

Mimicry in Nature

By RICHARD KERR, F.G.S., F.R.A.S.

MIMICRY in nature is an exceedingly attractive department of study. It arouses our interest at every step. It presents the unexpected so vividly that we are startled, and for the moment we can scarcely believe our eyesight or the description that is submitted to us with its accompanying illustration.

Thomas Belt had many of these surprises in Nicaragua, owing to insects that looked like dead leaves, and others which appeared as green leaves and pieces of moss. W. H. Bates, the famous naturalist of the Amazon regions, was astonished repeatedly by finding insects that mimicked other insects of a different kind, and by those which appeared as inanimate objects; also by birds that closely resembled those of a different order. Alfred Russel Wallace was never more surprised than when he found that the Kallima butterfly he was chasing instantly closed its wings and posed exactly as a dead leaf. G. S. Taylor, who wrote "Birds of Honduras," actually shot several birds, curassows, as he believed them to be, but which on close examination proved to be hawks that resembled the other birds in all the chief details.

Gould, the author of the grandest work on birds ever issued, had great difficulty in seeing, in Australia, the dozens of warbling parrakeets which were perched on a single branch of a eucalyptus tree close by. The colours of their plumage harmonised with the leaves of the tree. Gregory, the famous naturalist, in East Equatorial Africa, was astounded when he came upon a large collection of blossoms, as he thought, which suddenly took flight! They were butterflies that simulated the flowers of the foxglove, or some such plant, for protection from birds. Recently, at a conversazione of the Royal Society, Lieut.-Colonel Charles T. Bingham exhibited a remarkable moth and its chrysalis case from Upper Burma. The pupa was fixed by its tail end to a branch and bore a striking resemblance to the head of a

snake. At another meeting of the same Society, in 1908, Mr. H. S. Leigh showed some living examples of the leaf insects found in the Seychelles. They afford a striking illustration of protective resemblance. They are not only similar to leaves in shape and colour, but in their peculiar movements imitate the shaking of the leaves. The resemblance to vegetable structures is carried still further, since the eggs bear a marked likeness in shape and colour to certain seeds.

Our British Buff-Tip moth, when its wings are closed, is mistaken frequently for a bit of dead wood. The Lappet moth has the lines and colour of the beech leaves on which it likes to rest. Many of our moths look so much like the bark of trees on which they are found that it takes an experienced entomologist to differentiate between the insects and the bark.

It would not be a difficult task to quote many other instances of mimetic resemblance, but these will suffice for the present to show that we are face to face with phenomena that are indisputable. Mimicry undoubtedly exists extensively in nature, and, as it presents unlimited points of fascinating interest, it supplies material for research and close observation.

At the outset it may be asked—What is mimicry, and how is it brought about or accounted for? Before entering upon any answer we must dismiss from our minds the thought that the creatures which mimic others have any power to alter or change, in any one way, their own condition. The insect, bird, or other creature cannot bring its will-power, instinct, or any other power it may possess of controlling its actions, to effect any change whatever in its shape or colour.

The word "mimicry" is more or less misleading. Owing to the poverty of our language, we have no word that adequately describes this particular phenomenon in nature. We speak of one species imitating another as if it were a conscious act. No supposition can be

more absurd. Therefore no such idea must be entertained.

By mimicry, or mimetic analogy, is meant the fact that one creature often possesses a very close resemblance to some other creature, which is most frequently of a very distinct group. At times creatures are found which resemble inanimate objects. Mimicry, to some creatures, is a protection; to others it is of an aggressive value.

Dr. Wallace found in the Molucca Islands two species of honeysuckers which were mimicked by two species of orioles. "The imitation was carried out to the minutest particulars. The black orbits of the honeysuckers were copied by a patch of dark feathers around the eyes of the oriole, and even the very peculiar ruff of recurved feathers on the nape of the former had its general effect imitated by a collar of pale colour in the latter. The under and upper surfaces of the two birds were of the same tint, and, stranger still, the oriole had closely copied the mode of flight and the voice of its model, so that in a state of nature the two birds were practically undistinguishable."

