

XXIII. *On a Collection of Butterflies formed by THOMAS BELT, Esq., in the interior of the Province of Maranh, Brazil.* By H. W. BATES, F.Z.S.

[Read 6th May, 1867.]

THE collection on which these observations are founded is the first of the kind, so far as I am aware, that has been made in the Province of Maranh, and Lepidopterists will be glad to learn what light it may throw on the distribution and local variation of species in Northern Brazil, especially as we are so well acquainted with the productions of the adjoining country of Pará. The collection was made by Mr. Thomas Belt, who spent three months of the year 1866 at the gold mines of Montes Aureos, in the interior of the province. It may give some idea of the Lepidopterous riches of the country to state, that Mr. Belt obtained in this short time, during the hours of leisure he was able to spare from other duties, no less than 364 species of butterflies. I am indebted to Mr. Belt for the following short account of the geographical position and physical features of the locality:—

“The gold mines of Montes Aureos are situated about midway between the rivers Gurupy and Maracassumé, (2° S. of the Equator, and 160 miles in a straight line E.S.E. of Pará) about fifty miles from the sea-coast. They lie in the midst of the dense equatorial forest, which extends unbroken, as far as has been explored, on every side. The rocks of the district are soft decomposing granite, gneiss, and ferruginous slates, traversed by quartz veins, and forming low rounded hills. The hills are often capped with beds of conglomerate, and clays and gravels occupy the valleys. From the banks of the rivers already mentioned, roads were cut to the mines through the forest, and it was along these paths that the butterflies were taken. It is necessary to state that some portion of the collection was formed at a place called Vizeu, near the mouth of the Gurupy, on the Atlantic coast, about half-way between the city of Maranh and the mouth of the Pará river.”

Having been favoured by Mr. Belt with an opportunity of examining the whole of his collection, and comparing the species with those I collected in the neighbourhood of Pará, and on the Amazons, I find that with very few exceptions (about ten) the species are the same as those

inhabiting the alluvial plain of the Amazons and its margins; the resemblance being greatest, as was naturally to be expected, to the Pará productions. None of the peculiar forms of Southern or Middle Brazil are represented in the collection, although the physical features of the district more nearly resemble those of Brazil proper than the plain of the Amazons, and there is no known barrier to migration from the South. Some of the undescribed species (e. g. *Heliconius paraplesius* and *Olinia Stalachtoides*) had been found long ago in the province of Pará, by Mr. Wallace, probably on his excursion up the Capim river, which flows from the district of Montes Aureos. The new *Hesperiidae* and *Theclae* will be described and figured by Mr. Hewitson, who is at present engaged on those groups. Two other gentlemen engaged at the mines also formed collections, and whilst preparing this paper I have had an opportunity of seeing them; they do not add much to Mr. Belt's list of species, but amongst the additions are a fine *Papilio*, quite new to science, a new *Callithomia*, and an *Ithomia* (*I. Hippodamia*) interesting as being a Cayenne and Surinam species, not found in the intermediate valley of the Amazons.

Before describing the new species, a few interesting facts in distribution and variation supplied by these collections merit a few words of notice:—

Leptalis Theonoë and *Orise*.

In the midst of a series of *Ithomia Flora* and its varieties, in Mr. Belt's boxes, I detected four specimens of my old friend the mimicking *Leptalis Theonoë*; and in the same way, amongst a fine set of *Methona Psidii* and *Themisto*, was a specimen of the still rarer *Leptalis Orise*. They had deceived the keen eyes of Mr. Belt, who, although no novice, for he had collected butterflies in other countries, and had given much attention to the varieties of *Heliconiidae*, had not noticed any difference between these *Leptalides* and their associates. The occurrence of these insects in this district is so far interesting, that it confirms the rule I have pointed out in the paper I have elsewhere published on the *Heliconiidae* (Trans. Linn. Soc. xxiii. 495), namely, that the mimicking *Leptalides* are found only where the species of *Heliconiidae* occur which they mimic, and become modified when their associates are replaced by other species or races, so as to

