

heart, I believe. I know he has been helping his father of late, though he does not like to have it talked about, for when Mr. Docker spoke of seeing him come out of the office, Edgar seemed quite annoyed."

Hardly had Mary left her mother's room when she was summoned by Mrs. Mack, whose face was red with passion.

"Two of 'em in the hall," she said, "and not a stir out of the one of them when I bids 'em get out for dirty thieves of the world. Got a screed of paper, they have, and their chat is 'tis the sheriff's officers they are."

Mary went into the hall. "With submission," said a red-faced man, holding out his hands, "and humble apologies. 'Tis that small account of the Buncrana Coal Company."

"Stand aside off of that door-mat," said Mrs. Mack. "Do you suppose we keeps door-mats for the likes of you?"

"I beg your pardon, ma'am," said the bailiff. "Is there any reason in being unreasonable?"

"Faith, then," said the other man, "'tis a very belligerent lady she is altogether; and if only she'd receive us in the spirit in which we comes, miss, you'd never know we was in the house at all."

"Are you," asked Mary, trying to keep her poor lips firm, "the bailiffs?"

"Well, miss," said the red-faced man with a deprecatory wave, "that's the name they have for us. But Sam and me is no nuisance at all."

"No, then," said the other man, "but a pleasure."

"Mrs. Mack," said Mary, "please to show the gentlemen in."

"Come in, then," said Mrs. Mack, propelling the red-faced man half across the hall with a sudden pulling to of the door, "and if the likes of you is the

sheriff's officers 'tis for ugly faces and dirty ways they gets promotion in *his* regiment."

"Wait till you have the pleasure of our acquaintance," observed the red-faced man, meekly rubbing his elbow. "We had the whole of the last family on the steps roaring crying to see us quit out of it."

"And they named the baby after me," said the other man; "as fine a young son as they're showing in Munster."

"I'll whitewash after them," remarked Mrs. Mack over their heads; "mind you keeps the winders open, Miss Meary."

The two men tip-toed behind their caps into the kitchen, and Mary went back to Mrs. Haydn's room to break the harsh meaning of their rough but not unkindly voices.

(To be continued.)

## NATURE'S MIMICS.

By AGNES GIBERNE, Author of "Sun, Moon, and Stars," etc.



A MOTH exactly like a humming-bird! A beetle exactly like a caterpillar! A spider exactly like an ant! A locust exactly like a green leaf! A butterfly exactly like a brown leaf! These are the anomalies meant by the modern term "Mimicry in Nature." Let us look at an instance or two.

In Nicaragua, a great army of ants (Ecitons) was passing through the forest one day on a foraging expedition. These ants were not particular as to diet; they were ready to eat almost any sort of live creature that they might encounter. Grasshoppers, cockroaches, locusts, spiders, were equally to their taste. All animals fled before them; some climbing trees, whither they were relentlessly followed by a detachment of the foe; some hiding themselves in holes and corners, only to be ruthlessly routed out and slain; some getting away by dint of superior speed.

Among the cleverest in escaping were the spiders. They were not to be deluded by any tempting retreat, but used their long legs to advantage, keeping well ahead of the enemy. Or, if they mounted a tree, it was to hang on silken threads in mid-air from a bough, out of reach.

In the very path of the marching legions was a green-leaf locust; one of Nature's imitations. This locust, in outward form precisely like a green leaf, remained motionless, while thousands of ants walked past, surrounded it, ran over its legs, and never

discovered that the seeming leaf was a live animal, which they would have been delighted to devour. The locust did not stir, did not betray itself by a twitch or a quiver.

Nay, even when an observing naturalist picked it up, and then dropped it back among the ants, it made still no sign of life, no effort to get away. Instinct or experience taught it that its only chance of safety lay in a perfect acting out of the leaf which it resembled. Had the locust chosen to spread its wings and fly, escape from the ants would have been easy; but then it would almost certainly have been snapped up by one of the host of birds, hovering overhead on the watch for fleeing insects. By utter immobility it deceived ants and birds alike. Man alone saw through the trick.

