and Ceram, O. Priamus; Cape York, O. Pronomus; Darnley Island, O. Poseidon; New Guinea and Waigiou, O. Aruanus, O. Cassandra; New South Wales, O. Richmondia.

O. Priamus is a very old species, and was known to science at least 130 years ago; of late years it has become very rare, probably the rarest of all the green ones, and is best represented by specimens of long stand-

ing in collections and museums in Holland. O. Pronomus, which is decidedly smaller, is often offered for sale as true Priamus.

Green, gold, and blue confined to the males.

It will, of course, be understood that the green, gold, and blue here mentioned only refer to the males. The ground-colour of the females is invariably dark or dusky, diversified by yellow and white markings or spots.

Wallace thus describes his capture of O. Poseidon (in pp. 199 and 200 of vol. ii. of his *Malay Archipelago*) in the Aru Islands :—

Wallace's capture of O. Poseidon.

"I had the good fortune to capture one of the most magnificent insects the world contains, the great Bird-winged Butterfly, Ornithoptera Poseidon. I trembled with excitement as I saw it coming majestically towards me, and could hardly believe I had really succeeded in my stroke till I had taken it out of the net, and was gazing, lost in admiration, at the velvet black and brilliant green of its wings, seven inches across, its golden body, and crimson breast, &c."

Bodies of Ornithoptera, bright yellow.

The abdomens of all the Ornithoptera are a bright yellow.

O. Brookeana (so named after Rajah Brooke).

O. Brookeana was so named by its discoverer, Wallace, after Rajah Brooke, who showed him hospitality during his travels in Borneo. The Dutch were for terming this fine insect "Papilio Trogon," for a reason that appears in Wallace's account of its capture, but its original name, Brookeana, is the one by which it will continue to be known.

Compare the following passage from Wallace's *Malay Archipelago* (vol. i., pp. 58 and 59) :—

Wallace's discovery of O. Brookeana.

"I obtained some rare and very handsome insects, the most remarkable being the Ornithoptera Brookeana, one of the most elegant species known. This beautiful creature has very long and pointed wings, almost resembling a Sphinx Moth in shape. It is deep velvety black, with a curved band of spots of a brilliant metallic-green colour extending across the wings from tip to tip, each spot being shaped exactly like a small triangular feather, and having very much the effect of a row of the wing-coverts of the Mexican Trogon laid upon black velvet. The only other marks are a broad neckcloth of vivid crimson, and a few delicate white touches on the outer margins of the hind-wings. This species, which was then quite new, and which I named after Sir James Brooke, was very rare."

Locality of O. Brookeana.

Locality, Simunjon coal-works, near Sarawak, Borneo, in the mining district. Since the time of Wallace's travels a large number of the males have been sent to England, and this butterfly has also, I believe, been discovered in Sumatra,

Female Brookeana.

and the female has also been found, but it still continues very rare and costly. It is the only female Ornithoptera that possesses even partially the gorgeous colouring of the male,

the brilliant metallic green triangular spots of the one being replaced by streaks of the same tint in the case of the other.

Yellow Ornithoptera.

With regard to the yellow Ornithoptera, the upper wings of all the species are black, and in some kinds a very dark brown, frequently pencilled with white lines, more especially in the female. The colour of the lower wings is bright amber yellow and black, sometimes the one tint, sometimes the other predominating, according to the particular species. In reference to the females, the colour of the lower wings in all the kinds is usually darker than those of the males, as in the former sex the yellow surface is always diversified with a variety of black blotches or patches.

Females darker than the males.

Yellow group exceeds green, gold, and blue in size.

The yellow Ornithoptera differ, of course, also in size, according to the species, but these have the advantage over the green, gold, and blue group in that particular: the male of the largest of the yellow ones, O. Helena, exceeding the large green, O. Priamus; the male of the smallest of them, O. Nephereus, exceeding the little green, O. Richmondia, in size.

To consider the species in detail: much confusion has existed respecting their correct nomenclature, Minos having been confounded with Pompeus, while Mr. Kirby regards Minos, Pompeus, and Heliacon as three varieties of one species, and in Mr. Hewitson's catalogue the name Heliacon does not appear at all. The fact is there are two species:—

1. O. Minos (Cram.).
2. O. Pompeus (Cram.). (Heliacon is only a synonym of this last.)

(1) O. Minos.

O. Minos is larger than O. Pompeus. The male has a broader margin on the hind-wings, and the fore-wings are not so black as in O. Pompeus. It comes from South India. My own specimens are from Malabar.

(2 O. Pompeus.

O. Pompeus is common in North India, and has also been received from Sumatra, Perak, Malacca, and Java. This species is one that has been long known to science, and has probably been far more frequently sent over to this country than any of the rest, being familiar to the eyes of many owing to the fact of its having been included along with other Indian butterflies in glazed cases for hanging against the wall. The name Heliacon has long and widely obtained, but Pompeus is the oldest title, and the one which will stand. The following localities are given for it in the catalogue of Mr. Hewitson's collection, Makian, Menado, Amboyna, Tondano, and Sylhet.

(3) O. Heliconoides.

O. Heliconoides, of Moore, in Mr. Hewitson's collection, but not in my own, is really the Java or Andaman form of O. Pompeus. It is smaller than the latter, and the spots on the hind-wings are small. It is doubtful whether it possesses a claim to be regarded as a distinct species.

(4) O. Amphrisius.

O. Amphrisius (Fabr.), Malay Islands. A very distinct species, and, to my thinking, the handsomest of all this group; readily recognised from others by the fact of the male having scarcely any black edging to the clear yellow of the lower wings; upper wings very much pencilled. My own specimens of Amphrisius came out of a particularly large and fine collection of Borneo butterflies forwarded from Sarawak by Mr. Lowe to the care of Mr. Higgins, about twenty years since. Mr. Hewitson terms this butterfly Amphrisius of Fabr. It is the Amphrysus of Cramer, according to Mr. Kirby.

(5) O. Haliphron.

O. Haliphron (Boisd.), from Celebes, according to Mr. Hewitson and Mr. Kirby. My own specimens are from Ceram. The lower wing of the male consists of a patch of yellow, surrounded by a broad black band—not mere scalloping.

(6) O. Criton.

O. Criton (Feld.), Batchian and Gilolo. I have only one specimen of this insect, a male; not unlike Haliphron, but much rarer. It has more yellow in the lower wing, and the upper wings are deep black, instead of being pencilled.