maintain their close resemblance to them. I have stated in my paper, that in localities where *Ithomia Flora* was not present, but was represented by one or more allied species of very different colours, the *Leptalis* of the locality had assumed the same colours to suit these changed species. Montes Aureos lies within the area of the typical *Ithomia Flora*, and it is therefore the *Theonoo* form of the *Leptalis*, or that which most closely resembles *I. Flora*, which is here found. But an interesting variety of *Leptalis Theonoo* occurred in the same locality, differing from the type in having a reddish stripe within the black margin of the hind wing; this resembles closely a common variety of the *Ithomia* inhabiting this and other districts. In fact, *Ithomia Flora* is generally found to occur under two forms or varieties, and both of them are imitated by corresponding varieties of the *Leptalis*.

Heliconius Erato and *Doris*.

These two forms are still kept separate in some collections, on account of their striking difference in colours, the one red and the other blue. I bred, however, on one occasion, a large number of both from one set of caterpillars, found feeding socially on leaves of the same branch of a tree, and, apparently, belonging to one and the same brood. Mr. Salvin also captured the two forms *in copulâ*. The difference in colour occurs in both sexes, and, in most localities on the Amazons, there is no trace of connecting links of variation. It is a case, in fact, of dimorphism, and interesting on account of its persisting throughout two distinct local races of the species, one found in New Granada and the Isthmus of Panamá, and the other in Guatemala. The difference between the two forms is not simply a substitution of one colour for another, for there is a marked difference also in pattern, and in the glossiness of the surface; the differences, however, relate only to the upper surface of the wings. The fine series of specimens brought home by Mr. Belt show that this *Heliconius* has almost lost its dimorphism in the Montes Aureos district, as he found nearly all passages in coloration and pattern between one form and the other. In the neighbourhood of Pará examples occur of *Erato* (the red form) with the red colour at the base of the anterior wing nearly obsolete, and traces of glossy blue on the borders of the nervures of the pos-

terior wing, but these were rare ; whilst at Montes Aureos the intermediate forms seem to be as common as the two extreme forms. On the Lower Tocantins, and on the Lower and Upper Amazons, I met with no intermediate varieties.

Heliconius Melpomene, *H. Thelxiope*, and intermediate varieties.

Mr. Belt's collection adds considerably to our knowledge of the curious local distribution of these allied forms of *Heliconius*. In my paper on the *Heliconiidae*, already alluded to, I stated that *Heliconius Thelxiope* was confined in its distribution to the alluvial plains of the Amazons, and *H. Melpomene* to the more elevated continental land to the North and South of these plains ; and I argued, that as a series of connecting links between the two distinct types was found at several points on the margin of the low plains, we might fairly infer that one of them was derived from the other by variation and natural selection ; *H. Thelxiope* being probably originally an extreme variety of *H. Melpomene*, strayed into the low humid forests, and, becoming adjusted to the new conditions of life there, spreading, in course of time, as a distinct form, from end to end of the region. Since my paper was published, Mr. W. W. Saunders has exhibited to the Society (see Proc. Ent. Soc. 1866, p. iii.) a fine series of these intermediate varieties which he had received from Cayenne, where the extreme form *H. Thelxiope* does not appear to occur, although there are varieties nearly approaching it. The results of Mr. Belt's investigations confirm what I had observed with regard to the distribution of the forms. He tells me that *H. Thelxiope* did not occur in the Montes Aureos district, but that *H. Melpomene* was abundant between there and Maranham, and was found within three miles of his locality ; whilst at Vizeu, on the coast, nearer the Pará river, he found numerous forms intermediate between the two species, neither of which was there present. This accords with what I observed at Serpa, on the borders of the Guiana highlands, which there form the northern banks of the Amazons, and at one place on the river Tapajos. It also confirms what I have stated, that hybridity has little or nothing to do with the production of these inter-

mediate forms, for in a place where the two supposed parent species are not present, there could be no hybrid productions from them. I think the explanation I have before suggested is greatly supported by these additional facts. None of these intermediate varieties have been found in the humid forests of the alluvial plains where *H. Thelciope* abounds; nor in New Granada or Venezuela, where *H. Melpomene* is abundant; they are found only in districts which are intermediate in physical character, and their inconstancy shows that the physical conditions do not demand that one of them alone shall prevail over the others, as in the Amazons plain.