That the birds should be so taken in is perhaps not surprising; but the deception of an army of quick-witted ants, careering around and over the very creature they would so willingly have eaten, is far more extraordinary. Ants have keen senses; perhaps even an additional sense which we have not; and some naturalists have believed insects, including ants, to possess a peculiarly keen sense of smell. This story seems to throw some doubt on the truth of such a theory.

Try to deceive your pet dog by presenting to him the most perfect imitation of a cat. He may for a moment be taken in; he may dance round it, barking, and believing that the creature he loves to chase is before him. But let him come close and use his nose as well as his eyes. One long sniff, and the delusion is over. He will turn away with contempt, and you will hardly manage to deceive him a second time with the same trick. No such discrimination-power is apparent in insects—even in ants. Nor, it would seem, in bees. There are flies closely resembling bees in form and colouring; flies which by reason of this likeness can enter the bees' nest, and deposit eggs there; this being their natural mode of providing for their young. Without such resemblance they might have greater difficulty in carrying out the programme.

Suppose one were asked to guess what manner of mimicry a great tropical spider should most successfully attempt. One would

hardly suggest "a flower-bud." But the large bright-hued spiders of South America have a curious fashion of folding themselves neatly together, at the base of a leaf-stalk, so as to look like an innocent flower-bud. This piece of imitation is so successful as quite to take in the insects which those spiders wish to eat. It is with them, not a case of web-making, but a case of leaping. No sooner does some unwary creature walk or flutter near, than the flower-bud suddenly transforms itself into a long-legged hairy monster, springing upon its victim.

The two chief cases of mimicry above cited—that of the green-leaf locust, and that of the spider flower-bud—though partly due to shape and colouring, are also partly due to innate cunning; and they are thus to some extent typical instances. Mimicry among insects is commonly due either to form, to colouring, or to action; or to two of these together; or to all three combined. In the case of action, we ascribe it to inborn instinct; and by "action" must be understood also the literal absence of action, as in the simulation of death. This to restless human nerves and muscles is, perhaps, one of the most exhausting kinds of action. In cases of form and colouring, naturalists have fallen into a mode of speech which seems to denote a deliberate intention on the part of the insect or of the insect's ancestors, to copy some other creature or thing, but which really does not denote anything of the kind.

We hear of lichens, mosses, fungi, being "constantly taken as models" by insects; of insects "imitating" this, "mimicking" that, "simulating" the other. Now, with human beings, to imitate, to mimic, to simulate, to take a model and copy it, means invariably doing it of deliberate intention, acting with a conscious aim and with full understanding. But it ought to be generally understood that these expressions, used with respect to insects, are to a very great extent a mere figure of speech. It is, as Mr. Belt says, "only on account of the poverty of our language" that such terms are employed in such relations; and he adds plainly the self-evident truth that "no such idea is entertained" as that it is "a conscious act" on the part of the insect. That is to say, no such idea is or could be



entertained by anyone of cultivated scientific understanding. The ordinary run of readers, giving little thought to the subject, and disposed to take the words used in their common everyday sense, might easily carry away a false impression. Language may be, and is, poor, compared with the variety of ideas which it has to represent; yet one cannot but regret that a better choice of terms was not made in the first instance. The mistake was a natural one, in the enthusiasm of the naturalist; but on the whole the descriptive words savour more of poetry than of science, their symbolical sense needing explanation. Modern exactitude seems lacking here.