(7) O. Hippolytus.

O. Hippolytus (Cram.). Mr. Hewitson's specimens are from Celebes and Ceram, my own from Ceram and Amboyna. This butterfly is far better known to the generality of people by the name of Remus, but that of Hippolytus is the oldest, and therefore the one to be retained. Panthous is merely the Amboyna variety of Hippolytus. The black spots or blotches may be slightly larger in var. Panthous, but I am not sure that any difference really exists. The dark grey in the lower wings of the male and the lighter grey in the lower wings of the female serve to distinguish them from other species.

(8) O. Rhadamanthus.

O. Rhadamanthus (Boisd.), from the Philippines, according to Hewitson. My own specimens are from India. According to some there are two varieties of this insect, distinguished by the red or yellow collar respectively. The female Rhadamanthus has black scalloping, and black spots within the scalloping on the yellow of the lower wings.

(9) O. Nephereus.

O. Nephereus (Gray) Luzon. The male is much smaller than that of Rhadamanthus. The scalloping of the lower wings of the male is also not so distinct, and more gradually shaded. The female Nephereus has a broad black band and yellow patch without spots on the lower wings. Mr. Hewitson's catalogue

does not mention Nephereus, whether as species or synonym. According to Mr. Kirby, Nephereus of Gray is a synonym of Rhadamanthus Boisd.

O. Darsius (Gray), Ceylon. Not unlike Criton, but a much commoner species, and with more yellow in lower wings. (10) O. Darsius.

O. Helena (Linn.). Specimens from Malayan and Papuan Islands in Hewitson's collection. Also in Kirby's list marked Ins. Papuanæ (one male and one female from Ceram and one female from India in my own collection). Male distinguished from that of most other yellow species by its large size. Black band at border of lower wing; scalloped on the inner edge. (11) O. Helena.

O. Plato (one male and one female from Banda Islands in my own collection). According to Kirby from Timor. Not in Hewitson's collection apparently. Male not unlike that of Helena, but much smaller, like that of Pompeus also, only deep black band instead of scalloping on lower wings. (12) O. Plato.

O. Miranda (Butler). In my own collection from Merut. From Sarawak according to Hewitson and Kirby. Only known to science for the last eighteen or twenty years. Male like that of Amphrisius, another Borneo species, but with more decided scalloping, and upper wings have a purple bloom, as of a grape when seen in a bright light. Lower wings of female very characteristic and dark, a mere shading of yellow on a uniform black surface. (13) O. Miranda.

O. Magellanus (Feld.), Philippines. In Hewitson's collection, but not in my own. Remarkable for green opal-like iridescence of lower wings of the male when shifted in the light. Long and narrow wings. Scarcely any black bordering to the yellow of the lower ones. (14) O. Magellanus.

Genus Kallima. "Leaf" butterflies.

The most perfect case of resemblance to a dead leaf is afforded by the Leaf Butterflies, Kallima Paralekta, of Sumatra and Borneo, and the closely-allied species, Kallima inachis, of India, when settled and at rest. All the variations of their under surface (which varies much in tint in different specimens) correspond to those of dead leaves—yellow, ashy brown, or reddish, &c.

Deceptive resemblance of the under surface of the insect when at rest to dead leaves.

In many specimens, also, according to Wallace's description, and as I can testify by some in my own collection, there are patches and spots formed of small black dots, closely resembling the way in which minute fungi grow on leaves. Further, when the insect thus remains in repose, the head and antennæ are drawn back between the wings so as to be quite concealed. The mid-rib of the leaf and likewise its lateral veins are exactly represented on the under surface of the butterfly, and lastly, the tail of the hind-wing forms a per-

Protective imitation.

fect stalk, so that by this "protective imitation" of the surrounding dead leaves it contrives completely to elude the notice of insectivorous birds. To illustrate this adaptation of circumstances, without which the species, in consequence of its numerous foes, would rapidly become extinct, I had some specimens mounted on twigs and enclosed under a glass shade several years since, when delivering a lecture on entomology to a certain London parochial school.

Destructive mitation.

In some of the Orthoptera that are only found in hot countries, as the Phyllium Scythe, or Walking Leaf, this imitation does not serve for self-protection, as in the instance of the Leaf Butterflies, but for destruction of their prey that unwaringly come within their reach, owing to their likeness to the vegetable creation.

"Natural mimicry": what it is understood to mean.

In the Eastern tropics, as in all other hot countries, there are, of course, many instances of what it has been agreed to term "natural mimicry." Whether this appellation has been felicitously chosen to designate what it is intended to convey may be open to question, but the meaning is that the butterfly, for example, of one genus mimicks the butterfly of another in its natural state, namely, that both are almost alike in the colours, markings, shape, with which they emerge from the chrysalis, and which accordingly they always wear, and that the said colours and markings are not put on or changeable at their will, like those of the chameleon that varies its hues according as its temper is placid or ruffled, and in proportion as that reptile is confined in a dark place of captivity or allowed fresh air, green leaves, and sunlight. Again, with regard to this natural mimicry, the insect that is the mimicker is far rarer than the one mimicked; it has therefore been conjectured that it is a provision of Nature to preserve the rarer species from utter extinction: that a rare Papilio, for instance, should mimic a comparatively common Euplœa, because the Papilio is pleasant to the birds, and the Euplœa distasteful, or because, it may be, the Euplœa can protect itself from its foes by swifter powers of flight; at any rate, these reasons, whether the real ones or not, have been assigned. Further, this natural mimicry exists between different genera that have great structural diversity in the nervation of the wings, and there are cases of one sex only of a certain species of one genus mimicking both sexes of another species belonging to another genus. This is aptly exemplified by the female of Diadema Misippus mimicking both male and female of the well-known Danais Chrysippus in its general tawny ground-colour, and black and white markings, whereas the male of the above-named Diadema Misippus presents a

Mimicker far rarer than mimicked in some instances.

Mimicker pleasant to the birds, the mimicked one not so. The mimicked one possessed of swifter powers of flight.

Female of Diadema Misippus mimicks both male and female of Danais Chrysippus.

totally different appearance, being purplish or bluish black with large white discs or circular patches on the wings. Here again is an instance, not of a rare kind mimicking a much commoner species, but of one common kind mimicking another, Diadema Misippus and Danais Chrysippus being both very common species.

One common species mimicking another.