The following are descriptions of nine new species in Mr. Belt's collection.

Heliconius novatus.

♀. Expanse 3" 8". Closely allied to *H. Silvana*, Cram. (Pap. 364 C. D.). Differs from all the varieties of that species in having three black spots at the end of the fore-wing cell, with a broad yellow belt lying *beyond* the cell.

Fore-wing broadly truncated at the apex; black, basal half orange, except the costa; a black spot in the middle of the cell, a larger one within the end, and two smaller ones outside the median nervure at the end of the cell; beyond the cell is a broad yellow belt extending from the costa to near the outer margin, where it is crossed by a black lunulated streak; the black apical part of the wing crossed by a belt of four widely separated spots, and having, near the outer margin, a row of five more or less indistinct smaller yellow spots. Beneath, the same, except that the pale spots near the outer margin are larger and white.

Hind wing above, orange; a subcostal stripe, broad outer border and discal macular stripe (sometimes uniting with the outer border) black; two yellow spots near the apex. Beneath, the same, except that the subcostal black stripe is reduced to two large spots, and that the outer margin has a row of thirteen white spots, all in pairs, except the three nearest the apex.

Body and antennæ as in *H. Silvana*.

This species is found also at Pará.

Heliconius paraplesius.

♂. Expanse 3". Resembling *H. Aede*, Hübn.; differs in having a yellow spot near the apex of the fore-wing, besides the broad belt behind the cell, and in the abdomen above being ringed with yellow, with the lateral spots elongated instead of round.

Fore-wing black, with the basal third orange; a large subquadrate spot at the end of the cell, a broad curved belt beyond it, consisting of seven elongate spots separated only by the black nervures, a triangular spot between the first and second median branches, and a spot near the apex, divided by four black nervures, all bright yellow. Beneath, the same.

Hind-wing black, a stripe within the cell and seven lines between the radiating nervures orange; a series of whitish marginal specks between the ends of the nervures. Costal portion of the wing deep black. Beneath, the same, except that the white marginal specks are more distinct, two between the nervures respectively.

Body black; head spotted with yellow, disk of the thorax with larger spots; abdomen finely ringed with yellow, and having a row of elongate spots on each side. Antennæ, brown, beneath and the club tawny rufous.

Although closely resembling the common and well-known *H. Aede*, this species is most nearly allied to *H. Xanthocles*, Bates (Trans. Linn. Soc. xxiii. 561), the two agreeing in the length but not in the colour of the antennæ, and in the hind wing beneath presenting a marginal row of whitish specks. *H. Xanthocles* has not a continuous row of yellow spots on the side of the abdomen.

Olina Stalachtoides.

♀. Expanse 2" 10"". Similar in shape to *O. Emilia*, Cramer, but the wings are rather broader.

Fore-wing above, black, with a slight bluish gloss, three triangular spots in the cell, an elongate spot between the first and second median branches, a smaller one between the second and third, a belt of four spots across the apical portion of the wing, and a small spot near the apex, all grayish-white, semi-transparent. Beneath, the pale spots in the same position, but the apical spot elongated into a short belt; the black ground

colour is varied with tawny-orange, and there is a short greenish-gray streak near the hind angle.