In birds the strongest and bravest are most mimicked; and the weakest and most defenceless obtain advantage by imitating them. The honeysucker is well able to take care of itself, and if it should be in danger it can utter a variety of loud and piercing notes which will bring its companions to the rescue. Dr. Wallace has observed them drive away crows, and even hawks, which had ventured to perch on a tree where two or three of them had been feeding.

"The oriole is a smaller, weaker, less active, less noisy and less pugnacious bird; its feet have a less powerful grasp and its bill is less acute. It would, therefore, evidently be to the advantage of the more defenceless oriole to be mistaken for the honeysucker."

Mr. Bates has stated that in the Amazon regions he saw numerous groups of butterflies (the *Heliconidæ*) which, although slow-flying, are never persecuted by birds or dragon-flies, to which it might be supposed they would be an easy prey; nor, when at rest on the leaves, are they molested by lizards or predaceous flies,

which constantly devour butterflies of other families. They appear to owe this immunity from persecution to their offensive odour, which renders them unpalatable to the enemies of insects. Even when they are set out in the cabinet of the collector, they are less liable to be attacked by vermin than other specimens. Now, it is obvious that the more closely an inodorous butterfly of another species resembles one of the offensive *Heliconidæ*, the less likely will it be to be preyed upon by its natural enemies.

We come now to the next question—How is this mimetic resemblance brought about?

Before summarising the explanation that is generally given, I venture to state that no satisfactory definition or explanation has yet been formulated that will apply to *all* mimicking creatures. Bates is credited with the statement "that the intimate nature of the resemblance must be ascribed to the continued action of natural selection, by means of which the resemblance has been progressively accentuated."

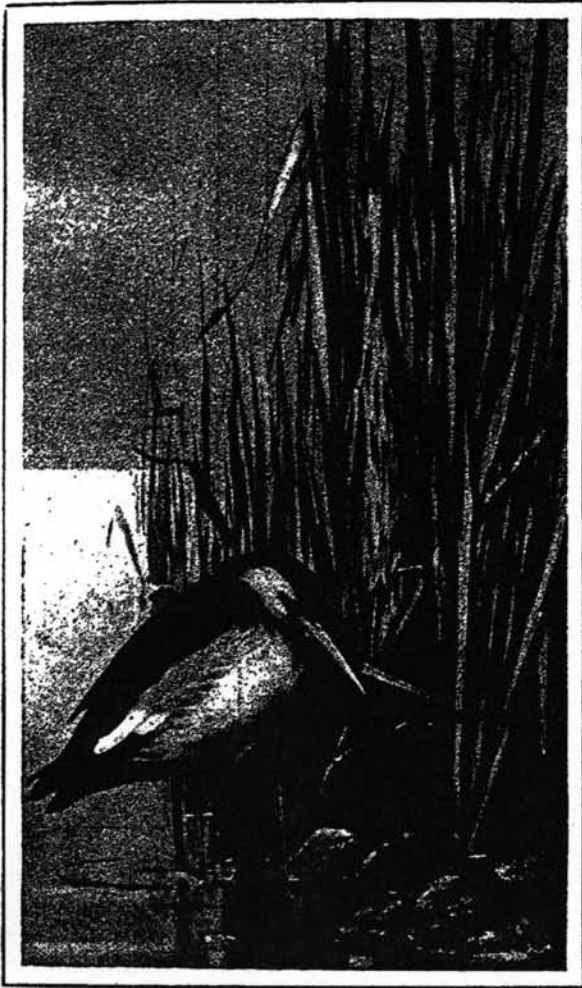
Darwin's theory may be summed up as follows: "All animals, without exception, are liable to variation in form, colour, and size. Among insects, in particular, variations of marking and form are most frequent." And similar variations would occur in succeeding generations, those imitations which most closely resemble the model always being left, until at last, as in the instances already named, the remarkable result would follow that two insects, belonging to distinct families, would so closely resemble one another as only to be distinguishable by a close inspection of their structural peculiarities.