Once more we must not omit to notice that not only does this mimicry exist between different genera of butterflies, but between moths and butterflies in both hemispheres, notably between moths and such Papilios as Rhetenor and Polydorus and the like in the Eastern tropics. Altogether there are far too numerous instances of this natural mimicry to specify here. I have never visited those regions of the tropics where the species that exhibit natural mimicry are to be found, but should imagine that in many cases the mimicker and the mimicked would be undistinguishable on the wing. Side by side in the cabinet a Papilio and a moth mimicking a Papilio would at once be recognised by the difference of the antennæ, however alike in all other points of superficial resemblance. Similarly those who are familiar with the female of Diadema Misippus and both sexes of Danais Chrysippus would never mistake the one for the other, though the respective specimens of these two kinds were mixed up any way and in any number in a box. There is here some slight difference in the tint, and likewise in the markings of the two butterflies in question. The mimicry is not always quite complete, although nearly so—closer between butterflies which we will term, for convenience, A and B, than between two other butterflies which we will name C and D; closer again between butterfly E and moth F, than between butterfly G and moth H. Sometimes the resemblance is not in corresponding size of the two respective species, only in colour, shape, and markings. Compare the South American Papilio Zagreus with the considerably smaller Lycorea Ceres which it mimics, to take an example not from the Eastern, but from the Western Hemisphere.

Mimicry likewise between moth and butterflies in both hemispheres.

The difference of the insects exhibiting mimicry can always be recognised side by side, though not on the wing.

Mutual resemblance of certain species greater than that of others

Mutual resemblance only in colour, shape, and markings, not in size in certain cases.

I would not willingly be understood as myself favouring the prevalence of such terms as "natural mimicry," or "mimicker," or "mimicked." Neither do I possess sufficient knowledge to allege reasons why this mimicry should exist in the economy of Nature. I would also prefer to suspend my judgment in reference to reasons given by others that have been above assigned. Thus much I admit, that of two species of two different genera resembling each other, one may be much rarer and more local than the other; that the instances of this mutual resemblance are very numerous in warm

Objections to the term "natural mimicry," and the reasons assigned for the same.

climates, and altogether unknown in temperate regions,* so far as I am aware. But supposing, for argument's sake, a mutual resemblance to exist not only between two species, but between three, or even four, between the representatives, not only of a Danais and a Papilio, or a Euplœa and Papilio, or a moth and a Papilio, but between the Papilio, which we will term A, the Euplœa, which we will agree to call B, and the Danais, and likewise the moth, C and D respectively. If such resemblance could be ostensibly shown between three or more different genera or tribes, which is the mimicker and which the mimicked? Is the one, namely, the Papilio, pleasant to the birds, and the Euplœa, Danais, and the moth distasteful accordingly? Or are the three, the Euplœa, Danais, and moth pleasant to their feathered foes, and the one, the Papilio, the reverse? Are those that are commoner, and are mimicked, always possessed of swifter powers of wing than those that are rarer, and are the mimickers? Allowing, as has been already granted, the much greater rarity of one species exhibiting the mutual resemblance, as contrasted with the other, is not such rarity to some extent occasioned by our ignorance of the food-plant of its larva, or it may be the exact time of year when to look for both larva and imago? The term I should myself be disposed to employ, with regard to this phenomenon, would be as follows: "Correspondence of superficial resemblance between different genera." It has the merit of being an unexceptionably safe appellation. Colour, size, shape, and markings are all superficial resemblances, quite apart from structural affinities, and it is precisely in colour, size, shape, and markings that one particular Diadema resembles a Danais, and one Papilio a Euplœa. Whereas there is no such common similarity in any one of the said superficial resemblances among the very numerous species, taking them as a whole, that make up the great genus Papilio, and which has to be sub-divided into minor groups accordingly, only structural affinity in the nervation of the wings.

"Correspondence of superficial resemblance between different genera."

In conclusion, with regard to British India, the Himalayas† and Neilgherries far more productive in number of species of butterflies than the lowlands of British India.

* Though in temperate regions also there are instances of a butterfly mimicking an object of the vegetable creation. Compare the fact of *Satyrus Semele* being undistinguishable from the lichen on the boulder on which it is at rest with its lower wings alone visible, and the similarity of the green-spotted under surface of *Anthorbaris Cardamines* to the flower of the Cow-parsley on which it has settled.—F. A. W.

† I must not omit mention of a very distinct and unique species from the Himalayas, the *Teinopalpus imperialis*, of a uniform mossy-green tint, with yellow and grey patches at the base of the lower wings. The said species is now assigned a place at the end of the *Papilionidæ*.—F. A. W.

that form the northern boundary of that country and the Neilgherries that are situate towards the south are far more productive in the number of the species those mountain chains respectively contain than all the rest of the territory throughout the whole of its plains, whether from the drainage of the low-lying regions for purpose of cultivation, or from greater variety of climate and correspondingly different zones of vegetation in the ascent of the hills favouring the existence of subtropical species, of kinds nearly corresponding to our own, and lastly, of such as are confined to the high Alps, I must leave for more precise and detailed explanation to others.

H. Cadman Jones, Esq., M.A. (the Chairman).—I must now ask you to join with me in returning thanks to Dr. Walker for his very interesting paper (applause). It would add to the advantage we have already derived if those present who have studied the subject would give us the benefit of their experience.

Mr. W. F. Kirby.—I have made a few notes in reference to Dr. Walker's interesting paper, and perhaps, I may be allowed to place them briefly before the meeting. The question of the distribution and extension of species from one district to another is one of great interest. The natural means of distribution appear to operate very slowly. It is thought that the greater portion of the butterflies of Europe were either exterminated by the glacial period, or driven out into other parts of the world, whence they slowly returned to us afterwards. But all of those which are found on the Continent did not reach England before its separation from the opposite shores was accomplished; and again, of those that did reach England, only two-thirds found their way to Ireland. Notwithstanding the short distance between the two coasts, very few butterflies, comparatively, now spread from the Continent to England. *Lycæna Bætica* which has been referred to, is found both in Asia and Africa as well as in South Europe. *Syntomis Phegea*, one of the Burnet moths, is a European species which seems to be spreading up the western coast and then gradually making its way eastward north of the Alps, though very slowly. Some insects appear to be spread by artificial means, which at present we can hardly estimate. For instance, one of the largest and most conspicuous of the North American butterflies, *Danais Erippus*, about thirty years ago, spread suddenly through the Eastern Archipelago, and now, I understand, has reached Penang, whence it will, doubtless extend further into the

