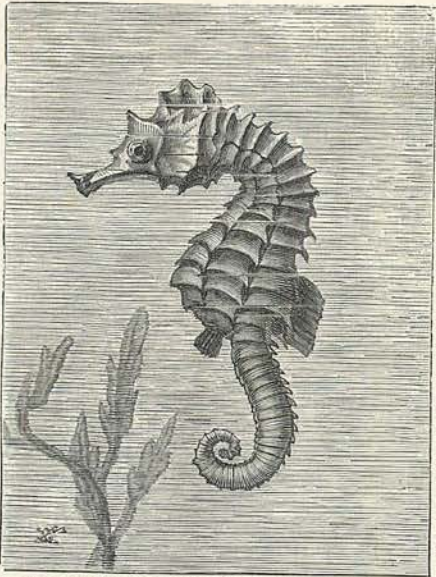


In Nature's Workshop.

IV.—MASQUERADES AND DISGUISES.

BY GRANT ALLEN.



1.—THE SEA-HORSE, UNDISGUISED, SEDATELY SWIMMING.

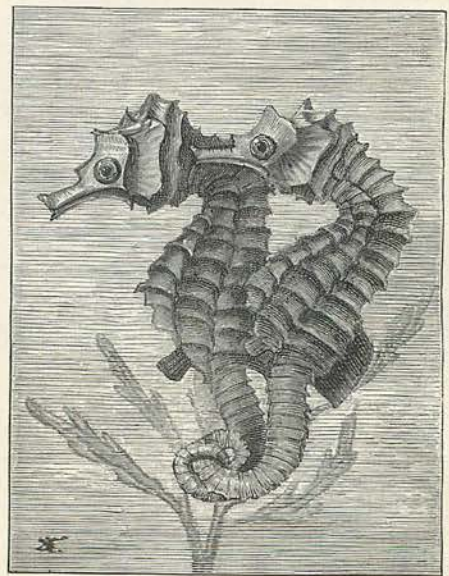


IN a previous article of this series, I introduced my readers to certain bold and deceptive insects—the “bounders” of their race—which pretend to powers they do not possess, and endeavour by sheer bluff to frighten away intruders on their domestic privacy. In the present essay, I am going to touch on sundry other wily animals which, either in order to escape the notice of their foes or to creep in silence upon their unwary prey, imitate more or less closely other objects in their surroundings—in simpler words, walk about in masquerade. This paper is thus to be devoted to the subject of disguises. I propose, as it were, to go behind the scenes, and show you the make-up of the principal characters in nature's melodrama of “Strictly Incognito.”

An ounce of example is worth a ton of description: so I will begin with a simple illustrative case among the class of fishes. My illustration No. 1 shows a “person of the drama” *without* his make-up: it represents that familiar little beastie, the common sea-horse, or hippocampus. In his dried condition, this quaint small Mediterranean fish is a well-known denizen of every child's domestic museum. Visitors to Venice have picked up sea-horses in abundance on the

sandy ridge of the Lido—that long bank of shingle which divides the lagoons from the open Adriatic, a spot which I have already mentioned in this Magazine as a favourite haunt of my own, and also of my good old friend the sacred scarab, or ball-rolling beetle. In most marine aquariums, too, the sea-horse is a much-appreciated popular performer: a group of them in the Brighton Aquarium (which, though you may not know it, contains tanks with fish in them) always receives an early call from me whenever I happen to be anywhere in their neighbourhood. By these means it comes about that even those who do not go down to the sea in ships have become fairly familiar with the appearance of the sea-horse and with his mode of life, which he pursues unaltered—being indeed a sluggish and phlegmatic brute—in a shallow basin as in the open Mediterranean.

In general shape, as you see, the hippocampus bears a striking resemblance to the knight in a set of chessmen. But instead of a round stand, he has a prehensile tail like a monkey's, by means of which he can securely moor himself to pieces of seaweed or other small objects. This is his usual attitude when not swimming. No. 2 shows a couple of hippocampi so curled together in friendly companionship on a spray of some



2.—A PAIR OF SEA-HORSES, MOORED TO A FUCUS.

focus. One may often observe a dozen or so of them thus intertwined by their tails in an inextricable knot—inextricable, that is to say, till you notice one of them display a nascent desire in his small mind to untie himself. Then you begin to perceive a sinuous wriggling movement in the coils of his tail, which communicates itself by degrees to his slimy comrades. For about a minute the would-be rover is engaged in disentangling his own nether part from the nether parts of his companions; at last, with a triumphant gliding motion, he sets himself free, and begins to swim, half upright, as you see in No. 1, with a sedate and churchwardenly motion, through the water about him. His fins, it is true, vibrate with extraordinary rapidity, like a waving ribbon; in spite of which he moves almost imperceptibly forward, and never goes more than a foot or two at a time in any direction. Though armed with a rather knobby and prickly coat, the sea-horse is exposed by the mere slowness of his gait to the attacks of more active and energetic enemies.