All variations, as already stated, are involuntary, and at present even their cause is unknown. "Variations occur both in wild and domestic animals, and are capable of hereditary transmission."

It is evident that those varieties that are protected in the most complete manner from their natural enemies are the most likely to survive and perpetuate their race.

It would appear that Darwin gave more consideration to the fact that varieties do actually occur in several classes of creatures, but more especially in the

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NO. 1.—TWO LITTLE BITTERNS, THE YOUNGER BIRD IN MIMETIC ATTITUDE (NATURAL HISTORY MUSEUM).

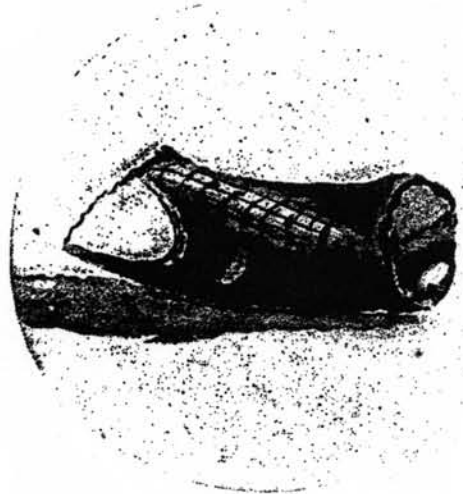
insect world, than towards any explanation of the causes which bring about varieties in nature.

Possibly we are expecting too much when we ask for the cause of this or of that phenomenon. There are some problems which are not likely to be solved this side of the grave, but there are several connected with animal and plant life that ought not to remain unsolved very much longer. The problem presented by "mimetic resemblance" is one that may be considered as only partially worked out. Even Henry Drummond, in his fascinating chapter on "Mimicry" in "Tropical Africa," evades the question as to how these innumerable instances of mimetic analogy are brought about. He tells us of "lichens, mosses and fungi that are constantly taken as models by insects, that there is probably nothing in the vegetable kingdom—no

knot, wart, nut, mould, scale, bract, thorn or bark—which has not its living counterpart in some animal form"; but he does not satisfy our curiosity or our craving for knowledge by even venturing an opinion such as we expect from a traveller who has seen tens of thousands of mimetic instances.

He surprises us with his pronounced views of mimicry. "Mimicry," he says, "is imposture in nature. . . . There are to be seen creatures, not singly, but in tens of thousands, whose very appearance, down to the minutest spot and wrinkle, is an affront to truth, whose every attitude is a pose for a purpose, and whose whole life is a sustained lie. . . . Fraud is not only the great rule of life in a tropical forest, but the one condition of it." And again—"At the first revelation of all these smart hypocrisies one is inclined to brand the whole system as cowardly and false. And, however much the creatures impress you by their cleverness, you never quite get over the feeling that there is something underhand about it; something questionable and morally unsound."

We must not, however, take this esteemed author's expressions too seriously, but, instead, accept the advice given in his preface: "If the dust of science has been too freely shaken from certain chapters, the scientific reader will overlook it for the sake of an overworked public which has infinite trouble in getting itself mildly instructed and entertained



NO. 2.—THE BUFF-TIP MOTH: RESTING ATTITUDE.

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without being disheartened by the heavy pomp of technical expression."

If we refer to the accompanying illustrations, we shall find considerable evidence in support of the phenomena of protective mimicry. In the bird department of the Natural History Museum, Kensington, there are several instances of mimicry, and amongst the number the little bittern is a good example. Bitterns live in marshes. They are not experts in the art of flying, but they are good runners and climbers. The young birds may be seen climbing the reeds and other water plants endeavouring

his hand, and, when released, it went back with a spring-like action to its mimicking position. The underneath side, which, owing to its colour and lines, resembled the surrounding reeds, was always kept facing Mr. Hudson as he went round it. This is one of the very remarkable instances of the many and varied ways in which creatures endeavour to conceal themselves.