Hind-wing black, with the whole disk, including the abdominal margin, grayish-white, semi-transparent, the nervures bordered with black; parallel to the outer border is a broadish orange belt, not reaching the apex, and separated from the semi-transparent disk by a broadish band of black; there is a submarginal row of slender grayish-white lines, and within them a row of four white lunules margined with black. Beneath, the same, except that there is a broadish band of orange, extending parallel to and near the margins, from the base round to the anal angle of the wing.

Body black; head and collar spotted with white, thorax with two gray belts, and abdomen striped with gray. Antennæ black; palpi in front white, the terminal joint black.

This handsome and distinct species was once found also on the river Capim, in the interior of the Province of Pará, by Mr. Wallace, and the specimen is now in Mr. Salvin's collection.

Cremna Beltiana.

♀. Expanse 1" 4". Allied to *C. Ceneus*, Cram. (Pap. 156 F.), but very distinct.

Fore-wing with the costa not arched, but straight from near the base to near the apex, the latter slightly produced, the outer margin bowed outwards and strongly waved. Blackish-gray, and ornamented with white spots similar to those of *C. Ceneus* ♀, but larger, and most of them edged with black; the row of spots nearest the outer margin consists only of three, equidistant from each other; the next row is formed of seven spots, the four nearest the costa being in pairs, the fifth lunate, the sixth and seventh oblong and close together near the hind margin. Beneath, the same, but ground colour paler, and spots larger and more distinctly margined with black, especially those on the basal half of the wing.

Hind-wing with the outer margin bowed outwards and waved, colours the same as the fore-wing, and spots edged with black; the row nearest the outer margin consists of five oblong spots, the next row forms a connected string of seven circumflexes, extending from the apex to the

abdominal edge. Beneath, the same, but the white spots are so much larger that the basal half of the wing might be described as white, with a number of quadrate black spots. All the wings with a very narrow white fringe in the sinuses.

Body above, dark brown, with a few white spots; beneath white. Antennæ ringed black and white, club black.

One example, Montes Aureos, Maranham.

[The following is a list of the species of *Cremna*, so far as at present known; the genus is a very distinct one, and is separated from *Charis* and allies by having four branches to the subcostal nervure of the fore-wing.

1. *Cremna Ceneus*, Cramer, Pap. 156 F.

Surinam, Amazons, Maranham.

2. *Cremna heterœa*, n. sp.

♂. Expanse 1" 4". Very similar to *C. Ceneus*; costa of fore-wing arched, apex much less produced, and more obtuse. Fore-wing dark brown, crossed by six broadish interrupted belts of a glossy light blue, the one nearest the outer margin lunulated; along the apical half of the costa are a number of small white spots, besides a row along the outer margin; beneath, paler, the belts much more broken up, and consisting of irregular rows of white spots, some of them oblong. Hind-wing above, crossed by five belts, broader and less interrupted than those of the anterior wing, except the middle one, which is divided into squarish spots, forming almost a double belt; the submarginal belt is lunulated, and very broad; near the outer margin is a row of white specks; beneath, the same, but the belts white, and broken up into spots, as in *C. Ceneus*.

Ega and Tunantins, Upper Amazons.

This seems to be an incipient species, scarcely segregated from *C. Ceneus*, the type form of which is also found at Ega.

3. *Cremna Beltiana*, Bates, ante, p. 541.

Montes Aureos, Maranham.

4. *Cremna Phryxæ*, Felder, Reise d. Novara, Zool. II. 2. p. 299, t. xxxvii. f. 23, 24, ♀.

Bahia.

5. *Cremna Actoris*, Cramer, Pap. 93 D, ♂.

Surinam.

6. *Cremna Eucharila*, Bates.

Napæa Actoris, Hübn. Exot. Schm. i. pl. 34 (*nec* Cramer).

Cramer's figure of *C. Actoris* evidently represents a species more nearly resembling in its markings our *C. Beltiana* than the handsome insect existing in collections under the name *Actoris*, and figured by Hübner. I have not seen a specimen with the numerous large white spots towards the outer margin of the hind-wing, and without a trace of a red submarginal line, as represented by Cramer.

