

Under side of primaries yellowish grey; a marginal row of nearly obsolete spots, the lunules above which are more distinct; a curved median row of small, rounded, black spots, six or seven in number, the first, on the costa, sometimes wanting, the seventh, on inner margin, double; all edged with white; on the arc a reniform black spot, and a small double spot in the cell one-third the distance from the reniform to the base.

Secondaries darker, with a blue tinge at base; a marginal row of spots as on the primaries; a submarginal of large, whitish spots, as in *Pheres*, some of which have a few black scales in the centre; these spots are connected so as to form a band; on the outer half of the wing are three whitish spots, the two on costa with black centres; another such spot on the costa near base, and one on abdominal margin.

Body below white; palpi white tipped with black; antennæ black annulated with white; club black above, ferruginous below.

Female. Same size, black, lightly sprinkled with blue at the base.

From two males, one female, taken at Pikes Peak by Mr. Ridings.

Notes upon the variation of sexes in *ARGYNNIS DIANA*.

BY H. W. BATES,
Of London, England.

(Communicated to Wm. H. EDWARDS, Esq., in a letter dated Oct. 20, 1864.)

Nothing, for a long time, in the Entomological way, has so much interested me as your account of the capture of the female of *Argynnis Diana* and the inspection of the specimen which you sent enclosed in your letter. If such fine discoveries can still be made in North America, it gives one a large idea of the field still open to the Entomologists of the United States. The contrast between the two sexes is wonderfully great: a wide disparity between the sexes, however, is not absolutely new in the genus *Argynnis*. It is seen in the *Argynnis Sagana* of Northern China, whose male is of the ordinary fulvous color and resembles *A. Laodice* of Europe, but whose female is greenish brown with white macular belts and so peculiar in coloring that it has been described not only as a distinct species but as belonging to a new genus, by Nordman, who called it *Damora Paulina*. Incipient sexual disparity in colors is seen also in *Argynnis Paphia* of Europe, the females of which are sometimes very different from the males. This sexual variety, however, is local, and it has been figured as a distinct species under the name of *Argynnis Valesiana* by Esper.

The subject of divergence in secondary sexual characters in the sexes of species is of the highest interest; the phenomena are extremely varied and complicated and I know, have almost puzzled our great master himself, Mr. Darwin. Mr. Wallace and myself read with great care the excellent account given by Mr. Walsh in the Proceedings of the Entomological Society of Philadelphia (Vol. I, p. 349), of the variety *Glaucus* of *Papilio Turnus* ♀. Mr. Wallace is about to publish a philosophical memoir in the Linnæan Transactions, on the *Papiliones* of the Malay Archipelago, and will quote this article on *Papilio Glaucus*. It is one of the most interesting and difficult cases of sexual variation. Our *Argynnis Paphia* var. *Valesiana*, seems to form a parallel case, but none of our European Entomologists have worked out the geographical distribution as your Mr. Walsh has instructively done. My views on this subject are at present somewhat hazy, but such as they are I give you them as follows.

I agree with Mr. Darwin that the formation of a sexual distinction in colors, form, ornament, &c. can be explained only on the principle that he has applied to the origin of species. First, slight varieties arise peculiar to one sex; if these slight peculiarities give their possessors any advantage in their life-career over their none-varying fraternity, they survive dangers to which these latter are exposed and so leave progeny when the others do not; and this progeny by the laws of inheritance tends in successive generations to become more and more true to the parental varietal type. Now the kinds of advantage possessed by sexual varieties, I believe, are resolvable into two. The first (the only one mentioned by Darwin) is when the males possess ornamental plumage or gift of song or strength of tusk and spur—as in Mammals and birds, which give the owners a superiority in competing for the favors of the female or in fighting with other males. The process of evolution of a striking male divergence, is the same as that which I have mentioned above; namely, slight varieties arise, and the most advantageous ones survive and propagate their kind, whilst the others die childless and so on until the complete male beauty remains as a fixed form. The other kind of advantage, which has occurred to me as existing in nature, is that of the possession of some peculiar color or form or habit by one sex to enable it to escape dangers peculiar to itself owing to its haunts being somewhat different from those of the opposite sex. I believe the consideration of this will account for the strongly marked female divergencies which are so common in Butterflies. I doubt much whether a female variety is ever purely climatal, i. e. due

to the immediate action of heat, &c. on the individual; when such a variety is geographical, I am inclined to think that it is so, because it has become adapted to some peculiarity in its surroundings which does not exist in other portions of the area of the species where the variety does not occur. It is thus that I would account for the *Glaucus* variety of the female of *Papilio Turnus* and all similar cases.