A very useful end is served by mimetic resemblance when it affords protection against natural enemies, either by concealment or disguise. The Buff-Tip moth (*Pygæra bucephala*), so abundant in many



No. 3.—THE COMMA MOTH.

No. 4.—THE LAPPET MOTH.

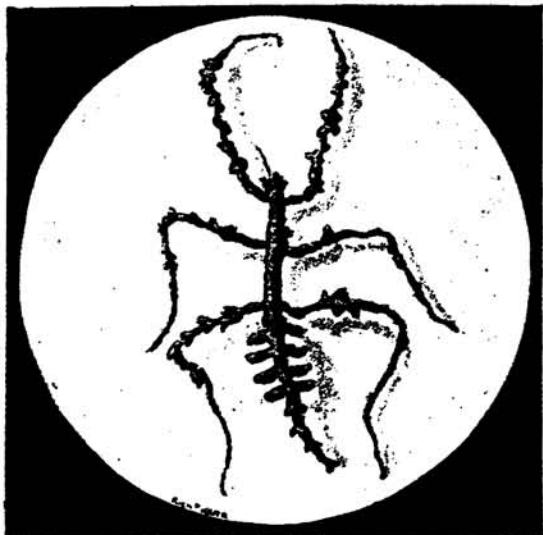
to conceal themselves by adopting an upright attitude with the beak held in a vertical line, with the body and the striped breast turned towards the spectator. In this way they appear like the adjoining reeds, and escape detection (Fig. 1).

Mr. W. H. Hudson, an observant lover of nature, was searching among the reeds for a young bittern which he had startled and which he knew must be quite close to him. He was about to give up the search, when to his amazement he saw it so close to him that he could touch it; and touch it he did, without its showing any signs of life. It stood grasping the plants and with its head and body as described. It then allowed the naturalist to bend its head down with

parts of England and Ireland, seems to enjoy immunity from its foes owing to this provision of nature. When at rest the wings are wrapped round its body in such a manner that the creature looks much more like a piece of wood than an insect. With a penknife and a bit of stick it would be possible in three minutes to fashion a very good imitation of it. It is shown in its usual resting attitude in Fig. 2.

Another instance of protective resemblance is afforded by a well-known insect which has the hind margins of all its wings more remarkably indented than those of any other British butterfly. It is described under three or four different names, e.g. the "White C butterfly," the "Comma," the "Vanessa C album," &c.

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NO. 5.—THE MOSS INSECT.

Two specimens are represented as among decayed leaves in Fig. 3. The under sides of the wings in some instances are uniformly dark brown, in others they are richly varied with different shades of brown and metallic green, while a third variety assumes a tinge of fulvous or tawny yellow. It will be seen that in all three instances the insects when resting display colours corresponding to those of different leaves. The insect possesses the shape of a comma or letter C on each of the hind wings, which accounts for its name.

The adjoining illustration (Fig. 4) represents the Lappet moth (*Lasiocampa quercifolia*). Owing to its colour and markings it is well disguised on the seared leaves of the beech tree.

Drummond, Wallace, and Belt have met with the "moss insect" in different parts of the world. Belt says in his "Nicaragua": "Another insect, of which I only found two specimens, had a wonderful resemblance to a piece of moss, amongst which it concealed itself in daytime, and was not to be distinguished except when accidentally shaken out; it is the larval stage of a species of *Phasma*." This insect is represented in Fig. 5. It will be noticed that the body and legs are knotted with prominences like those on moss. In this, as in many other instances, the full extent of the deception is not so pronounced as it would be if we could see the insect in its natural surroundings. If we could see it with several

others of its kind on a bank of moss, we should be unable to discover any of them unless they began to crawl about.