Found throughout the Amazons, but rare.

7. *Cremna Melampia*, n. sp.

♂. Expanse 1" 10". A large robust species. Fore-wing with the costa very slightly arched, apex produced, but the outer margin very little bowed outwards; hind-wing with the anal angle acute, prominent. Above, dark brown, with white marks in the fore-wing only, namely, four lines (two interrupted) across the cell, two between the cell and hind margin, and two rows of spots across the apical portion, those nearest the costa alone being clear white. Beneath, clear light-brown, with numerous short slender lines, forming irregular belts across both wings: all except the submarginal row have, each on its inner side, a large black patch. Body dark-brown above and beneath; antennæ black, the stem ringed with white.

Bahia. In my own collection.

Westwood, in Doubleday and Hewitson's Genera of Diurnal Lepidoptera, enumerates two other species under the genus *Cremna*; of these one, *C. Orpheus*, is a *Lemonias* or *Anatole*, being totally different in neuration from the group to which *Cremna* belongs; the other, *C. Thasus*, Cramer (Pap. 333 I.), I know only from Cramer's figure; it may be a *Cremna*, or a species allied to *Charis Trochilia* and *Hisbon*.]

PSEUDOPHELES, nov. gen.

Differs from *Phelos* in the neururation of the fore-wings, the upper radial (or discoidal) nervure being emitted at the end of the cell, in conjunction with the discocellular nervule, and the lower radial lying about midway between the subcostal and median nervures. The genus differs from *Esthemopsis* of Felder, which it much resembles in form of wings and in coloration, alone by the conjunction of the upper radial and discocellular nervures at their origin. If this difference in the neururation should prove not to be constant when other species are discovered, the genus may very well be united with *Esthemopsis*. The antennæ are concolorous black, with a gradually-formed club. The palpi do not pass the forehead.

Pseudopheles sericina.

♂, ♀. Expanse 2". Fore-wing strongly arched before the apex, the latter slightly produced, outer margin bowed outwards; hind-wing short, very little longer than the abdomen, anal angle produced. Wings black, glossed with rich blue; fore-wing with a bent basal stripe traversed by the median nervure and its first branch, and a short belt crossed by three nervures before the apex; hind-wing with a broad discal vitta traversed by the median and its two branches, white, semitransparent; fore-wing with a glossy blue streak extending from the base along the postmedian nervure. Beneath, the same, except that the costa and abdominal edge of the hind-wing have a glossy light-blue streak. Body black, striped with bluish-white. Head (except the crown) and palpi clear rosy red. Antennæ black.

Found also at Pará. Occurs, too, on the Upper Amazons as a local variety, wanting the red colour on the head behind the insertion of the antennæ.

Emesis Aurelia.

♀. Expanse 1" 10". Allied to *E. Fatimella*, Westw., but of a tawny duller hue; much less robust than *E. Mandana*, Cramer, and differing in the markings of the underside. Fore-wing with a moderate incurvation in the middle of the costa (as in *E. Fatimella*), apex markedly produced; hind-wing forming an obtuse angle in the middle of the outer border, anal angle rounded off.

Fore-wing above, crossed by five dusky flexuous lines, and having a row of black specks near the outer margin. Beneath, yellow, uniform in tint, except near the apex, where it is ruddy-brown: the flexuous lines reddish.

Hind-wing above, crossed by lines and having a row of submarginal spots, as in the fore-wing. Beneath, the same as the fore-wing, except that the submarginal black specks are enlarged near the apex and anal angle into large quadrate spots.

Body, above tawny, beneath whitish. Antennæ brown, stem ringed with white.

One example; Montes Aureos, Maranham.

Nymphidium sylvorum.

Expanse, ♂ 2", ♀ 2" 3". A very distinct species, allied to *N. Regulus*, F., and destitute of the usual submarginal pale arcuated lines.