continents of the Old World. Some years ago, too, specimens were taken in England and France; but a number of unfavourable seasons succeeded each other, and the insect seemed then to have disappeared. However, within the last few years it has not unfrequently been taken in England, especially in the western counties, and also occasionally on the Continent. I suppose the wider range of the African and Asiatic species, as compared with many of those found in tropical America, is due to the greater uniformity of the vegetation, and also to the less frequent occurrence of mountain ranges in the districts over which they are respectively spread. At the same time, some mountain districts are peculiarly favourable to the existence of a great variety of these insects,—a fact partly owing to the difference between the vegetation and climate of the different elevations, and partly to other causes. Although the great genus Papilio itself is tropical, yet the greater proportion of the well-defined genera belonging to the same family, are found in the extra-tropical Northern Hemisphere. The following are the well-defined genera of true *Papilionidæ* with their distribution: *Papilio* itself is cosmopolitan. *Ornithoptera* and *Leptocircus* are Indo-Malayan. *Eurycus* is Australian and Papuan. *Euryades* is South American. All the remainder belong to the extra-tropical northern hemisphere. *Doritis* and *Thais* are Mediterranean. *Hypermnestra* inhabits Turkestan. *Parnassius* extends from the Pyrenees to Western North America, but is most numerous in Central Asia. *Mesapia*, *Teinopalpus*, *Bhutanitis*, and *Armandia* are confined to the Himalayas or Thibet; *Sericinus* is Chinese, and *Luehdorfia* is found at Vladivostok and in Japan. *Papilio Memnon* has been referred to as a variable species; but I understand that some entomologists are inclined to think that there are more than one species included under this name; and in regard to *Ornithoptera D'Urvilliana*, I may say that it has been obtained in Duke of York Island as well as in the Solomon Islands. *O. Victoriæ*, also from the Solomon Islands, is a very distinct species in the male, so much so that if the female did not resemble that of *O. Poseidon* and allies in form, no one would think of placing it in the same genus. *O. Magellanus* from the Philippines is the finest of all the yellow group, and is remarkable for the iridescent colouring of its wings; and yet there is this peculiarity about it, that, if you hold the insect to the light you see no trace of the iridescence,—so that, in order to perceive it, you must stand with your back to the light and hold

the insect almost on a level with the eye, when the peculiar and beautiful green iridescence is seen to perfection. If you do not do this you may have a specimen in your cabinet for twenty years and never notice the iridescence at all. There is one point of distribution I should like to mention, and that has reference to *Pyrameis Indica*,—a species allied to our Painted Lady. It is found in the East Indies, and there is a very similar butterfly in the Canary Islands. The species found in the Canary Islands is, however, completely isolated from any of its allies, and I can only imagine that it must have been introduced many years ago,—possibly in pre-historic times,—by man, or perhaps by some accident, like *Danais Erippus*, which has thus been introduced into the South Sea Islands, as well as into Europe. But the *Pyrameis Indica* of the Canaries is not quite identical with the same insect from Eastern Asia. Probably length of time and climate may have modified it to some extent. There is one form of mimicry which Dr. Walker has not alluded to, and that is the manner in which some moths and beetles mimic hymenopterous insects. We have a moth, *Ophecia Apiformis*, which is so remarkably like a hornet, that when you see it sitting on the trunks of the poplar trees you would almost mistake it for one, owing to its peculiar colouring. I will add the following notes on Dr. Walker's paper :—

P. 196.—*Euplœa* is not quite confined to Asia. There are one or two species found in South Africa and Madagascar.

P. 196.—*Acræa*. There are two common North Indian species—*A. vesta* and *A. violæ*, the latter very close to some African species; the genus is also represented, though not numerously, in the Moluccas and Australia.

Mr. G. W. Oldfield.—I have to congratulate Dr. Walker on his very interesting paper. Referring to the question of Mimicry, it may be interesting to note the observations of Mr. Thomas Belt, in his *Naturalist in Nicaragua*, pp. 314, 315, on the subject where he says: "Ant-like spiders have been noticed throughout tropical America, and also in Africa. The use that the deceptive resemblance is to them has been explained to be the facility it affords them for approaching ants, on which they prey. I am convinced that this explanation is incorrect so far as the Central American species are concerned. Ants, and especially the stinging species, are, so far as my experience goes, not preyed upon by any other insects. No disguise need be adopted to approach them, as they are so bold that they are more likely to attack the spider, than the

spider them. Neither have they wings to escape by flying, and generally go in large bodies, easily found and approached. The real use is, I doubt not, the protection the disguise affords against small insectivorous birds. I have found the crops of some humming-birds full of small soft-bodied spiders, and many other birds feed on them. Stinging ants, like bees and wasps, are closely resembled by a host of other insects; indeed, whenever I found any insect provided with special means of defence, I looked for imitative forms, and was never disappointed in finding them." The mimicry by spiders, *Hemiptera* and *Coleoptera*, of stinging ants is there referred to on pp. 381, 382, the resemblance of curious species of *Orthoptera*, of Chontales (with a figure) to green and faded leaves, and of two specimens of the moss insect (with a figure) to moss, the insect being the larva stage of a species of *Phasma*. The author then discusses the extraordinary perfection of these mimetic resemblances, which he attributes to natural selection.

A Visitor.—With reference to the range of genera, may I ask the author, or Mr. Kirby, a question about the genus *Diadema*? Does not the species *Diadema Misippus* also extend to America? This I regard as a very interesting question. Dr. Walker has alluded to the *Diadema Misippus* mimicking *Danais Chrysippus* and, certainly, *Danais Chrysippus* is not found in America. This would lead us to the conclusion that *Diadema Misippus* has been introduced into America, possibly by the agency of man. In reference to *O. Victoriæ*, I have seen the specimens of that grand insect, both male and female, which Mr. Woodford has brought from the Solomon Islands, where they are apparently found in considerable numbers. Mr. Woodford was resident there for three years, during two visits, he being the only European among the natives of those islands. The insect is certainly distinct from *O. Tithonus* being a green species. I will not venture to go into the difficult subject of mimicry, which has been so often and so long discussed, since I caught the *Euplœa* and the *Diadema*; but I may say that I have often caught these insects both in India and Ceylon, and other tropical parts, and, if I remember rightly, the *Euplœa* is a slower flyer than the *Diadema*. As to the term "mimicry," it may not have been a happy one originally, but I think we do right to stick to it, my reason being that the term is better than a definition of eight words, and it is one easy to remember.