Our European sea-horse, as you can see in these illustrations, makes no pretence at concealment: he moves about undisguised, like an honest gentleman, and can be readily recognised wherever you meet him. But there is an Australian relative of his, the leaf-like sea-horse (known to men of science as *Phyllopteryx*), which is much softer and more palatable in the body, and therefore stands in greater need of protection from predatory fishes. This curious ragged creature, shown in No. 3, has its tail and fins provided with irregular long waving appendages, exactly resembling in form and colour



3.—AUSTRALIAN SEA-HORSE DISGUISED AS SEAWEED.

the sharpest-eyed enemy to pick it out from the fronds it so closely resembles. The tint, in particular, is absolutely identical.

How does this quaint resemblance come about? Probably in this manner. All the sea-horses of this kind which could be discovered by enemies for many ages have been assiduously eaten. If every one of them had been eaten, however, the species would now be extinct: and this is really what has happened over and over again to many species in the sea, as it has happened on land in our own time to the American bison, the great auk, the moa of New Zealand, and several other creatures. But if any sea-horse of this more threatened class happened to resemble the seaweed in which it lived, either in form or in colour, or in both, rather more than the rest of its kind, it would stand on the whole a somewhat better chance of not getting eaten, and would on the average leave more offspring than its less protected fellows. Thus, from generation to generation, as enemies poked their noses into the tangled weed in search of food, the tendency would be for the more seaweed-like to escape and mate, while the less seaweed-like were detected and eaten. This is what we call "natural selection," or "survival of the fittest." The result would be that the protected, mating always with the protected, produced young like themselves, and that

out of their offspring the ones least like seaweed would still oftenest get devoured, while those most like seaweed still escaped.

The leaf-like sea-horse is a simple case of what is now known as *protective resemblance*. A very similar instance is that of the so-called skeleton

the seaweed in which it lurks. In the drawing, to be sure, Mr. Enock has represented the fish rather isolated, so as to let you clearly distinguish it from the neighbouring weeds; but you can easily understand that in nature, when it is lying hid in a knotted mass of such seaweed among the overgrown rocks at the bottom, it must be very difficult for even

shrimp, which also moors itself to bits of seaweed, and looks just like the plant it clings to. But the same sort of thing occurs on a large scale among the entire group of animals inhabiting what is called the Sargasso Sea. This sea is a belt of the Atlantic near the Azores, where great masses of a particular tropical seaweed, known as

sargasso-weed, mat together so as to form perfect floating meadows, and often even impede the navigation of vessels. The weed is pale yellow in hue, and is inhabited by vast numbers of small marine animals—crabs, prawns, and the like—all of which are protectively coloured exactly like the weed on which they live. I have often had a bucket of sargasso-weed fished up for me by the sailors when crossing this sea, and have amused myself by trying to distinguish the numerous little beasts among the almost similar berry-like knobs of the sargasso in which they lurked.

In the case of the Australian sea-horse and of the crabs and fish which inhabit the sargasso-weed, however, the imitation is quite general. My next example will be of a more specialized kind. No. 4 represents a butterfly of a species peculiar to the Malay Archipelago, and known as a Kallima. That is how it looks while it flies about coquetting in the open sunshine, displaying its brilliant hues, and seeking to attract the attention of its observant mate. Under such circumstances, it is a beautiful creature: its wings are dark brown at the tip, and crossed by a bright yellow band; the under wing being blue, with shot hues running through it. A very gallant gentleman indeed the male Kallima appears when thus flaunting his beauty in the tropical sun before the eyes of the ladies of his species.

