

## **Nature's riddles, or, the battle of the beasts / H.W. Shephard-Walwyn.**

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NATURE'S RIDDLES  
OR  
THE BATTLE OF THE BEASTS  
BY  
H.W. SHEPHEARD-WALWYN  
M.A., F.Z.S., F.E.S.





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NATURE'S RIDDLES

OR

THE BATTLE OF THE BEASTS







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THE LEAF INSECT.



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# NATURE'S RIDDLES

OR

THE BATTLE  
OF THE BEASTS

BY

H. W. SHEPHEARD-WALWYN

M.A., F.Z.S., F.E.S.

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AND OVER 100 ILLUSTRATIONS  
BY THE AUTHOR*

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## INTRODUCTION.

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NATURE is fond of riddles ; she would in great measure lose her charm if she could be read at sight, and required no trouble or thought to explain her actions. What pleasure is there in a riddle that can be answered at once, or in a problem whose solution is obvious ? Now all natural life is full of puzzles, and the very air we breathe teems with problems ; and many of those which at first sight appear the easiest are in reality the most difficult of explanation. Thus we find in Nature's riddles an additional charm from the fact that we may guess at the answers, but can never be sure that our conclusion is correct until we have proved it in countless instances, and even then we may have made a mistake—for some of the simplest little facts have taken years of patient study and careful observation to prove. It is often easy enough to hazard an answer, and although we may feel so certain at the time that it is the only obvious one, that we do not give it another thought ; yet, perhaps, years afterwards we unintentionally light upon some little stray circumstance which upsets



all our calculations, and shows how radically wrong was our first conclusion, and we laugh at ourselves for our stupidity as it dawns upon us how necessary it is to sift thoroughly every detail before we can arrive at any definite result.

Let us take as an instance the pretty little heartsease, or "wild pansy," whose tender face, uplifted to catch the sun, lends a peculiar charm to the most uninteresting stubble-field. Perhaps a lover of country rambles may have noticed that this delicate flower has become scarcer in his particular district than it used to be, and he wonders what has caused this disappearance. The casual passer-by does not stop to consider "the why and the wherefore" of the non-appearance of any particular flower, but just puts it down to chance. But surely it is difficult to believe that there can be such a thing as *chance* in Nature. Her works seem too methodical and too wonderful to admit of such a possibility. Not long ago I heard a most interesting lecture by Canon Fowler at a meeting of the Entomological Society of London, in which he set himself to prove that natural phenomena are never due to chance, but are always the results of fixed, set laws, as inviolable as they are wonderful. And he showed this most strikingly in the case of beetles and their means of defence.

Nature never makes a mistake ; often she may



appear to do so, and anyone will admit that such an atrocity as a three-legged chicken, or a calf with two heads, makes the case look very strong against her. But even such an apparent freak has a definite cause, and there was undoubtedly some subtle influence at work which gave that chicken three legs or the calf two heads. Nature knew why she did it, and because we poor, ignorant mortals are too stupid to be able to unravel the complexity of her designs, we put it down to a mistake, instead of setting ourselves to fathom the reason. A chicken with three legs is simply one of Nature's riddles. It is her way of asking, "Why has this chicken got three legs?" The "lords of creation," as we are pleased to term ourselves, need an infinite amount and variety of entertainment, and when Nature does her best to amuse us we "turn and rend" her, and accuse her of making a mistake!

Neither was it a mistake nor a chance that the heartsease disappeared. Nature has just given us another riddle to answer. "Why has the heartsease disappeared?" Now it might result from several causes, as when children and holiday-makers ruthlessly pluck up all the roots. By this means many a lovely plant has been exterminated in a district where it formerly was abundant, to the everlasting shame of those who did the deed. Such

a solution appears simple enough to satisfy most people, and they would only laugh if one suggested that it might depend upon the number of CATS in the district. "What on earth has heartsease got to do with cats?" they will exclaim. "Cats cannot wear the flowers in their buttonholes, and they would hardly want to eat them!" Agreed. But for all that, this *is* very often the reason, as in the case of which we are told by the late Charles Darwin, in his "Origin of Species." And the explanation is clear enough, though it may have taken years of observation to find it. Darwin worked it out, and he found that the heartsease flowers are fertilised exclusively by the common humble bee; and the number of humble bees in any particular district depends a great deal upon the number of field-mice, which destroy their nests and combs. The remaining step is easy, for everyone knows that the number of mice is largely dependent upon the supply of cats in the neighbourhood, and the sudden scarcity of the latter might easily be accounted for by the efforts of a new gamekeeper, particularly zealous to protect his master's preserves. Cats are inveterate poachers, and not a few skins may be found in any keeper's "museum."