Fore-wing with the costa arched just before the apex, the latter pointed in both sexes; hind-wing moderately long, and outer margin regularly rounded. Wings dark rufous-brown, fore-wing with a triangular spot in the middle of the hind margin, extending only to the median nervure, and two submarginal short thickish lines, parallel to the outer border, ochreous. Hind-wing also rufous-brown, with a very broad ochreous belt across the disk, leaving a small basal spot, and a broad outer border; in the middle of the latter a continuous ochreous submarginal streak. Beneath, the same, but paler. Body brown, apical half of abdomen ochreous. The female is much paler than the male.

Taken at Vizeu, on the coast. I have both sexes also from Pará.

Nymphidium Chione.

♂, ♀. Expanse 1" 6". Fore-wing in shape resembling that of *N. Ascolia*, with the costa rather strongly arched before the apex, and the latter, in the male, slightly produced; hind-wing much longer than in *N. Ascolia*. Wings dark-brown, the central part of all pure white; the white on the fore-wing forming a triangular spot, bisinuate on the outer side, on the hind-wing leaving a brown border of moderate and uniform width. The costal edge of the white patch of the fore-wing is besides in-

dented by the transverse dark streaks of the cell. The outer border of all the wings has a submarginal row of fine gray lines, joined together, and of arcuated or semi-circular shape, not at all triangular. Fringe dark-brown, in the fore-wings varied with white. Body dark-brown, abdomen white.

A very distinct species, closely allied to *N. Cachrys*, Fab., (*Damon*, Stoll) and *N. Ascolia*, Hewitson; agreeing with them in shape, and in the form of the fine submarginal gray lines, but differing in the pure white hue of the disk of the wings.

Found also at Pará; not uncommon.

Theope Janus.

♂. Expanse 1". A small and very distinct species. Fore-wing triangular, with pointed apex, and outer margin slightly bowed outwards; hind-wing scarcely longer than the abdomen, outer margin rounded. Wings above blackish-brown, fore-wing with a triangular silky-blue patch near the base and hind margin. Beneath, pale lilacine-brown, with the basal fourth of all pale yellow; this colour limited in a straight line from the rest of the wing.

Montes Aureos, Maranhão.

Exhibitions, &c.

Mr. M'Lachlan exhibited a species of Mantispidæ from Bahia; he believed it to be the female of *Trichoscelia notha*, from the male of which, described and figured by Erichson, it differed in being half as large again, in having the anterior femora unarmed, the abdomen ochreous beneath, and provided with a long flexile ovipositor; in all other characters it agreed with Erichson's insect. The species was especially remarkable by the lobate dorsal ridge of the abdomen, and by the greatly dilated and compressed posterior tibiæ, resembling the pollen-bearing organs of a *Bombus*.

Mr. M'Lachlan exhibited, on behalf of Mr. B. Cooke, two examples of gynandromorphism. The first, a sawfly, *Dolerus madidus* of Klug, the left-hand side presenting male characters, the right side female characters. The second, a Trichopterous insect, *Limnephilus striola* of Kolenati, in which the palpus, antenna and wing on the right-hand side were of the male form and on the left side of female form, whilst the abdomen was wholly female: this specimen was captured by Mr. Cooke near Manchester.

Mr. M'Lachlan also exhibited two monstrosities, both sawflies, which he had received from Prof. Zeller. One was an example of the rare European species, *Hylo toma fasciata* of St. Fargeau, in which the left posterior tibia was two-jointed, the second joint being greatly dilated. The other, a specimen of *Tenthredo scalaris* of Klug, with five wings, three on the right side, the anterior and posterior being perfectly normal, whilst the intermediate one combined the neural characters of both.

Mr. Bond exhibited three recent additions to the list of British Lepidoptera, namely, *Psyche crassiorella*, *Bruand*, *Grapholitha ravulana*, *H.-S.*, and *Coccyx vernana*, *Knaggs* (Ent. Mo. Mag. vol. iv. p. 122; see also p. 154).