But let some enemy threaten, some bird pounce down upon him, and the Kallima butterfly has an easy refuge. He need but settle down quietly on a neighbouring bough, and hi, presto! all at once he seems to have put on the cap of invisibility. If you are chasing one of these butterflies, and he alights on a tree, you imagine at first that he has disappeared entirely. And so he has, though only from your vision. At rest, he is indiscoverable. No. 5, if you look close, contains the explanation of this "mysterious disappearance of a gentleman." But you *must* look close if you want to find him out in his ex-

cellent disguise. The branch, you see, has four leaves on it: well, the uppermost left-hand leaf is our vanishing butterfly. The undersides of his wings are coloured and lined so as exactly to imitate the leaves of his favourite bush, on which he usually settles. Mid-rib and veins are all carefully imitated: while the actual body and legs of the insect become quite unobtrusive. Indeed, in real life, the imitation is even more perfect, owing to the addition of colour, than it seems in the sketch, for here you have Mr. Enock's sharp eyes—and I know none sharper—to pick out the creature for you, apart

from all the leaves on the tree it inhabits; whereas, in nature, you would have to hunt it up for yourself among a whole bushful of foliage, all exactly like it.

Residents in London can easily try for themselves this interesting game of hide-and-seek with a vanishing butterfly: for in the vestibule of the Natural History Museum at South Kensington there is a case of animals intended to illustrate protective resemblances; and conspicuous in the case is a large group of these very butterflies, some of them almost impossible to detect among the leaves around them. It is noticeable, too, that similar types of double colouring—for display and for protection—are common in nature. The upper side of the wings is visible only when they are unfolded, and the insect is consciously showing off his charms in the sunshine to his mates: he then desires to look as handsome, as well-dressed, and as conspicuous as possible. But the under side

is shown when he rests with folded wings on a twig; and his obvious cue is then to escape observation. In the one case, he is the gallant at large; in the other case, the fugitive in hiding.

Similar instances of protective resemblance, produced no doubt by natural selection, are now well known in many different classes of animals. The most familiar are the leaf-insects of Ceylon and Java—wonderful green creatures with ribs and veins like those of leaves, so deceptively arranged that, as Mr.



4.—KALLIMA BUTTERFLY, DISPLAYING ITSELF WHILE FLYING.



5.—THE SAME KALLIMA, SETTLED ON A TREE: PUZZLE, TO FIND THE BUTTERFLY.

Alfred Russel Wallace says, "not one person in ten can see them when resting on the food-plant close beneath their eyes." Others of the class imitate bits of stick, with little knots and branches, so that one can only recognise them as alive when one touches them. A stick-insect brought to Mr. Wallace in Borneo so exactly mimicked a piece of stick, covered with green mosses and liverworts, that it fairly took in even that lynx-eyed naturalist. That these protective devices do really benefit the animals which exhibit them there can be no doubt at all: for Mr. Belt saw a locust in Nicaragua got up as a leaf, and absolutely overrun foraging ants, hungry carnivores which devour every insect they come across like a ravening army: yet they never even discovered that the apparent leaf they were walking over was itself a store of good ant-meat. The locust, on the other hand, fully recognised the nature of his immunity from attack, and understood that if he moved a single limb he would betray himself: for he allowed Mr. Belt to pick him up in his hand, examine him closely, and replace him among the ants, without making an effort to escape or a movement to reveal his true nature. This trick of "shamming dead," as it is called, is common among beetles and many other insects.

In most of the cases known to us, such imitations are due to the need for protection alone. Sometimes, however, the tables are turned: animals which prey upon others deceive their prey by posing as something quite harmless and even attractive. Thus the lizards of the desert are usually sand-coloured, so that they may creep up unobserved upon the insects they devour; while in the arctic snows, all the beasts and birds alike are snow-white, because there a black or red animal would be seen and avoided at once by all its possible victims. One of the strangest instances I know of imitation in a hunting creature occurs in Java. There is a type of creature allied to the grasshoppers and known as the Mantis, many species of which in various countries are specialized into leaf-insects: they are voracious creatures, with long arm-like fore-limbs, which lie in

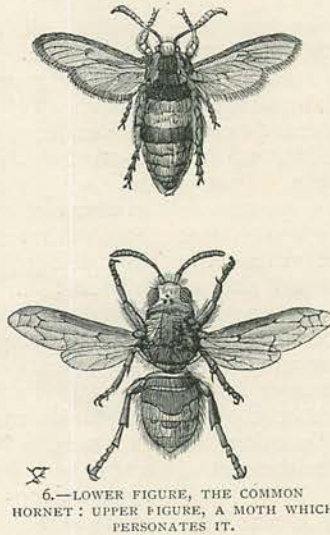
wait for and devour many smaller insects. One such Mantis in Java is coloured pink, and resembles when at rest a pink orchid. The butterflies on which it feeds mistake it for a flower, alight on what seem its petals in search of honey, and are instantly seized by the ruthless hand-like claws and devoured without mercy. As Mr. Wallace pithily puts the case, "It is a living trap, and forms its own bait."