It is of course easy to ascertain whether it is the female or the male that has diverged from its type in any genus. When it is the male, the females retain the type common to the genus or group to which the species belong, and vice versâ. Therefore in the cases of *Argynnis Diana*, *Sagana*, *Paphia*, *Papilio Turnus*, &c. it is the females which have been brought under the operation of natural selection. In the case of Gallinaceous and Humming birds it is the males; the form of selection which has been at work here is called by Mr. Darwin Sexual Selection. It is very interesting in Butterflies to study those genera which exhibit sexual divergence. In Tropical America there are many such. The genus *Epicalia* affords one of the best cases. A good series of species of this genus exhibits almost all stages of sexual divergence in a small compass. *Epicalia Cyaniris* and *Ep. Capenas* scarcely differ in the two sexes; the male only having a little more color than his partner. In *Ep. Ancea* the male shines forth with a brilliant orange belt, denied to his mate, although the latter has a handsome blue belt as good as that of her husband. Further on *Ep. Orsis* shows a wide divergence, the female being striped with slaty blue and white, whilst the male is silky blue. Afterwards we come to the extreme forms of the genus *Ep. Acontius*, *Ep. Numilius* and others. In these the females are nearly all similar to that of *Ep. Orsis* and to both sexes of *Ep. Cyaniris*, but the males are so wonderfully different, not only in color but sometimes (*Ep. Numilius*) in form, that Entomologists had always placed them in separate genera, until they were detected in copulâ. A similar gradation is observable in the Papiliones of the *P. Æneas* group.

A great deal, however, remains to be done before this interesting subject can be placed in such a light as to become clear to every one. We require good cases where the course of variation and its incipient selection of one of the varieties may be seen in process, such as that which I think I have detected in the Heliconidæ, as illustrating the formation of mimetic forms, and described in the memoirs of which I sent you a copy. Then there is a mystery still to be cleared up in the inheritance of varieties by one sex and not by the other. These phenomena in domestic poultry require careful observation and expe-

riment, before any light can be thrown upon them. The peculiar conditions of life in portions of the areas of distribution of species which influence the formation of local sexual varieties also require to be studied. In the case of insects there is a further complication in the metamorphoses; for some imago varieties may have originated in the egg, larva or pupa state, and all this requires investigation. We are, in fact, only on the threshold of this most pregnant and interesting subject, and it would be a gain to science, if American Entomologists would take it up, for the North American Fauna supplies endless material for the investigation.

On the Synonymy of *PARATHYRIS ANGELICA*, Grote.

BY AUG. R. GROTE.

(Communicated January 9, 1865.)

On examining the figure of the South American *Parathyris cedonulli* given by Cramer, I find that the species probably differs generically from our allied North American forms: *P. torrefacta* and *P. Angelica*; I readily adopt then the generic term proposed for these by Dr. Packard.

The South American genus is distinguished by the more elongate anterior wings, which are not truncate at the apices, and the proportionally more reduced secondaries; its habitus thus recalls certain Sphingidæ, and compared with which our species, with their more similarly sized anterior and posterior wings, present a more geometri-form appearance.

With myself, Dr. Packard has only seen the female of the second species, in which the lateral white abdominal pustulations are quite distinct, and of which I give the following synonymy:—

APATELODES, Packard.

Apatelodes Angelica, Grote.

Parathyris Angelica, Grote, Proc. Ent. Soc. Philad., Vol. 3, p. 322, Plate 4, fig. 1. ♀. (1864.)

Apatelodes hyalino-puncta, Paek., Proc. Ent. Soc. Philad., Vol. 3, p. 354. (1864.)

Habitat.—Eastern and Middle States. (Coll. Ent. Soc. Philad.)

This exquisite species is of apparently rarer occurrence than its congener—*Apatelodes torrefacta*.