This example bears out my meaning when I say that Nature loves to work out elaborate conclusions,



“wheel within wheel,” so to speak, and that often the apparently obvious cause of anything is very far from being the right one. Instances such as this are common in Nature, and the multiplication of them would afford the intelligent observer ample proof to refute the objections of those who would ascribe everything that happens around them to the result of a mere chance.

Now Nature has countless such riddles, which she presents to us at every turn; and there is a vast amount of pleasure and instruction to be derived from even the briefest contemplation of some of her puzzles. I cannot urge too strongly their attractions, or the refreshment to be obtained from even an occasional few minutes spent in communion with Nature—a distraction which the busiest of daily toilers could well afford. Moreover, even those who have studied Nature all their lives find that her all-absorbing interest is ever increasing; and, indeed, the more we know the more we seem to realise how very small the extent of our knowledge really is.

We might divide up Nature's riddles into three classes, and call them, for the sake of distinction, animal riddles, vegetable riddles, and mineral riddles—for the smallest child soon learns that everything the world contains falls under the three heads: animal, vegetable, and mineral. And hence



the above classification seems to be the most suitable ; and as it was my intention to deal only with animal riddles in this work, I will not again transgress by further reference to the beautiful heartsease, or any other of the wonderful vegetable riddles, which would readily fill a volume in themselves. And it is for only one of the many subdivisions even of animal riddles that I intend to solicit my readers' attention. I shall, in fact, confine myself throughout these pages to answering one solitary specimen of Nature's riddles ; and I fear that even this attempt must be at the best very incomplete, considering that it would require a set of volumes about the size of the " *Encyclopædia Britannica* " to give the subject even half the attention that it deserves.

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Part I.

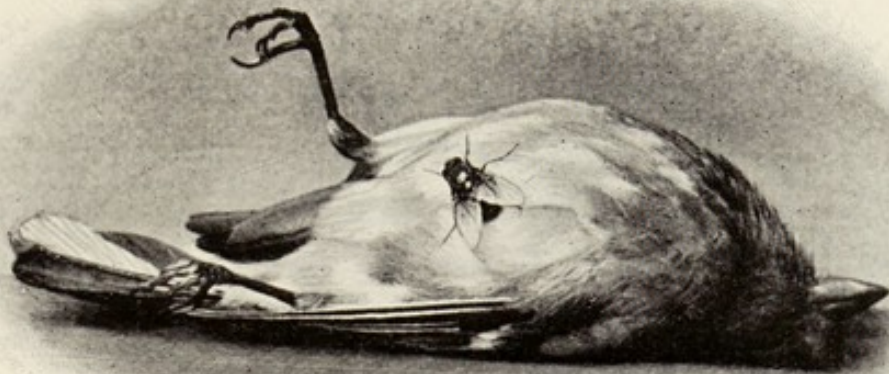
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BEASTS  
AND  
REPTILES









BLUEBOTTLE ABOUT TO LAY ITS EGGS ON  
BODY OF DEAD CHAFFINCH

## CHAPTER I.

### THE STRUGGLE FOR EXISTENCE.

A SPARROW is sitting in a bush outside my study window, watching with jealous eye the antics of a sleek robin which has come in at the open window (as is his custom), and is regaling himself with some crumbs which I have sprinkled for him on the floor; the sparrow follows his every movement with greedy anxiety, and wonders how his rash cousin dare enter thus boldly into the very jaws of the lion. It must be very hard for that sparrow to have to listen to the taunts and jeers hurled at him from time to time by the plump robin in a kind of hysterical twitter, especially as sparrows are themselves so abnormally

quarrelsome by nature! Robin thinks he has had enough crumbs, and, with a little satisfied flap of his wings, he glides on to the back of a chair, and trills forth a soft gurgling melody by way of thanks ;