Examples like this lead one on to the still more remarkable group of facts known as *mimicry*. It might almost be called impersonation. A certain number of animals belonging to the most different families have the odd peculiarity of resembling, or as it is oftener called "mimicking," sundry other animals to which they are not really in the least degree related. As before, I will begin with a single good typical example of such mimicry, and when we have thoroughly comprehended its nature and meaning, will pass on to the principles which govern the practice in all similar cases.

No. 6 shows us, below, a specimen of the common English hornet. Now, everybody knows that the hornet is a large red and brown and yellow wasp, very active and irritable, with a nasty, aggressive temper, and an unpleasant way of stinging on the slightest provocation, or none at all for that matter.

Furthermore, everybody who has once been stung by a hornet—as I have been not infrequently in the cause of science—is keenly aware that a hornet's sting bears to an ordinary wasp's the same relation as scourging with scorpions bears to scourging with rods. On this account, hornets are generally let severely alone by birds and other insect-eating creatures. It must clearly be an advantage to the wasps and hornets that they possess a sting: and its chief point is just that—it protects them from attack by possible enemies.

Again, almost all specially-protected creatures, as I mentioned once before in the case of the nasty-tasted and inedible caterpillars, are very brilliantly and conspicuously coloured. The contrasted bands of black and yellow in the common wasp, which render him so easily recognisable at sight, are a familiar instance.



6.—LOWER FIGURE, THE COMMON HORNET: UPPER FIGURE, A MOTH WHICH PERSONATES IT.

Such vivid bands or bright tints have been well described by Mr. Alfred Russel Wallace as "warning colours." The moment we see a bright black-and-yellow-belted insect alight with a buzz on the fruit at dessert, we say at once to the little ones, "There's a wasp! Don't touch him!" This almost instinctive fear which the mere sight of the venomous insect inspires in onlookers is all to the good for him: it serves his end by preventing us from handling or crushing him. Still more do the lower animals give such insects a wide berth: a very young and inexperienced puppy, it is true, will sometimes make an imprudent snap at a passing wasp; but the piteous way he licks his tongue afterwards, and the dejected attitudes by means of which he tells us that he is very sorry for himself, show before long that the wasp, though vanquished, has left his mark behind him. That puppy, you may be sure, will never try to snap at another bright yellow-banded insect as long as he lives: when one buzzes about him, he will put his tail between his legs like a wise dog, and retire incontinently into safer quarters.

It is now well known that whenever we find animals belonging to usually sober families, but tricked out in gaudy red or orange or yellow, they are almost invariably protected in one way or another—are either venomous, or stinging, or nasty to the taste, or else possess, like the striking black-and-white-banded skunk, the power of ejecting an offensive and irritating odour. A famous instance of this conjunction of inedibility and brilliancy is "Belt's frog." In Nicaragua, that close observer Mr. Belt found a small kind of frog, gorgeously arrayed in crimson and blue, and swelling about like King Solomon in all his glory. Frogs of this dazzling sort were extremely abundant in Nicaraguan woods, and never made the slightest attempt at concealment. Now, it is the common habit of land frogs, all the world over, to be protectively coloured with brown or green, according as they haunt most the ground or the foliage of trees. The common little tree-frogs so abundant in most warm climates, for example—every visitor to the Riviera must know them well—are either a brilliant grass-green, to imitate the foliage to whose underside they cling by their sucker-padded feet, or else are mottled with grey and white and brown, to mimic bark, dead leaves, and lichen-covered branches. So Mr. Belt felt convinced that his Nicaraguan frog, which behaved so differently from the rest of its kind—which was so brilliantly dressed

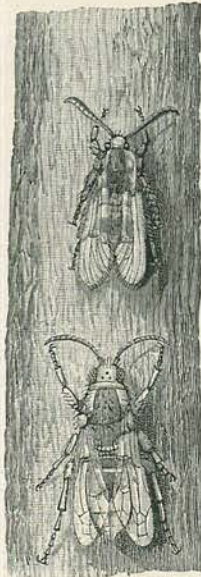
and never tried to hide itself—must be venomous or inedible. He tried the question by giving a few frogs to his fowls and ducks: the wary birds looked at them suspiciously, put their heads on one side, and refused to touch them. At last, by throwing a single frog down unobtrusively among pieces of meat for which the ducks were scrambling, he managed to induce a young and inexperienced duck to pick up the creature. "Instead of swallowing it, however, the duck instantly threw it out of its mouth, and went about jerking its head as if trying to get rid of some unpleasant taste." I have myself experimented in the same way on some brilliantly-coloured slugs, which cover rocks in the open, and can add my personal testimony to that of Mr. Belt's witness, the incautious duckling.