Mr. Kirby.—In reply to the question put by the last speaker, I

have to state that *Diadema Misippus* is only found in America in one or two restricted localities on the north coast of South America, in and adjoining Guiana and Trinidad, and probably on one or two of the West Indian Islands. I consider it to have been undoubtedly introduced into America.

Mr. W. White.—As a visitor, perhaps I may be permitted to offer a few remarks on Dr. Walker's most interesting paper. I was struck on reading it with the thorough manner in which the author had treated the subject from the point of view relating to geographical distribution, a point that has become increasingly interesting, especially when fully considered in relation to climatic change and the wider question of its relations, not only to continents and islands, as they now are, but to "the geological extension of continents and islands," as originally discussed by Sir Charles Lyell, which evidently has had very much to do with the condition of existing faunas. Another thing that struck me very much was the complete recognition on the part of the author of an important fact respecting highly variable species, to the extent of the annihilation of species, as such, in many cases. He has described how two forms passing under different names,—even two sexes described as different species,—are really only one species, and that they therefore ought to be limited to one name. He has told us also, that the eggs of certain Papilios will produce imagines, some with tails and some without tails, thus showing their extreme variability; and he has even suggested that the Borneo species, *Papilio Arycles*, may be a hybrid between two other *distinct* species—*Bathycles* and *Agamemnon*. Therefore, it is patent that the order of insects so dealt with forms a striking illustration of the non-fixity of species, and that a distinct withdrawal of the view that used to be accepted as to the distinction of species under one creative fiat is definitely implied. Indeed, we find there is such an immense variety in this class of insects that probably in no other order of animated nature are the variations so marked. Perhaps, if Dr. Walker will allow me to say so, the paper might have had a more restricted heading. He has dealt with the diurnal *Rhopalocera* only, and has not included the diurnal *Heterocera*, which certainly must be very numerous. Possibly, let us hope, he has reserved that for some future paper. But the second part of his paper,—if I may so term it,—in which he has dealt with the question of mimicry, is one that must be regarded as so important that it would almost seem to require a separate discussion. This is not an hour at which

I ought to trespass on your patience by speaking at any length on this point. Very much has been written on the subject by Darwin, Wallace, and Bates,—the originator of the word "mimicry,"—and the word, as so applied, is a very good one; but I am not quite so sure that the choice of the term "natural mimicry" as used in the paper is entitled to this commendation. I never met with it in that shape before, and the word "natural" is, I think, quite unnecessary. There is, however, a further criticism I would make in reference to a remark made by Dr. Walker. He says: "The instances of this mutual resemblance are very numerous in warm climates, and altogether unknown in temperate regions, so far as I am aware." I think that Dr. Walker on thinking the matter carefully over would be able to recall very many instances of this mutual resemblance in temperate regions, some of them having already been alluded to by Mr. Kirby; and, as the investigation proceeds, I am inclined to believe that the number of cases will be found very numerous indeed. I would here throw out the suggestion that, among our own British moths there are two common species of *Acronycta* which are so identical in every feature, that there is scarcely a naturalist who will pronounce decidedly which is *Psi* and which is *Tridens*, while it is well known that the larvæ are so distinct that there can be no possibility of mistaking one for the other. I would suggest that this also may be a case of mimicry, —not, perhaps, a case of direct mimicry, but a case of indirect mimicry. The insect is in the habit of sitting at rest on the bark of trees, and I have frequently pointed out specimens when out in the fields with friends, who have been unable to see them on account of their close resemblance to the surface on which they rested. Therefore, it may be, that the two insects, being located similarly, have assumed the same character; but in making this suggestion it may be as well to point out a broad distinction in such cases,—a distinction which Dr. Walker has not defined. In a foot-note he says:—"Though in temperate regions also there are instances of a butterfly mimicking an object of the vegetable creation. Compare the fact of *S. Semele* being indistinguishable from the lichen on the boulder on which it is at rest, with its lower wings alone visible, and the similarity of the green-spotted under-surface of *A. Cardamines* to the flower of the Cow-parsley on which it has settled." The term "mimic" is here misapplied. These are not properly cases of "*mimetic* resemblance," but of "*protective* resemblance." The difference is, I think, a highly important one, and in all dis-

cussions on mimicry it ought to be distinctly expressed by the separate phrase.

Captain F. PETRIE, F.G.S. (Hon. Sec.).—Before I read the communications that have been received, may I refer to a remark in Dr. Walker's paper as to certain butterflies being found where they were least expected? I happened to visit Muckross near Killarney a few days after the late Prince Consort had been there, and my entertainer mentioned to me, with a view of showing the great interest Prince Albert always took in scientific matters, including the subject of entomology, that the Prince had expressed some surprise at finding the British Swallowtail (*Papilio Machaon*) at Killarney;—my friend had introduced it two years before.

Among the letters that have been received in regard to this evening's paper is one from that eminent man of science, Sir Richard Owen, who, I am sorry to say, expresses regret that failing health confines him so much to the house that he is unable to be present to-night.

Mr. H. E. Cox, F.E.S., writes:—

As regards Dr. Walker's very interesting paper, I do not feel qualified to take part in a critical discussion upon it, for I am not possessed of any knowledge of the Lepidoptera; there are, however, two points arising from it which would amply repay full investigation. The first of these is what is called Mimicry. Dr. Walker remarks upon the close resemblance to a dead leaf furnished by certain butterflies (*Kallima Paralekta* of Sumatra and Borneo, and *Kallima inachis* of India), and upon the fact that some of these insects have among their markings patches and spots similar in appearance to those produced by minute fungi on leaves. Not only so, but these apparent leaves are furnished with a stalk by the tail of the hind wing. We are here, I think, placed in a vast and very slightly explored field. These mutual resemblances, which in many cases are so strikingly exact, are found spread over a wide area. Sometimes we find a resemblance to various surrounding natural objects; at other times the products of animal life are imitated; and again, different species of living beings present great similarity of appearance. The case of the butterflies above referred to furnishes an instance of resemblance to surrounding natural objects, with which also we are all familiar from seeing moth larvæ standing stiff and straight out from the side of a twig exhibiting both in colour and attitude so strikingly the appearance of a minute branch. The same thing is seen in the larvæ of the

