

tains and between the Saskatchewan River on the north and the Platte River on the south fresh-water representatives of the entire Upper Cretaceous series will yet be found. Both the terrestrial vertebrates and the fresh-water mollusca of the Belly River, Judith River and Laramie beds indicate that they and their ancestors found somewhere in this immediate region a congenial habitat where it was possible for them to continue their development without interruption. The Pierre shales in the Belly River region are remarkably thin as compared with the thickness to which they attain in the south, where the Belly River beds are wanting, thus indicating that in the former region the lower Pierre shales are replaced by the fresh-water deposits known as the Belly River beds.

Several years ago (*Am. Nat.*, February, 1896, p. 116) the present writer affirmed that the Judith River beds were certainly older than the *Ceratops* beds of Converse County, Wyoming, and that the dinosaurs from the Judith River country belonged to smaller and less specialized forms than those from the latter locality. It is gratifying to note that Professor Osborn has arrived at the same conclusion. In the article in the *American Naturalist* just cited I considered the Judith River beds as the equivalent of the 400 feet of barren sandstones lying between the base of the *Ceratops* beds and the marine Fox Hills sandstones in Converse County, Wyoming. I am at present of the opinion that they pertain to a still lower horizon.

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CARNEGIE MUSEUM,
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SHORTER ARTICLES.

A CASE OF MIMICRY OUTMIMICKED? CONCERNING KALLIMA BUTTERFLIES IN MUSEUMS.

IN a recent collection illustrating mimicry I noticed that the *Kallima* butterflies had been placed on twigs whose dried leaves were startlingly like the butterflies in their position of rest. There was no doubt that the butterflies were in exactly the right position for orthodox mimicry; the antennæ were carefully tucked out of sight, and the folded wings were in

the plane of the adjacent leaves; and certain leaves of the spray had, it seemed, opportunely fallen off so as to allow the insects to seize the vacated places with unerring accuracy, each crouching at such an angle that the tail processes of the hind wings fitted near the scar on the stem where the leaf had been attached. The leaves, moreover, which had been chosen to imitate the tropical butterflies happened to belong to a *North American* tree, and it is even possible that they had been skilfully touched up to mimic, one, the usual type of *Kallima*, with distinct rib-like markings, another, the form which seems fungus-spotted.

As a work of art this preparation was certainly a success, and it taught interested visitors a forceful lesson in animal economy. But I have to confess that it gave me the feeling that both insects and preparateur had overdone their work. And that the preparation had an additional air of false pretenses about it for which the naturalist afield more even than the preparateur and the hapless butterflies, is to blame. For he is the one who allows the finishing details in such cases of mimicry to be assumed without critical foundation. In the present case, indeed, one may justly query whether *Kallima* mimics its surroundings as perfectly as the preparateur will have us believe. Wallace himself, who knew the creatures at first hand, does not figure them as accurately adjusted to their surroundings as are these mounted specimens. And even his account seems to need amplification, *e. g.*, as to the species of leaf mimicked and the more exact habits of the butterflies.* And beyond this I do not recall detailed field observation. Perhaps I should say that my faith in the possibilities of *Kallima* became somewhat weakened during a visit to the

* Thus he states in his 'Malay Archipelago' (p. 142) that 'the habit of the species is *always* (*italics mine*) to rest on a twig and among dead or dry leaves,' but later admits (*Natural Section*, p. 44) that only 'on one or two occasions the insect was detected reposing * * *.' He does not show furthermore what the leaf is that is so exactly mimicked, merely referring to general resemblance to 'the leaves of many tropical leaves and shrubs.'

Philippine Islands. In southern Negros, about a mile south of the little fishing village of Manjuyod, along the sides of the road to Bais, I noticed many of these butterflies; but to my surprise they were frequenting bushes whose leaves they in no way resembled. The leaves were bright green, magnolia-like, much larger than the butterflies, perfectly elliptical, glossy, turning bright orange yellow when dead, and falling to the ground. There were no brown leaves, pointed leaves, conspicuously veined or fungus-covered leaves in the neighborhood, say within a hundred rods. In this instance I could not help concluding that the dark-colored butterflies were conspicuous instead of inconspicuous, as they alighted on the *leaves* and not on the stems of the bright green bushes. And I observed the behavior of the butterflies with considerable interest at several favorable stations; their movements and flight reminded me of our *Vanessas*, more nearly perhaps of *Grapta*; they could be approached almost within reaching distance and could not be mistaken generically. I intended, however, to return that way and examine the shrub and collect the insects and if possible their eggs and larvæ, but by an unfortunate accident I was obliged to cut short my stay and thus miss my chance. From the behavior of the butterflies, my impression is that they were breeding then and there, and on one leaf of the shrub I noticed a patch of eggs which might well have belonged to *Kallima*. At that time my faith was strong and I was inclined to believe that the butterflies were migrating or had even for the moment become careless as to their surroundings, and I felt that had I looked further afield I might have found the leaves which were so admirably mimicked.

For the rest the question is whether it is just for the naturalist, the preparateur and *Kallima* to compound such museum preparations as we have above described, on present evidence. I for one would be glad to learn of additional observations, for, like many others, I am not able to repress a suspicion that in *some* cases (who knows in how many, even perhaps in the case of these classic but-

terflies?) our idea of the mimicry may be preconceived, rather than truthful. The fact that a butterfly looks strikingly like a given dead leaf is no adequate proof that it was evolved in mimicry—it must be proven a mimic in all details. Otherwise it should be kept in limbo with those creatures which to our eyes and to our eyes only suggest natural objects—such creatures as moths with skulls pictured on their backs and Taira-headed crabs.*

BASHFORD DEAN.

‘ROOT-PRESSURE’ IN *BEGONIA* (FLETCHER’S SEEDLING).

On July 15, a vigorous *Begonia* was selected from the greenhouse plants at the Harvard botanic gardens with a view to illustrate, to the students in botany at the summer school, some of the phenomena in connection with the so-called ‘root-pressure.’

The stem of the plant was cut off about three inches above the surface of the soil in the flower-pot, and a firm rubber tube was fixed to the stump and connected with a glass tube held in a vertical position. A small amount of water—about one cubic centimeter—was poured in upon the cut end of the stem. The glass tube first attached was about two and a half feet long and the diameter of the bore was three millimeters. In twenty-four hours after arranging the experiment the sap had ascended to a height of two feet one inch, and in twenty-four hours later the tube was overflowing. Another tube was then added, the connection being made with a short piece of rubber tubing.

* In the twelfth century the famous sea fight off Dannoura saw the destruction of the dominant Taira family of Japan; it is recorded that upward of twenty thousand of this clan and their adherents lost their lives; and their bodies were washed up on the neighboring beaches in wind rows. Each Buddhistic soul, however, was said to have passed into the crab, *Dorippe*, which to this day retains its imprint. The carapace bears in bas-relief a striking likeness to the face of an Oriental, and the fishermen, in ‘proof’ of the accuracy of the legend, point out further details in resemblance—the eyes and mouth are open, and the face is swollen, after the fashion of the drowned!