But I am wandering from the question. Let us return to our pictures. The upper insect in No. 6 represents, not a hornet or relative of the hornets, but a moth, deceptively coloured so as to mimic and suggest the hornet kind. Bees and wasps, being species that enjoy immunity from attack, are naturally very much imitated by other insects. The whole family to which this imitation hornet belongs, indeed—that of the clear-wing moths—seems to have laid itself out on purpose to personate the wasps and bumble-bees, for almost every species is an imitator of some particular species of stinging insect. Of course the moths are themselves quite harmless soft things: but they *look* like wasps or hornets, and that is enough to protect them. They produce their effect in a very odd manner. Most moths, as we know, have feathery wings, covered with a fine powder of dust-like scales; but the clear-wings have got rid of the scales, so as to resemble wasps and bees with their membranous wings; and it is this peculiarity in their structure which gives the common English name to the family. Not only, however, are the wings transparent, but the bodies also are shaped much like those of wasps and hornets, and are conspicuously banded with red and yellow. The antennæ, too, are made as wasp-like as possible. The clear-wings fly about rapidly in the open sunshine, and their flight resembles that of wasps and bumble-bees, according to the model selected for imitation by each species. Indeed, the resemblance is much greater in real life than in Mr. Enock's sketch, because the colour is so deceptively similar. No ordinary person who saw a hornet clear-wing would dare to put his hand upon it,

even if told it was harmless: naturalists themselves look twice before they venture incautiously to finger a doubtful specimen.

The hornet clear-wing is a great frequenter of poplar trees, in the wood of which the larva burrows; and in No. 7, Mr. Enock has shown us the same two insects again, at rest on the bark of a branch of this favourite food-tree. As before, the hornet is still below, and the moth above; but in this instance, even without the aid of colour, the deceptive resemblance becomes still more conspicuous. If, while the moth is thus sitting in the sunshine on a trunk of poplar, you try to touch its body, it will perform one of those curious "terrifying" evolutions which I have already described in so many insects. It will curve its back, and dig once or twice into the bark with its tail, as if it had a sting and meant to use it. This queer habit puts a finishing touch to the clever deception; and the consequence is, that the hornet clear-wing is seldom molested by birds or other inquisitive strangers. The imitation pays: it secures the little mimic from undesirable intruders.

Still stranger and more immoral is the gross case of impersonation for purposes of burglary, illustrated in No. 8. Here we have, below, a great burly bustling bumble-bee, and, above, a particular fly, named *Volucella*, which dresses itself up to imitate the bee in indistinguishable hairs and colours. And it does so for a very curious and treacherous object. The grubs of the fly are parasitic on the grubs of the bumble-bee and wasp: and the female *Volucella* is thus enabled to enter the nests of bumble-bees, and lay her eggs among those of the real owners, whose larvæ the fly larvæ will finally devour. It is true that doubts have lately been cast upon this fact, because the fly which imitates the bee has been seen to enter the nests of wasps: but I do not attach much importance to this objection, which needs even now to be more widely demonstrated. At any rate, these facts remain, that various



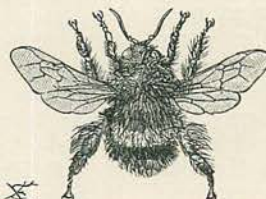
7.—HORNET AND HORNET CLEAR-WING MOTH, ON A BRANCH TOGETHER.

kinds of *Volucella* mimic various kinds of bumble-bee, and that the young of one devour the young of the other. For my part, I say confidently, a clear case of loitering under disguise, with intent to commit a burglary.