Mantidæ. In the South of Europe I have observed the larvæ of small Mantidæ, motionless upon the long withered stalks of dry grass, with their long, thin legs extended, clasping a stalk here and a stalk there, and scarcely distinguishable either in form or colour from the stalks among which they stood. There are numerous such instances around us. In some cases moths and insects of other orders present all the appearance of the lichen-covered bark upon which they stand; in others, spiders resemble in colour the petals of flowers; and some beetles might, when motionless, be easily mistaken for seeds or pellets of earth. Of insects which resemble the products of animal life we have an instance in certain moth larvæ which simulate the appearance of a bird's excrement; and among insects exhibiting a similarity to other living creatures we find that the resemblance is not confined to the same order, but that in some cases there is a likeness between Hymenoptera or Coleoptera and Diptera, or between certain Staphylinidæ and Forficula. When we remember that this similarity of appearance is not confined to insects or even to the animal world, but that we can, within easy reach of London, pluck the flowers of the spider orchis, we can, I think, see the great scope for investigation as to the meaning, the origin and progress, and the purpose of these resemblances. In considering this it is well to bear in mind that the mode of life is clearly capable of exercising a great influence upon form. This is well exemplified by the striking peculiarities found in the Coleoptera inhabiting ants' nests. It has been suggested that some of the colours of insects may be produced during the developments which occur immediately on emerging from pupa by a sort of photographic process, by which the tints prevailing around may be reproduced. This, however, would not avail to account for the white winter garb assumed by Arctic animals, for the tawny coat of the lion matching the colour of the sand or rocks, or for the stripes of the tiger and spots of the leopard, recalling the appearance of flickering gleams of sunshine among the leaves. The other point to which I would draw attention is the geographical distribution of species. Dr. Walker in the early part of his paper refers to the division of the Eastern Archipelago into two portions, one part being attached to Asia, and the other part to Australia. I think that it is a matter of great importance that we should know what insects are peculiar to the Australian division. I believe Australia to be a relic of the old world, in which we have preserved for us the forms of life, both animal and vegetable prevalent upon the earth prior to the

appearance of the fauna and flora found elsewhere; in it almost exclusively we find the marsupial animals, the method of whose reproduction is certainly inferior to that of the other mammals, and may, in fact, be described as midway between this and that of the birds. There is almost an entire absence of indigenous placental mammals, (the dingo or wild dog having been very possibly introduced by man). The vegetation also is peculiar, and I think I might say of an inferior type, exhibiting an absence of deciduous trees and showing special forms, such as the Casuarina. On the other hand, the birds, reptiles, and fish of Australia do not present so many striking peculiarities. I therefore believe that Australia was separated from the rest of the land surface at a time when fishes, reptiles, and birds were old and well-spread forms, and antecedent to the appearance of the placental mammals and deciduous trees. If, then, we know what are the insects peculiar to the Australian continent, I think we shall get some idea of the oldest forms.

Mr. C. W. Dale, F.E.S., writes:—

The term "mimicry" is certainly a bad one, as its proper use is for some kind of voluntary action on the part of the animal. However, it is used in cases where one insect resembles another. I do not hold with the conjecture of the present day that it is a provision of nature to preserve the rarer species from utter extinction. I rather believe that the same cause which produces one species to be marked and coloured in a particular way produces another marked and coloured in like manner. Take, for instance, reed feeders of various families, all of a light brown colour:—*Macrogaster Arundinis* amongst the Bombyces; the genus *Leucania*, and its allies, *Simyra venosa*, which mimics the Leucanidæ, but is at once separated from them by the hairy larva, amongst the Noctuæ, *Chilo* and its allies amongst the Crambi, and *Orthotelia sparganella* amongst the Tineæ. *Gnophos obscuraria*, again, on chalk soil is light, on peat soil is dark. The colour is probably affected by certain chemical properties in the food plant. The similarity of the underside of *Anthorbaris Cardamines* to the flower of the Cow-parsley might possibly be brought about in the long run of time by a process of natural photography (perhaps the term is a bad one, like mimicry). Another instance may be seen in people (man and wife, master and servant) who live much in each other's society gradually growing somewhat like each other. Again, it has been said a man's occupation may be inferred from his looks. Certain spiders resemble ants. They live in the same localities,

and have similar vocations. Therefore, the same reason which produces the one in a certain form, produces the other likewise.

Mr. THEODORE WOOD writes :—

"Protective imitation" (top of page 206).—One point of interest connected with this subject, and one which I do not know has as yet been touched upon, is this:—Are lepidopterous larvæ, which are protected from the attacks of birds by their resemblance to natural objects, protected also from the attacks of parasitic foes? Are the stick-like *Geometer* larvæ, for example, persecuted by *Ichneumonidæ?* For, if so, this would tend to show that the parasites in question seek their victims, not by sight, but by means of some other sense possibly not known to ourselves. And this supposition is favoured by the obvious fact that hyperparasites must depend upon a sense or senses other than sight in detecting the presence of their victims under the skin of the caterpillar in whose flesh those victims are concealed.—— "Destructive imitation."—I would suggest that the imitation of such insects as the *Phyllium* serves for self-protection *as well* as for the capture of unwary prey; for all insects have their natural enemies. In our common British Water Scorpion the resemblance to a withered leaf would certainly avail it as a protection against the *Dyticus* beetle or the Dragon-fly larva, as well as assisting it in the capture of prey.

The Rev. H. S. GORHAM writes :—

I am sorry I shall not be able to avail myself of the Council's invitation, as I am seldom in town, especially in an evening. I am engaged at present partly upon the Coleoptera of Java and Sumatra and Borneo, and I have described a good many from Japan. My own opinion is that at present we have not sufficient acquaintance in detail with the insect productions of the East to make general deductions, but that from what we do see and know the facts all point in the direction sketched out by Wallace in his work on Island Life. I am a decided believer in "mimicry," though not concerned to defend the term, as critics appear to find in it some suggestion of voluntary action. To those who have eyes the effect is being produced all round them: everywhere I see animals protected by their close resemblance to both living and inanimate objects. Very often the resemblance is imperfect, yet useful, as far as it goes. This seems to show that it is rather the result of gradual evolution than of a sudden creative act. Sometimes closely-resembling forms are found in different parts of the

world, as the *Euphorbias* of Africa and the *Echinocacti* of North America. Clearly a different explanation to mimicry is the true one here, and this has always been admitted.