MOTH ON LAUREL LEAF.

then out he hops with a parting jibe at the sparrow, and flies off, and I know I shall soon see him again in the stable-yard when I give the dog his biscuits, for he is quite as much at home in the kennel as in the house. The sparrow, meanwhile, puffs out his feathers, and tries to assume an injured expression, and while he is

doubtless thinking what an ill-used mortal he is, an unexpected meal comes his way, for out of a bush hard by, with lazily flapping wings, and slow, zigzag flight, proceeds a small moth. A rash moment to take an airing! Better had he lain concealed amid his dark canopy of sheltering leaves until a more auspicious occasion, for, like a shot from a gun, Mr. Sparrow is after him, and although the unfortunate moth puts on full steam ahead, and even succeeds in cleverly dodging



two or three fierce onslaughts, his attempts are useless, and he soon falls a victim to his own foolhardiness. The sparrow carries off his prey in high glee, followed closely by a crowd of his brethren, who have suddenly appeared from nowhere in that extraordinary way that sparrows seem to love ; and I can hear them squabbling furiously on the lawn over the mangled remains of the poor little moth.

An episode such as this might set one wondering how it is that such fragile, unprotected creatures have not long ago become exterminated, beset about as they are on every side by scores of greedy foes. Here, then, is one of Nature's riddles : " How is it that the weaker species do not become extinct ? " The dodo has long since vanished into space, likewise the great auk, and even some of the larger animals are showing signs of disappearing altogether. How, then, is it possible for such a delicate atom as a little moth to survive in sufficient numbers to perpetuate the species ? Nature has indeed set us a poser this time ! And it is this riddle that I shall undertake to try to answer here, and I hope my readers will bear with me if I do not succeed according to their expectations ; but I trust that I may at any rate achieve my object of making them eager to learn more, and to study for themselves wild Nature and her wonderful ways.

The riddle which is now presented for our



consideration is one which few could attempt to answer offhand. Let me repeat it. "How is it that the weaker animals do not become extinct?" Not only is it obvious that this cannot be fully explained without some trouble, but we might at first sight even be tempted to assert that it is fundamentally impossible for such defenceless creatures as the little moths aforementioned to survive for more than a few generations, surrounded as they are by dangers at every turn. "They cannot remain for ever under the shelter of a leaf" is the natural objection, "or they would die of starvation; and if they venture abroad, they are snapped up at once by a sparrow." And still more plausible would this objection appear to anyone who could see the countless enemies that threaten the little moth in its earlier stages—as an egg, caterpillar, and chrysalis—and compass it about for its destruction. But still, "facts is facts," as Sam Weller once observed, and no one can deny that they *do* exist, and have for thousands of generations past; and, indeed, they are very much in evidence on a warm, damp night, as they flutter round the lamp-posts in ever-increasing numbers, in spite of the bats which glide to and fro among them on noiseless pinions, and swallow with a squeak of relish any unfortunates that cross their path. The bat is, in fact, a far more serious adversary than the sparrow, for whereas

the former lives exclusively on moths and flies, the sparrow, not having the same opportunities of catching them, only indulges in one occasionally by way of a *bonne bouche*.

But we must not begin yet to enumerate the various enemies of the poor little moth; we will do so when we come to him in his proper turn. The larger animals must first occupy our attention, then the birds, and lastly insects—for none is exempt from that ceaseless struggle for existence which forms the principal occupation throughout the entire animal kingdom. And, having enlarged somewhat upon this state of universal warfare, I will endeavour to show how Nature has provided even the least of her creatures with weapons or means of defence to meet the occasion.

Now this struggle for existence, to which I have just referred, takes the form of a life-and-death conflict, in which every living creature upon this earth—that is to say, in a state of Nature—from the meanest to the greatest, is engaged; and this combat must continue until one or another proves victorious, or retires—perhaps more speedily than gracefully—down the throat of his rapacious foe! The victor, having digested his vanquished enemy, tries his hand—or, more strictly speaking, his teeth—on the next creature that crosses his path; and so continues his career of slaughter,



until one day, under an unlucky star, swift retribution overtakes him in the form of some strange beast who is too strong for him; and then he in his turn has to pay the penalty for his crimes by experiencing the not over-agreeable sensation of being swallowed.