The case of the bumble-bee and the *Volucella* fly is an excellent example also of the extent to which alone mimicry is possible. I said above that animals of quite different families mimicked one another: and you can see for yourselves here just how far the imitation goes, and where it fails. For the bees have *two* pairs of wings each, folded one slightly under the other; but the whole group of flies has practically only one pair, the second or hinder pair having dwindled away to a couple of slender little "poisers," or "balancers," which you can see sticking out from the side of the upper figure in No. 8. Now, the fly couldn't easily re-develop these stunted and almost abortive wings to the primitive size, as one sees them in the bumble-bee; so what did it do? Made the one pair of front wings look like two pair, by means of a notch half-way down the side, as you may see by comparing the two figures. 'Tis ever thus. The disguise is always external only; it affects nothing but outer appearances, leaving the internal organs and underlying structure of the beast unaltered. So, when a savage dresses up in the skin of a wild animal, in order to approach others of the same kind without being noticed, his disguise is external only:

peel off the skin, and in essentials, beneath, he is human. It is the same with mimicry. Visible parts undergo modification: invisible parts are never altered. A legend of the stage tells us of a thoroughly conscientious actor who blacked himself *all over* to play Othello; nature is content with blacking the face and hands like the ordinary unconscientious player.

In No. 9 you see the same two insects, the bumble-bee and the *Volucella* fly, feeding side by side on a head of Dutch clover. (You remember its trick of tucking away the



8.—LOWER FIGURE, BUMBLE-BEE: UPPER FIGURE, FLY WHICH IMITATES IT.

fertilized blossoms.) Both are sucking honey; and it takes a keen eye to distinguish them. But lest family quarrels arise over the question, I will say that the bee is to the left, the fly to the right. These are only a few stray examples out of the numerous insects which imitate bees, wasps, and other stinging species. Often enough, indeed, I have seen ladies scream at the approach of a perfectly harmless fly, because he came to them in wasp's clothing. The drone-flies, which imitate bees, do it so well that even spiders are taken in, and treat them with caution as if they had stings.

Mimicry is not wholly confined to the smaller animals. It occurs, though sparingly, higher up in the scale of being. There are several venomous snakes, for example, in tropical America, conspicuously arrayed in alternate bands of red and black, or red, black, and yellow, which are clearly warning colours. They mean, in effect, "Let me alone, or I sting you." Now, in the same region, three genera of unarmed and harmless snakes mimic and personate the various species of venomous banded snakes, so that it is often impossible to distinguish one from the other except by killing them. Naturally, snake-eating birds and mammals follow in such cases the familiar principle of the British jury, and "give them the benefit of the doubt." A few defenceless birds likewise imitate pugnacious and powerful ones, and so secure immunity from the attacks of enemies.

How did these mimicking species arise? It was that wonderful student of animal life, Mr. H. W. Bates—the Naturalist on the Amazons—who first solved this knotty problem.

He showed that, if a helpless or palatable species of butterfly (to take a particular concrete example) happened even remotely to resemble an uneatable one, it would derive some slight advantage from the resemblance, because birds and other enemies would often be uncertain, and therefore afraid to attack it. As the birds or other enemies grew sharper, by dint of practice, the edible individuals which happened to be least like the nasty species would get detected and eaten; but those which happened to be most like it would be spared, and would breed

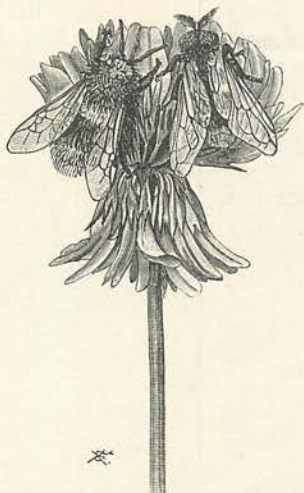
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together, thus handing on their peculiarities to their offspring. Among *their* descendants, again, those which most resembled the protected kind would escape, while those which least resembled it would be spotted and devoured. In this way the imitation would at last become almost perfect, at least so far as externals were concerned, until the enemies were no longer able to distinguish the mimic from the original. Many cases thus present, in Mr. Bates's own words, "a palpably intentional likeness that is quite staggering." Since Mr. Bates wrote his famous paper on the subject endless new instances have been accumulated, and we now know of hundreds of mimicking species, both among insects and other animals, the whole world over.