Mr. Wm. F. de Vismes Kane, M.A., M.R.I.A., writes :—

Dr. Walker's paper deals with the Rhopalocera of parts of the globe which possess a lepidopterous fauna not only diversified in genera and species, but fertile in those strange phenomena of variation to which attaches so great an interest for the scientific zoologist. Speculations on the latent causes which give rise to these cannot, however, proceed on a satisfactory basis without accurate knowledge of the life-history of the insect in all phases previous to the final metamorphosis. This is at present unattainable in respect of the greater part of the Oriental species. But the study of those which are inhabitants of different latitudes in the temperate zone may prove suggestive. The acquisition, for instance, of the so-called "tails" in the genus Papilio, Charaxes, &c., seems to me to appertain to a comparatively recent stage of evolution. We have in Europe, as elsewhere, several other groups of Rhopalocera (notably the Lycænidæ), in which a tendency exists to develop a "tail" at the extremity of those nervures which approximate to the anal angle of the hind-wing. In some cases, as in the Tailed Blues and the Theclas, this tail is a constant character. In others, the tail is an aberration developing more in one season or latitude than another. I therefore take it that this is one of the latest (so to speak) ornamental acquisitions among the Lepidoptera. And I may, perhaps, venture to suggest that the rays or nervures of the wings seem to have played an important part in the production of certain patterns, as well as in the contour of the wings. On this subject I cannot enlarge. The extension of their extremities (if we except the costal) would seriously interfere with the flight of the insect, if it took place on the fore-wing. Hence, though the tendency shows itself, yet we have no projections on the anterior pair more remarkable than those found in the genus Vanessa, Libythea, and Gonopteryx. And it is only on the posterior or following portion of the hind-wings, where such appendages do not interfere with flight, that they are to be noticed; so that we have the first, second, or third median ray frequently giving rise to these processes. In the Oriental Papilios of which Dr. Walker treats, we have species in which both sexes remain still in the ancestral condition, without tails. Others, again, in which (and they are the most numerous) both sexes have acquired them, and again some in which the more conservative sex has

remained tail-less, while the male has adopted these additional attractions. Lastly, we have other species in the abounding vitality of the tropical fauna which are in a state of transition, and sometimes are with and sometimes devoid of these appendages. I draw the conclusion, therefore, that this is one of the most recent developments of wing-structure in the Lepidoptera, and it is to be hoped that further discoveries of fossil forms may eventually throw some light upon the genesis of wing-neuration. The remarkable alteration of contour displayed in the wings of many of the butterflies of the Island of Celebes, described by Wallace in his *Malay Archipelago*, and alluded to by Dr. Walker, is a very interesting problem. As Mr. Wallace says, the pointed wing in birds and insects usually accompanies rapidity of flight, and he suggests that perhaps when the island formerly possessed a much richer fauna, the abundance of insectivorous creatures rendered some unusual means of escape necessary for the more showy butterflies. Any change of wing-contour, at least in temperate regions, is a very rare occurrence, when compared with an alteration of pattern or colour. But in Europe we have examples in which species inhabiting considerable Alpine altitudes display a rounder wing-contour than their fellows of the lower levels. And we have, perhaps, an explanation of this in the Coleoptera of the Madeiras, where, as you ascend the mountains, the species met with become increasingly apterous, demonstrating that the high winds which there prevail have proved prejudicial to the survival of flying insects. I do not know whether the Island of Celebes, with its very remarkable geographical outline, can be shown to possess an unusually tranquil climate; but if this is so, it might be a factor in the production of some of its zoological anomalies. The phenomena of seasonal dimorphism exhibited so remarkably in many Japanese butterflies has been explained in the case of the bleached female varieties of the Colias genus by recurrence to an ancestral type produced during the glacial age (although South African Coliidæ exhibit a similar dimorphism). It would be interesting to know whether the Japanese group of islands shows traces of glaciation; and if so, whether any of the cases of dimorphism in its Lepidoptera throw a convergent light on the subject. A study of the European fauna shows, according to Ernst Hoffmann, that the larger number of European butterflies have migrated from Siberia, and only a small proportion from South Asia and Africa. The theory that our more brilliant insects have been developed from their more sober sub-Arctic

ancestors by the increasing warmth of climate succeeding the glacial age, and therefore occasionally recur to the primitive type, has gained favour. But the more popular impression is, I think, that the migration has been northward from the sunny south; and that our dull-coloured alpine and boreal species are merely the faded representatives of more gaudy prototypes. The study of Oriental entomology will, I trust, in time throw a light upon this *quæstio vexata*. I regret that the subject of so-called "mimicry" has been only glanced at by Dr. Walker. The phenomena are so striking, so varied and complex, that they possess an interest almost surpassing any other in the animal kingdom. We find the tendency developed not only between larvæ of different genera, but between the "imagines" of widely-different groups. And further, a wonderfully exact correspondence in form is sometimes exhibited with inanimate objects, such as leaves and flowers, bark and lichen. Are we to refer this power of adaptation of form and colour to vital force, and an internal power of development; and to acknowledge some sort of directive agency on the part of the creature, which is hard to conceive, and against which many observations and experiments militate? or must we fall back for an explanation to the action of environment, and a blind tendency on the part of organised matter to vary in form, and become adapted to their circumstances through the equally blind action of fortuitous influences? Whether we eventually are enabled to decide the question in favour of the theory of the operation of physical causes alone, or an innate tendency implanted in the organism to develop in certain directions, it is equally a proof of the wisdom and power of the Great Source of all Life.*

Mr. Edward B. Poulton, M.A., F.L.S., writes:—

As the council of the Victoria Institute have honoured me by asking for some criticism of Dr. Walker's paper, I am very glad to send a few remarks which I hope may be of interest. The chief part of the paper is systematic, descriptive, and distributional, and to this I have nothing to add, for my own researches have never been connected with these points of view. It appears to me, however, that Dr. Walker has treated these important considerations extremely well, and has, at the same time, made his paper of great general interest. I

* A Member writes:—As to the concluding remarks made by Mr. de Vismes Kane, may it not be considered that living matter is endowed with a power of developing, under varying circumstances, varied results?—Ed.

therefore propose to confine my remarks to the brief exposition of "mimicry" at the end of the paper. I think it is a pity that Dr. Walker has touched upon so important a subject unless he intended to go further, and to include a short account of all that we know about it. "Mimicry" might, indeed, form the subject of a single paper or even of a short series of papers. To me, Dr. Walker's account of it conveys a certain impression of vagueness, and I think it would be a mistake to adopt the formula suggested by him.