When a brown bear first reached glacial regions—let us say, when the original brown bear ancestor first wandered thither—he did not definitely come to the conclusion that his dark coat was out of place, and that a white dress would be more appropriate to his new surroundings. By a wonderful provision in Nature, the needful change came about with no effort on his part. The colour of his hair adapted itself to his new surroundings, it would seem, as easily and naturally as our hearts in beating, our lungs in breathing, constantly adapt themselves to changed conditions of weather or of life; nay, as automatically as the colour of man's skin has adapted itself through ages to diverse climates. The negro did not become black, because his ancestors thought it desirable. The bear did not become white, because some original brown bear craved that tint. The locust did not develop a leaf-like appearance, because his locust forefathers approved the plan. How the creature's surroundings in Nature so act upon him as to produce in time these singular results we may conjecture, but we can hardly yet affirm. Here as elsewhere walls of mystery still close in our researches. No doubt the need existed, to ensure due preservation of certain insect-forms; and no doubt that need was met through the gradual adaptation and development of existing forms. In the ceaseless struggle for life, peculiarly characteristic of the insect-world, those insects, best fitted to escape danger and to obtain food, would most plentifully survive; and so the strange imitative forms would be more abundantly perpetuated than any others. But when one has said so much, the real "how" of the matter is not fully fathomed.

The object of this so-called mimicry is twofold. First, it is for the avoidance of peril to life; secondly, it is for the more easy catching of prey. Not always both at once, but almost always the one or the other. The aim of the crouching spider is to get a good meal. The aim of the leaf-like locust was to escape death. In these cases, and in countless others, it seems that with the imitative form comes the instinct to act in accordance with that form; it may be an altogether blind instinct. When the green-leaf locust made believe to be nothing but a leaf, two separate parts went to the mimicry. First there was the outward form of a green leaf; secondly there was the immobility of a green leaf. The leaf-like appearance would have availed the locust little, if he had walked or flown; and the immobility would have availed him little, if he had not possessed the leaf-like aspect. Each seems to be a concomitant of the other. We can hardly imagine that the crouching spider definitely knows himself to present the appearance of a flower-bud. He only knows—at first by instinct, then by experience—that when he so crouches insects come within reach, and not otherwise. The locust can perhaps hardly be aware of his own likeness to a green leaf; but his inborn instinct in danger leads to utter immobility, and he is thus protected.

In Nicaragua many small spiders are found, closely imitative of stinging ants. One kind

presents so perfect a copy that it has been killed by a naturalist in mistake for an ant. It has a mode of holding up its two little front legs, and swaying them about so as to look like the antennæ of an ant; and because the ant has a sting, this resemblance means safety to the spider which has no sting. In the same part of the world there are beetles which bear a marked resemblance to wasps; the head being very small and almost hidden away under the thorax, which is painted into a likeness of the wasp's head and eyes. One such wasp-mimic has a trick of fidgeting its antennæ, exactly after the fashion of a wasp, and not at all of a beetle. Here again the mimic is protected from hungry birds and fellow insects by the false supposition on their part that it has a wasp's sting. Such wasp-imitations are found in most parts of the world.

Beside copies of offensive and defensive insects, of those with stings and other hurtful weapons, we have copies of unpleasant ones, of those, for example, which are distasteful for eating.

An enormous Nicaragua beetle is described as "short, thick, hairy," almost the counterpart of a caterpillar which is also found there. Other beetles, in mortal dread of birds, will carefully hide themselves as much as possible; but this one ventures fearlessly out, lying in full view upon green leaves. Only one precaution is needful. It must keep its antennæ folded close to its body, lest those un-caterpillar-like appendages should betray it. Birds have usually a great dislike to hairy caterpillars; and so the beetle gets off scot-free, protected by its imitative outlines and tints.

Certain bright-hued butterflies, in different parts of the world, are almost universally rejected as food by other animals, either from their unwholesomeness, or from an unpleasant taste. No insects, for example, will touch the *Heliconii* butterflies of Nicaragua; and birds never capture them. A certain tania monkey, devoted to insect-food in general, utterly declined to eat these. He would, indeed, politely accept one if it were offered, but he always rolled it up in his hand, and took an early opportunity to drop it quietly on the ground. One kind of spider, it is said, will dispose of even these butterflies; but in a general way, if they are dropped into a spider's web, they are simply got rid of, not devoured. They have weak wings and are poor fliers; doubtless because they have few foes to escape from, and so have not needed to strengthen their powers of flight by exercise through generations. This distasteful butterfly is "mimicked" in appearance by many other butterflies which are not at all distasteful; and thereby the lives of the latter are often preserved.