Our next instance of protective mimicry is from Venezuela. (See Fig. 6.) It is shown in the Natural History Museum among the fine collection of "Cryptic Resemblances." A few inches cut from the branch of a rose tree, with apparently its natural thorns, is labelled "The homopterous insect *Umbonia spinosa*, when at rest, bears a close resemblance to a rose thorn." The word "homopterous" implies that its wings are equal in size. The meaning of the word "spinosa" is self-evident, for if no indicating mark had been placed near the insect it would be reasonable to assume that all were thorns and nothing more!

I now come to two instances of remarkable resemblance, but, as opinions upon them differ very widely, I will avoid labelling them as "protective," though I firmly believe them to be so. The moth shown in Fig. 7 is found in Costa Rica, and is named *Caligo ilioneus*. The illustration shows the under side of the creature. The upper side of the wings is ornamented with velvety brown and blue. The moth when it appears in the evening, is liable to be attacked by small birds, which have a formidable enemy in the owl. The moth in fear makes for the nearest foliage and displays the under side of its body and wings. The small birds are scared

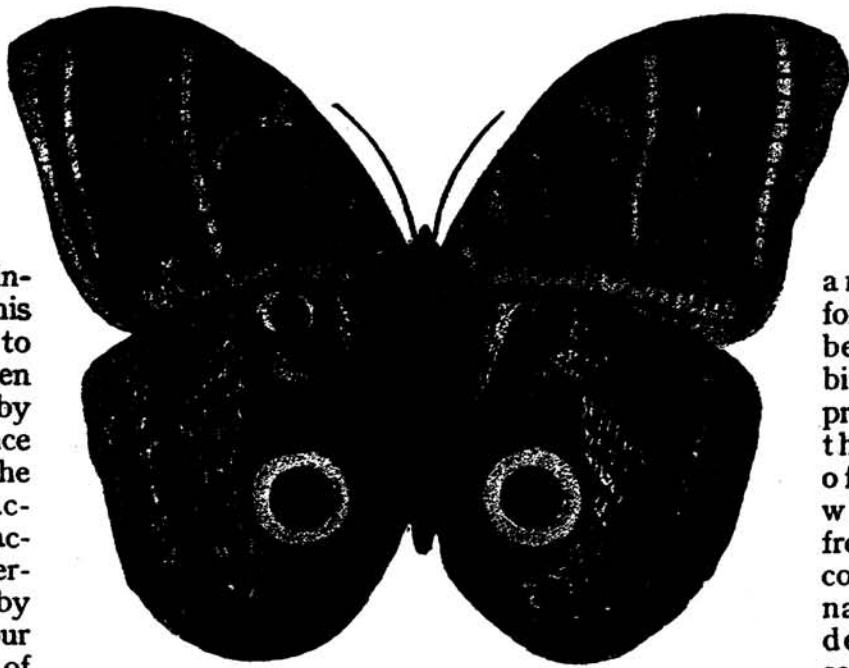


NO. 6.—AN INSECT (*UMBONIA SPINOSA*) RESEMBLING A THORN, VENEZUELA (NATURAL HISTORY MUSEUM, LONDON)

away, and the moth escapes. It would be ridiculous to attribute any intention on the part of the insect, in this performance, to try to frighten its pursuer by its appearance as stated. The foregoing account is accepted as perfectly true by three- or four naturalists of experience, and I submit it, believing, as I have said, that it is an illustration—and a good one—of protective resemblance.

The next, around which there is a certain amount of doubt as regards its being a case of protective mimicry, is shown in Fig. 8. The chrysalis case of a moth new to science, and discovered by Colonel Waller-Barrow in Upper Burma is shown in two positions, together with the head of a snake, *Lycodon aulicus*, from the same district. The insect is named *Binsitta Barrowi*, and was exhibited recently at the Royal Society's conversazione. From the position of the pupa-case on the twig and from its general appearance it was thought to resemble a snake's head, and especially that of the snake shown, which is given to bird-eating.