Mr. T. W. Wood (who was present as a visitor) exhibited a number of pupæ of *Papilio Machaon*, *Pieris Brassicæ* and *P. Rapæ*, exhibiting various shades of colour corresponding with the colours of the surfaces to which they were attached; and read the following

Remarks on the Coloration of Chrysalides.

"All Lepidopterists are probably aware of the very great variability in the colouring of the chrysalides of butterflies, and I am able to state, as the result of some years of observation, that their colours are more or less derived from the objects in their immediate vicinity. It is obvious that this assimilation of their colours to their surroundings is of great use to them, tending to their concealment and consequent immunity from the attacks of enemies during their period of exposure in a helpless state. The specimens of chrysalides on surfaces of different colours which I now exhibit are, I trust, sufficient to convince you of the truth of this statement. I find, as the result of my experiments, that the skin of the chrysalis is photographically sensitive for a few hours only after the caterpillar's skin has been shed, and, as might be expected, by putting the specimens in the sunshine at the time of changing, and surrounding them as much as possible with any desired colour, the most successful results have been obtained. Under these conditions the specific markings are almost entirely overpowered if necessary to the assimilation of colour; and these markings are, in fact, entirely overpowered in the exhibited green varieties of *Papilio Machaon* and *Pieris Rapæ*. I have not had an opportunity of seeing the former species in its natural haunts, but the latter I have observed, and have found the green variety of the chrysalis

on a green leaf, and on a door which was painted green (specimen shown). There are also before you green specimens of *Pieris Brassicæ* which were under a vine on the side of a house which was of a stone-colour, with many others taken from the adjoining side of the same house, where there was no vine to affect their colour, but only the somewhat dirty stone-coloured surface; I particularly noticed that there were no green specimens to be seen on this side, although their number was very considerable, and they were attached at various heights, some very near the ground, and others at the house-top under the projecting eaves. Some of the darkest specimens shown on blackened surfaces were exposed to a very subdued light in a dark corner, and the detached ones so strongly suffused with black were taken from a tarred fence. One of the chrysalides of *Pieris Brassicæ* on a white surface, now exhibited, is almost an albino. I also exhibit green, reddish, and dusky chrysalides on surfaces of similar tints. Specimens kept in the dark would be interesting; I have one of *P. Brassicæ* which was placed on whitish wadding in a box from which light was excluded, and it is of a light colour, although possessing all the specific markings, but from this solitary example no conclusion can be drawn. Mr. A. G. Butler has informed me that he also has made some experiments with chrysalides of *P. Rapæ*, and has procured a reddish tinge by means of a red surface, besides other colours. The gilded chrysalides deserve mention here; those of *Vanessa Urticæ* I have hardly ever found except when concealed by nettle-leaves; those on fences, walls, tree-trunks, &c., being of similar colours to those objects, and mottled more or less. The fine chrysalis of *Vanessa Polychloros*, when amongst foliage, is coloured like a withered elm-leaf; I have not unfrequently found it of a light reddish brown, with a cluster of metallic silver (not golden) spots on the back at the juncture of the thorax with the abdomen: this colouring also gives place to mottled grayish when the individual is on a wall or other object. The metallic appearance is probably of service in giving the insects an uneatable look, and is not necessarily connected with the possession of *Ichneumon* in their interiors, as one or two of my entomological friends think, for I have had very fine butterflies out of very metallic chrysalides; indeed I consider this to be the normal colouring, it being the most beautiful by far. I would venture to suggest another reason why the gilding, when amongst leaves, is of service in the way alluded to: it is this—that the *Vanessa* chrysalis is quite loosely attached, hanging only by the tail, so that, even if it could assume the green colour by which it is surrounded, it would be rather dangerous to it than otherwise, for it would then appear to birds very much like a green caterpillar swinging in the air, but as it is it looks more like a piece of gold or brass than anything else, and birds probably do not think of touching it. There are doubtless many instances of the absence of variability in chrysalides, but I think they would all be found to be mimics of some disliked or dangerous insect. The chrysalis of *Aporia Cratægi* is very conspicuous and not very variable, but I have been much struck by its strong resemblance to the caterpillar of the currant-bush moth (*Abraxas grossulariata*), as both are speckled with black on a whitish ground, and the moth caterpillar is extremely abundant in the same localities, and is probably disliked by birds. The pupa of the moth is very remarkably coloured with yellow bands on black, giving it a waspy appearance, and I recollect being afraid when a child to touch it, thinking it would sting. I feel convinced that by the proper use of gilded surfaces the gilded chrysalides of *Vanessa*, and perhaps of other genera, would be obtained, and I hope to be able to try the experiment next season; also to obtain colours with coloured glass, as it is probable that the strongest effects would be

