

outweighs the "determination of its foraminiferal affinities by a point no larger than a pin's head," and I feel assured that whenever impartial geologists take the question up the fossil itself will become extinct.

T. MELLARD READE

Blundellsands, Liverpool, Dec. 12

The Difficulties of Natural Selection

MR. WALLACE'S frank acknowledgment, for which I thank him, that he had in his two previous letters misunderstood my line of argument in what I consider one of the most important points at issue between us, absolves me from the task of again defending myself from charges of error and self-contradiction. As, moreover, Mr. Wallace has not accepted my challenge "to explain the nature of the intelligence which was operative in the creation of man, and which is a principle unknown in the rest of the organic world," it is impossible to pursue further this branch of the question. All naturalists will look forward with the most intense interest to Mr. Darwin's long-promised work on Natural Selection as applied to Man. There are, however, one or two subsidiary points raised in the discussion, to which I shall be glad of the opportunity of briefly referring. Mr. Stebbing, objecting to my attempted parallelism between mimicry and instinct, says that "it can hardly be said to be proved" that the extraordinary resemblances occasionally found in the vegetable kingdom are not protective or mimetic. I certainly think it can be. When we find an almost absolute identity between the foliage of a plant belonging to Africa and another growing in South America,* we are certainly justified in saying that one has not imitated the other, and that it gains no protection from the resemblance. Mr. Carvalho again makes merry over what he calls "my" argument, that imperfect imitation is, to all appearances, not beneficial in the cases published by Mr. Weir. The argument is not mine. I simply recount the observations made by practical entomologists, undertaken at the suggestion of Mr. Wallace himself. Mr. Carvalho's argument, which follows, is an instance of how, when a theory is once adopted, every conceivable fact may, by its too zealous advocates, be twisted to support it. Had these twig-like caterpillars been rejected by birds, it would have been considered a triumphant proof of the theory of Natural Selection; the fact that "they are eaten with great relish," we are told is equally "really in its favour"!

Westminster Hospital, Dec. 17 ALFRED W. BENNETT

Is Mimicry Advantageous?

THE discussion of mimicry among butterflies, in the recent numbers of this Journal, has brought to my mind some considerations which seem to have been overlooked by those who have treated the subject.

Of the fact of mimicry there can be no possible doubt, and in some instances it is even more striking than has been asserted. For instance, in North America, Messrs. Walsh and Riley have pointed out the resemblance between *Danais Archippus* and *Limenitis Misippus*; they might also have shown that in the extreme southern states where *L. Misippus* occurs, and *D. Archippus* is replaced by *D. Berenice*, the colour of the mimetic *Limenitis* deepens nearly or quite to the tint of the southern *Danais*.

But of how much actual benefit to the mimetic species is this so-called "protective" resemblance? It seems to occur where it can be of the least possible advantage to the species. The great sources of destruction here, as in all groups of animals, are in early life. How large a proportion of the eggs that are laid by butterflies ever finally produce imagines? Let those answer who have attempted to follow their history in their native haunts. My experience leads me to believe that, at the very least, nine-tenths—perhaps ninety-nine hundredths—never reach maturity. Hymenopterous and dipterous parasites beset them at every step; the eggs, although so small and often heavily ridged, cannot escape the ovipositors of the tiny Pteromali; while in attempting to breed caterpillars taken in the field, the chance is so greatly against the evolution of a butterfly, that hymenopterists actually choose this method of supplying their cabinets. "Of two hundred larvæ of *Pieris Brassica*," Mr. Drewsen, of Denmark, writes to me, "I obtained only twenty pupæ; all the rest were attacked by *Microgaster glomeratus*," and my own attempts with the larvæ of *Pyrameis Atalanta*, both in America and Europe, have been even more unavailing. These caterpillars seem to be peripatetic banquetting halls of *Microgaster*s and *Tachina*æ.

* See NATURE, Vol. ii. p. 70.