Mr. Alfred Russel Wallace, who has also paid great attention to this subject, has further pointed out that true cases of mimicry can be said to occur only where five distinct conditions are all fulfilled. To begin with, the imitator and the original protected species must live in the same district; for, if not, the enemies would not know and avoid the protected species: how, therefore, could they mistake the masquerader for it? Again, the imitators are known to be

always more defenceless than the creature they imitate: harmless themselves, they pretend to belong to a dangerous or inedible kind. There is some sense in an antelope dressing up as a tiger, but none at all in a tiger dressing up as a hyena. Once more, the imitating species is always less numerous in individuals than the kind it personates: only rather common and well-known venomous types are ever mimicked—types that everybody knows and avoids—and the mimickers must be relatively uncommon, or else their enemies will soon discover the fraud. It is also noticeable that the mimics always differ conspicuously from their own allies: they have to dress the part, a part for which nature did not originally fit them. Finally, the imitation never goes one mite beyond the merest externals: it is not a real analogy, but a disguise and a fancy dress—a superficial outer seeming.

Actual mimicry of another species, such as we see in these special cases, is the furthest pitch of which protective res-



9.—THE REAL BEE AND THE FALSE ONE; ON A HEAD OF DUTCH CLOVER: WHICH IS WHICH?

blance is ever capable. Between that and the mere general resemblance of arctic foxes, arctic hares, arctic ptarmigan, arctic willow-grouse, and so forth, to the snows in whose midst they live, we get every possible variety of gradation. The general principle involved appears to be this. Where the surroundings are *very* uniform, as among the ice and snow of the po'ar regions, the protected animals are all uniformly coloured—in this case with snow-white fur or feathers. Where the prevalent hue changes, as in sub-arctic lands, the animals may change too, being brown or grey or russet in summer, and white in winter. Where the ordinary tint is slightly varied, as in the desert, the animals tend to be sand-coloured or speckled. The same rule holds good of the sea sands. Excellent examples of this stage are to be seen in the soles and other flat-fish, which imitate on their exposed or upper side the colour of the bottom on which they habitually lie. Everybody who has watched the behaviour of soles in an aquarium must have observed not only that they are hard to distinguish, when at rest, from the sand on which they repose, but also that, in order to increase the resemblance and conceal from foes the outline of their shape, they have a canny way of flipping a little loose sand with a wave of their fins over the edge of the body every time they settle down again after a short swim. Soles frequent sand, and are therefore of a brownish sandy tone of hue; dabs or flounders, which lurk in mud, are more uniformly mud-coloured; plaice, which affect pebbly banks, have a variegated pattern, interspersed with red spots, to imitate coloured pebbles; and turbot, which belong to somewhat greyer tracts, are vaguely grey and spotty, with raised knobs scattered over the surface to make them look like the rough ground about them. All, however, are white on the under side; because, when they swim, the white makes it more difficult for an enemy below them to recognise them against the general shimmering glare on the surface of the water, as you look up at it from the bottom.

Every swimmer must have noticed as he dives how dazzling white this surface seems when observed from below.

In woods, forests, tangled brake, jungle, copses, hedgerows, thickets, and so forth, the surroundings are much more varied, and the protective resemblances therefore become somewhat more complex. A simple case of this more special kind is that of the great cats, whose colours differ exactly in accordance with their lairs. The lion, a desert beast, is simply sand-coloured; the tiger, a jungle beast, frequenting tracts overgrown with bamboos and other big yellow reed-like grasses, has up-and-down stripes, which render him difficult to perceive as he creeps upon his prey among the up-and-down lights and shadows of the pale straw-coloured dead grasses in his favourite ravines; while the tree-cats, such as jaguars, ocelots, and so forth, are spotted or dappled, because the spots make them more difficult to recognise among the round lights and shadows in their native forests. Spotted deer and antelopes also belong to forest regions; while almost all of those with vertical stripes are constant frequenters of deep grasslands.

Smaller creatures go yet a step further: they imitate not merely the general effect, but particular objects in their surroundings, such as leaves, sticks, bits of moss, and lichens. Certain greyish moths, for example, pretend to be bird-droppings; while many spiders fold themselves up in the angle between a leaf and the stem, and masquerade as buds, on the hunt for insects. A group of plant-bugs cover themselves all over with thin threads of white wax, which they secrete themselves; and they are then mistaken for fragments of wool, rubbed off and left behind on the bark of the tree by some passing animal. Caterpillars and grubs are particularly given to this class of deception: and, considering how ruthlessly they are persecuted by birds, the sternest moralist can hardly blame them. No. 10 represents one such typical specimen: the ingenious larva of the swallow-tail moth, pretending for all he is worth that he is a twig of ivy. The branch to the right is the