obtained by that means. There can be no doubt that disguise will be found to be carried to as great a length in chrysalides of butterflies as in any other class or stage of insect life, as their evading observation, and consequent security during a considerable portion of their lives, must depend *solely* upon this power which they unconsciously possess."

Mr. A. G. Butler (who was present as a visitor) stated that he had obtained a red or rosy chrysalis of *Pieris Rapæ*, which had undergone its transformation in a piece of scarlet cloth; and pupæ upon glass were generally of a pale slate-colour.

Mr. J. Jenner Weir said that, whatever might be the explanation, he could speak to the fact that metallic chrysalides were for some reason or other obnoxious to birds and free from their attacks.

Mr. Bond combatted Mr. Wood's theory; he had had thousands of pupæ of *Papilio Machaon*, and had often had the brown variety of pupa on a green ground-colour, whilst in some seasons he obtained no brown specimens at all: as regards *Pieris Rapæ*, he had noticed that the pupæ of the second brood were generally rather paler than the first brood; but in the same green-house, the doors and wood-work of which were painted white, he had found chrysalides of all the exhibited colours, many of them quite as dark as those shown by Mr. Wood on black surfaces; on the same wall, built of particularly red bricks, he had found all the colours except the red; on the same twig of the common garden rocket, subject to precisely the same external influences, he had often noticed three or four pupæ of *Anthocharis Cardamines*, and at times the twig would produce red, green and white varieties, while at other times all the pupæ were of the same colour.

Papers read.

The following papers were read:—

"A Revision of the Australian Buprestidæ described by the late Rev. F. W. Hope," by Mr. Edward Saunders.

"Descriptions of some new Species of Diurnal Lepidoptera," by Mr. W. C. Hewitson.

"A Monograph of the Genus *Thais* of the Family Papilionidæ," by the Rev. Douglas C. Timins. The following seven species were enumerated and figures of each exhibited:—

"1. *Thais Cassandra* (Boisd. Icon. pl. iii. fig. 1, 2; Hübn. Pap. fig. 910—913. *T. Hypsipyle*, Godt. Pap. Fr. ii. pl. 2 C, fig. 1, 2; larva figured by Boisduval Rambert et Graslin, Coll. Icon. Chenilles Papil. pl. ii. fig. 1—3). The larva feeds on several species of *Aristolochia*: it varies much in colour, but is generally pale reddish, spotted with black. The pupa state lasts from November to March; the pupa is reddish brown, the wing-cases yellowish. I have found this species at Cannes and Hyères: it is of very short duration and very sluggish, frequenting marshy grounds, where it flies lazily from flower to flower, settling with expanded wings. Near Cannes it is very common in some marshy meadows on the road to Auribeau; at Hyères it is comparatively rare; near Horace Vernet's chateau, about ten miles from Hyères, it is plentiful on a patch of marshy ground. This species usually appears on the wing in March, about the 15th, and after a fortnight few good specimens are to be seen. The time of appearance, however, varies much: in forward seasons it appears in February, but in 1864 and 1865 it was not on the wing until April. Slight varieties occur, the