The same thing is seen in Africa, where exist "two great families of butterflies, the *Danaidæ* and the *Acraidæ*, which are inedible, owing to the presence in the bodies of acrid and unwholesome juices."\* Monkeys and lizards, as well as birds and spiders, are all given to butterfly-eating; but from them all these ill-tasting species are safe.

To render them safer, by preventing needless mistakes, they wear particularly lively costumes. No need for them to scurry away, to hide in dark corners, to live in perpetual dread. "They float serenely about the forests in the broadest daylight, leisureliness, defiance, and self-complacency marking their every movement, while their darker brethren have to hurry through the glades in terror of their lives."\* These creatures again are closely imitated by hordes of other butterflies, which have not the acrid juices, but which are protected from attack by the lively colouring

which seems to imply that they have. Here, once more, we have "mimicry" for purposes of safety.

How far insects generally possess a certain low order of thinking power, it is difficult to decide; certainly there seems to be in some instances a capacity, on a small scale, to put two facts together and to draw thence a deduction. Occasionally an insect appears to view a difficulty, to appreciate it, and to take counsel with himself how best to get out of it. Now and again an action or a mode of behaviour is seen, which we cannot ascribe to mere blind impulse. But long and patient study of the subject is needful, before definite conclusions can be reached, which shall be worth much.

When, however, we touch upon odd traits of mimicry, such as a spider curling himself up like a flower-bud, or a beetle posing as a caterpillar, or a locust and a butterfly feigning to be leaves, then there can be little or no doubt that we are reviewing purely instinctive and involuntary actions. The creatures cannot so much as will to do otherwise; they simply follow the law of their being. They have no responsibility in the matter of their shape or colouring; and they act in obedience to inherited instincts.

Still, say what one will in explanation, the facts remain the same. Such appearances are "masterpieces of deception" to the deceived birds and insects. It is not a case of immoral cheating, but of successful dressing up and brilliant acting; and it is, in tropical forests, not merely a curious freak of nature, but absolutely essential for the preservation of insect-life in the face of countless hosts of foes.

While a locust will "copy" a green leaf, a butterfly will "copy" a dead leaf. Mr. Wallace describes for us such a butterfly in Sumatra, nearly allied to the Purple Emperor. When on the wing, it is seen to be of a fine purple, variegated with ash tints, and with an orange bar. Not an animal to be easily hidden, one would think; yet again and again the naturalist vainly tried to secure a specimen. After being a little way pursued, it would flutter into a bush among dry leaves, and would instantly vanish. Presently it would start off again, fly another short distance, and again mysteriously disappear. One day, however, Mr. Wallace perceived it actually alight; and though even then he could see it no more, he would not lose sight of the spot, but searched until his efforts were rewarded. There the purple and orange beauty was, among dead leaves, no longer purple or orange, but itself as perfect a specimen of a dried leaf as any around. For the wings were closed; and the under side of each wing was an exact and artistic copy of a withered leaf, correct in colour and in shape, with midrib, veins, and lesser markings, precisely true to nature. The head with its antennæ is, at such a time, withdrawn between the wings, so as to be hidden; and as this species always, when possible, alights among dead leaves, the difficulty of catching it is not to be wondered at.

Among insect-mimics none are more extraordinary than the *Mantidæ* and the *Phasmidæ*. Some of them are like mere wisps of hay, or twisted grass-stalks. They are found in long tropical grass; and they imitate in colouring the recurring changes in that grass. When the young green growth first comes up, the prevailing tint of the grass-stalk insects is green. When the grass is yellow, or variegated with red and brown, the insects are yellow or variegated to match. But whether throughout the year they are the same individuals, changing their clothes with the seasons, or whether a year means a whole cycle of grass-stalk insect generations, is still an open question.

\* Drummond.