Now it is a curious fact that while the globular egg of *Limenitis Misippus*, with its deeply-pitted shell, defended by long filamentous spines, is constantly attacked by parasites; and the grotesque, hump-backed, strangely-coloured caterpillar of the same species is likewise infested to an extraordinary degree, I have been unable to discover by very careful search any evidence that the egg or larva of *Danais Archippus* is ever pierced by a parasite; yet the egg is not small and only lightly ribbed, and the caterpillar large, fleshy, smooth-skinned, and gaily banded, living on the widely-separated leaves of *Asclepias*, with no attempt at concealment. The abundance of the imago of the *Danais* is then due quite as much to the immunity of the egg and larva from the attacks of parasites, as to any freedom it may itself enjoy from pursuit by insectivorous birds.

Although I have hunted butterflies for fifteen years, I confess I have never seen one in a bird's bill, and my faith in that method of lessening their numbers is very slight. Birds, too, must be their greater foes in earlier life; and the chances of living, which are certainly against them before they take wing, seem afterwards rather in their favour, at least, until they have accomplished their mission.

If, then, such an extraordinary element as Mimicry is to be summoned to the aid of Natural Selection, and can perform its task in such a masterly manner, why has it been made to waste its energies upon unimportant material? If the object of the resemblance be protection, why does not the unfortunate caterpillar of the *Limenitis* mimic the more favoured larva of the *Danais*?

I cannot now consult the writings of Messrs. Wallace and Bates, nor do I remember their statements respecting the abundance of the mimetic species compared to that of its normal congeners. In my own country *Limenitis Misippus* is, as a general rule, more common than *L. Ursula*, but the difference in their numbers is not very marked. It is by no means as great as one would expect had Mimicry in the imago state so strong a protective power as has been assumed. Two closely allied species,* occupying the same geographical area, do not often occur in the same abundance, whatever be the cause; and the disparity in numbers in these two species of *Limenitis* is no greater than occurs in many instances where mimicry plays no part.

Cairo, Egypt, Nov. 9

SAMUEL H. SCUDDER

Nepenthes

THE allusion to *Nepenthes* in Mr. Buckton's interesting article in a late number of NATURE, on the liquid secreted by this and other plants, prompts me to place on record a few facts regarding that genus, at which I have just arrived, after monographing the Pitcher-plants for the "Prodromus Systematis Vegetabilium" of De Candolle; a work of which the publication is suspended, owing to the siege of Paris.

The genus *Nepenthes* extends from Madagascar on the west to N.E. Australia, the Louisiade Archipelago, and New Caledonia on the east; embracing within these limits, thirty species, most of which have well marked characters in the pitcher, but which, with only two exceptions, present a wonderful uniformity in the structure of both flower and fruit. It has two foci of maximum development; the Malay Peninsula (including Sumatra), and Borneo, in both of which localities the species are not only more numerous, but more gigantic than in any other country. No fewer than twenty-one species inhabit these two countries, of which thirteen are common to both; but, what is very remarkable, the intervening island of Java contains but one representative of the genus, and that a totally different species from either the Bornean or the Malayan; thus confirming the fact first brought to light by the Dutch naturalists, of the close biological relationship between the two former localities, to the exclusion of Java. Only one species has a wide range, the *N. phyllamphora*, which extends from Sumatra to Borneo, Amboyna, China, &c., but is absent from the island of Java.

Proceeding from the Malayan islands westwards, we find one species in east Bengal, more allied to the Javanese than to any other; another in Ceylon, the old *N. destillatoria* of Linnæus (a name long usurped in our gardens by the Bengal plant), which presents the first departure from the typical structure of the genus, having a spreading paniculate inflorescence; a character shared by those in Madagascar and the Seychelles. Proceeding further west to the African islands, we find still further deviations from the type, which now extend to the structure of the seed and

* *L. Misippus* and *L. Ursula* can with difficulty be separated in their earlier stages, although so unlike in their perfect forms.