A very condensed abstract of all that I can find recorded upon the subject of "mimicry" is given below: I divide the description into a series of stages, each of which corresponds to a marked advance in our knowledge of the subject.

(1.) H. W. Bates was the discoverer of "mimicry": he noticed that the conspicuous and slow-flying Heliconian butterflies in South America were attended by a relatively small number of butterflies belonging to widely different families, and in some instances by moths; and he found that there was a considerable degree of superficial resemblance between the members of the groups thus found together. He suggested the term "mimicry" for the resemblance of the rare to the abundant species, and he further suggested that the latter were protected by the possession of some unpleasant taste or smell, so that they would be avoided by their natural enemies. Although unfortunately too little tested, this explanation has really NEVER BEEN SHAKEN. There is indeed some direct evidence for it. Thus R. Meldola has found "that, in an old collection destroyed by mites, the least mutilated specimens were species of Danais and Euplœa, genera which are known to serve as models for 'mimicry.'" —*Proc. Ent. Soc. Lond.*, 1877, p. xii.

This observation has been since confirmed by J. Jenner Weir (*Entomologist*, vol. xv., 1882, p. 160). Again, M. de Nicéville "has found that *Acræa violæ* is the only butterfly which all the species of Mantis he has experimented with, refuse to eat" (*Butterflies of India, Burmah, and Ceylon*, vol. i. pt. ii. p. 318). I do not feel any doubt about the widest proofs of the accuracy of Bates's great suggestion when experiments are generally made. Bates's epoch-aking paper was read November 21, 1861, and appeared in the *Trans. Linn. Soc.*, vol. xxiii. His observations were subsequently extended by the record of analogous facts in the Malay Archipelago by A. R. Wallace, and at the Cape by Roland Trimen.

(2.) One great difficulty had been observed by Bates, but remained unexplained by him and the other naturalists. Bates found that not only were the presumably nauseous Heliconians "mimicked" by the palatable groups, but that the different species of the former mimicked each other in certain cases. This remained a complete mystery until the appearance of an important paper by Fritz Müller in 1879 (*Kosmos*, May, p. 100). He suggested that advantage was gained by each of two convergent and nauseous species, because the number of individuals which must be sacrificed to the inexperience of young birds or other enemies would be made up by both of them instead of by each independently. Müller's paper was translated by Meldola, and appeared in the *Proc. Ent. Soc. Lond.*, 1879, p. xx. Wallace also accepted the results (*Nature*, vol. xxvi. p. 86), but the mathematical aspects of the subject were revised and perfected by Blakiston and Alexander (*Nature*, vol. xxvii. p. 481, and vol. xxix. p. 405).

(3.) The next advance was made by Meldola, who brought forward the following suggestion in *Ann. Mag. Nat. Hist.*, Dec. 1882. He saw in the wider application of Fritz Müller's principle an explanation of "the prevalence of one type of marking and colour throughout immense numbers of species in protected groups, such as the tawny species of Danais, the barred Heliconias, the blue-black Euplœas, and the fulvous Acræas. While the unknown factors of species-transformation have in these cases caused divergence in certain characters, other characters, viz., superficial colouring and marking, have been approximated or prevented from diverging by the action of natural selection, every facility having been afforded for the action of this agency *by virtue of the near blood-relationship of the species concerned.*"

Under this suggestion we expect to find, and we do find, a far greater similarity between the species of a large group of closely-allied nauseous insects in any country than between those of other large groups protected in other ways.

(4.) On March 1, 1887, I read a paper on this subject (*Proc. Zool. Soc.*), attempting to bring together all that had been previously proved by direct experiments and including a number of experiments of my own. Carefully comparing the colours of all the insects of our own country which have been *proved by direct experiment* to be nauseous or dangerous, and neglecting all others, I was able to show that Meldola's generalisation may be still

further extended and may be made applicable to the whole of the scattered small groups and isolated species which are defended by the possession of such unpleasant attributes, the convergence being often *independent of relative affinity*. If such insects are looked at as a whole, it is seen that the same colours are repeated again and again, and are those which are known to produce the greatest effect upon the vertebrate eye. So, also, there are a few eminently conspicuous and simple patterns which are met with again and again in totally distinct groups of insects. The advantage of this convergence in colour and in pattern is certainly found in the fact that it facilitates the educatiou of the vertebrate enemies of insects. Such convergence also passes into and always contains an element of true "mimicry"; and Dr. Walker will find an example of the undoubted protective effects of "mimicry" among our own lepidopterous fauna, which I proved by experiment during the past summer (*P. auriflua* and *L. salicis*. *Abstract of British Association at Manchester*, Section D). Further references and details upon the subject will be found in my paper in the *Zool. Soc. Proc.*, and I have only here attempted to bring forward mere notes of the course of our knowledge on this most interesting subject.

Dr. Walker, in the note on his last page, alludes to instances of protective resemblance, and I understand him to imply that such instances as he cites are relatively rare: I think the difficulty is, *not* to see such modes of protection in five out of six of the species one meets with. A considerable number will be found described in my paper, but only such as have been subjected to experiment and found to be edible or otherwise.

I trust that I may be pardoned for the references to my own paper, but I do not know any other which deals with the historical aspects of the subject, for I paid especial attention to this side of the question in its preparation.

Rev. Dr. WALKER.—There are one or two points raised in this discussion to which I should like to refer. The new definition in place of "natural mimicry" has been said to consist of eight words,—though I think it will be found to consist of seven,—while the definition I have given is in two words only,—"natural mimicry." I may have omitted one or two cases of what I have termed "natural mimicry" in our own temperate region; but what I say is that, for one of these instances in England, we can find hundreds in the

tropics. The last speaker referred to the similarity between *Acronycta Psi* and *Tridens*, and Mr. Kirby alluded to the similarity between *Opheciæ Apiformis* and the hornet. For some unknown purpose in nature, we find that one species of one genus of insect almost exactly mimics another species belonging to another genus, and that one tribe almost always mimics another tribe. Mr. Kirby mentions *Sericinus Montela* as a tribe allied to the *Papilio*. Mr. Kirby is better informed than I am as to the affinity he speaks of; but the marking of *Sericinus Montela* is more like *Apollo* than any species of the *Papilio*, or swallow-tail.

The meeting was then adjourned.