Whether the passing bird would avoid the pupa because of its snake-like appearance, and thereby allow the moth to develop and go on its way free and unmolested, is a question which could only be settled by actual observation. Lieut.-Colonel Charles T. Bingham, who exhibited the specimens, and who has kindly allowed me to copy them, very fairly states that, with regard to what are called "protective resemblances," "the only sure test seems to lie, not in experimenting with captured lizards and caged birds, but



No. 7.—THE OWL MOTH (*CALIGO ILIONEUS*).

in patient watching and observations, repeated again and again, in the field and in the forest, of the behaviour of bird and lizard, pre-eminently the enemies of insects, when confronted in the course of their natural wanderings with cases of what we call protective mimicry."

Prof. E. B. Poulton, F.R.S., at the same meeting of the Royal Society exhibited what is looked upon as the most remarkable example of mimicry hitherto discovered. He showed several female insects of the African *Papilio dardanus*. The male of this well-known butterfly is a yellow, black-marked, long-tailed "swallow-tail." In Madagascar a very similar male of the allied *Papilio meriones* has a female much like itself, *i.e.* long-



No. 8.—TWO VIEWS OF PUPA OF MOTH (*BINSITTA BARROWI*); ALSO HEAD OF SNAKE (*LYCODON AULICUS*).

(Adapted from Hugh Main in *Transac. Entomol. Soc.*, 1907 by kind permission of Lieut.-Colonel C. T. Bingham.)

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tailed. But everywhere on the mainland of Africa, except in Abyssinia, the females are without the tail to the hind wing, and closely resemble distasteful butterflies belonging to the *Danainæ* plentiful in their districts, and in one instance the model belongs to the *Acraeinae*. The most remarkable fact about the mimicry is that the females occur in the same locality in two, three or even four different forms, each resembling a different model.

We have already alluded to Bates's opinion with regard to insects which mimic offensive and odorous insects, noting that by such mimicry they are avoided by their foes. The exhibit by Prof. Poulton bears out Bates's observations. The females, minus the tails to their hind wings, and closely resembling offensive butterflies, would be more likely to be mistaken by their foes for the offensive ones and thereby escape detection. They would therefore remain to produce offspring.

Thomas Belt gives his experience, which agrees with that of Bates: "I had an opportunity in Brazil of proving that some birds, if not all, reject the *Heliconii* butterflies, which are closely resembled by butterflies of other families and by moths. I observed a pair of birds that were bringing butterflies and dragon-flies to their young, and although the *Heliconii* swarmed in the neighbourhood, and are weak of flight, so as to be easily caught, the birds never brought one to their nests."

The *Heliconii* are offensive, and therefore all insects that mimic them escape the attentions of their foes and gain many points in the struggle for existence.

My last illustration is of the *Hypsa monycha*. The caterpillars of the family of moths known by this name are plentiful in Singapore, and they are of a sociable temperament. They are evidently gregarious in an eminent degree. The prevailing colour is a rich crimson relieved by one white band. The head is dark green and the body is covered with hairs.

In a mysterious way a number of them appear to be impelled by a common understanding — call it instinct, if you wish — to climb the stem of a plant and to arrange themselves in a compact mass at its topmost point. (Fig. 9.)

Here they may readily be mistaken for an extra large raspberry or other succulent fruit. The rich colour and the division of the bodies of the caterpillars into segments emphasise the striking resemblance to a luscious fruit.

This is undoubtedly another illustration of mimicry, but it is by no means apparent that the creatures reap any advantage from the position they assume.

It might prove the very opposite, and be a source of danger,

should a bird given to fruit-eating pass in that direction.

There is another way in which to consider the point raised. If there should be in the neighbourhood of Singapore a fruit of this shape, and injurious to birds or other creatures, it might be an advantage to mimic that fruit. But as to this we are without information.

I am indebted to Mr. H. N. Ridley, of Singapore, who made the original drawing which is now in the Natural History Museum.



NO. 9.—CATERPILLARS OF THE MOTH *HYPSA MONYCHA*, SINGAPORE (NATURAL HISTORY MUSEUM, LONDON).