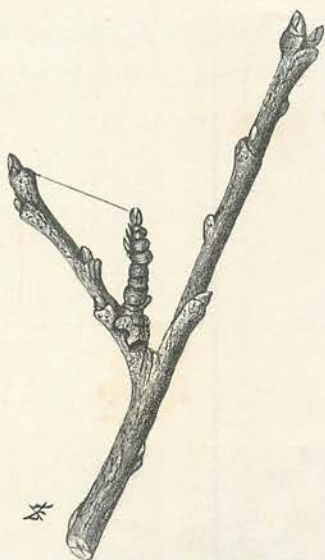


10.—CATERPILLAR OF THE SWALLOW-TAIL MOTH, PRETENDING TO BE A TWIG OF IVY.

real twig: observe its buds and the scars at the bases of the fallen leaf-stalks. Then look at the twig to the left, which is really the caterpillar, with form and colour cunningly devised to imitate exactly the true twig beside it. He holds on by his hind legs, and sticks his body out from the stem, in a rigid attitude, at the appropriate angle; a knob on his side mimics the scars of the fallen leaves, while the turn of his head and neck exactly reproduces the terminal bud on the real ivy-branch. This admirable insect-actor, Mr. Enock tells me, has often imposed even on the artist who here paints his portrait.

A slightly different specimen of the same class of deception is given in No. 11, which is the likeness of the caterpillar who turns into the thorn-moth. Only a very keen eye can detect a well-disguised grub like this on a knotty branch of its native food-plant.

No. 12 is a common example of the group of stick-insects, allies of the grasshoppers, crickets, and locusts, a tribe among which the resemblance to leaves and twigs is carried further than in any other instance. This particular stick-insect does not look very much disguised in the sketch, it is true; but then, you must remember that colour counts for half the battle in all these cases; and I have not yet ventured to ask for coloured illustrations. I know the stick-insects well, however, in many parts of the world—I was "raised" on them in Canada—and I know that they are often most difficult of detection. Sherlock Holmes himself would sometimes find them very hard cases. It has happened to me more than once to stand gazing for some minutes into a



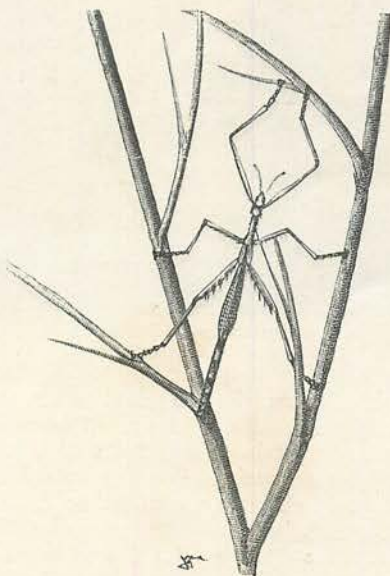
11.—CATERPILLAR OF THE THORN MOTH, PRETENDING TO BE A TWIG OF HAWTHORN.

bush in search of them, and find none: suddenly, a slight movement somewhere would arrest my attention: and then, all at once, the twig at which I had been gazing with rapt attention would get up and walk away in the most leisurely and lordly fashion. Stick-insects are slow and inactive creatures: they sleep by day, and wander forth by night to feed on leaves, for, like Mr. Bernard Shaw, they are strict vegetarians.

Only those who have looked close into tropical jungles or into English hedge-rows, with long and careful scrutiny, can realize the large part which such disguises play in the balanced and complicated scheme of nature. Un-

observant people are apt to disbelieve in them. For, naturally, unobservant people see only the obvious: most of the birds and animals they know are just the protected minority which have bright warning colours, or are courageous enough and strong enough to dare to be conspicuous. But the world about us teems with unobtrusive, skulking life: and this skulking life, in many ways the most

curious and interesting of all, is unknown save to the naturalist. I hope I may have succeeded here in unmasking the disguises of some few among these countless natural masqueraders, and that a proportion of my readers at least may be led by my remarks to look a little more closely into that glorious and profoundly absorbing panorama which nature unfolds, free of charge, before our eyes every morning. Barnum's show, indeed! Why, nature can give Mr. Barnum, his heirs, executors, and assignees, ninety-nine points in every game, and "beat him, easy"!



12.—COMMON STICK-INSECT, LOST AMONG THE THICKET OF TWIGS WHICH HE IMITATES.