I made use just now of the expression "in a state of Nature," and I used the term advisedly, intending thereby to distinguish between animals which are naturally and actually wild and those which have become domesticated. The latter must, of course, be excluded in laying down this natural law of universal battle, and for obvious reasons; for domestic animals, after generations of servitude, have practically acquired a different nature, and the natural weapons with which they were originally endowed have, owing to a long period of inaction, become gradually lost, or, at any rate, greatly diminished, and of little use for practical purposes. Such animals, in fact, have become mere chattels or slaves of man, and exist only to gratify his desires and to minister to his wants, their sole object in life being to eat and grow fat, in order eventually to supply nourishment and strength to the hand that fed them. A pitiful existence! Look at the average London tram-horse, as he drags along on his daily round of monotonous misery, often with no higher goal than the slaughter-house, by



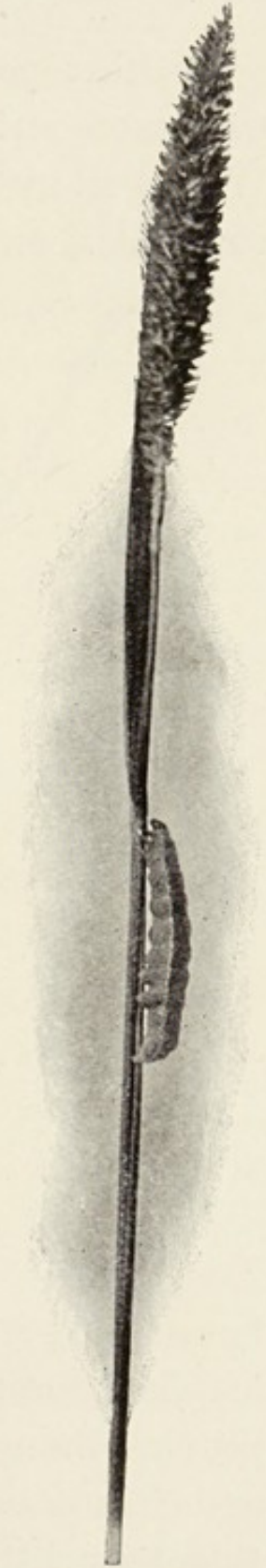
which deplorable fate he will doubtless perform his last act in the service of the masters for whom he worked so nobly and endured so patiently. Surely he deserves a better fate! Look upon him, I say; and it is indeed difficult to recognise that this miserable, ill-used, skeleton-like specimen of lamentable degradation even belongs to the same race as the magnificent creature which, with flashing eye and streaming mane, roams at will over the boundless plains of his native prairie, little recking of curb or bridle, but rather rejoicing in his absolute freedom, and revelling in the consciousness of his perfect strength. Look at yonder patient cattle, plodding along the dusty road on their way to the market. Think you that they shudder as they enter those grim portals, or realise their impending fate? There go a little group of sheep on their way to a similar destiny. At their head is a splendid ram—one of the finest of his race—walking a little in front of the others as if conscious that he is their rightful leader. We may picture him an hour later, quietly awaiting his doom, and we wonder, does he shrink from the fatal blow? Far from it. Calmly he stands upon the scaffold, and waits with a brave unconcern for the henchman's axe to sever his little thread of life. Perhaps in that brief moment he has a glimpse of what he might have been—the monarch

of his native mountain-side, fearless and joyful, springing from rock to rock in the very exuberance of his spirits, or resting among the purple heather, without a thought for the morrow, or a jarring note to break in upon his peaceful happiness. Such he might have been. But, alas! how he has fallen from his high estate. Poor creature of a moment, whose very existence is subject to the caprice of a master who seldom stops to think what he owes to the poor dumb beasts who feed and clothe him, and without whom he could not live! But there he waits unflinchingly. Perhaps that passing vision gives him courage, so that he stands and waits, and cares not for the descending blow.

The domestic animal, of whatever sort or kind, is essentially a product of civilisation, and as all civilisation is in direct opposition to the laws of Nature, the obvious conclusion is that domestic animals are entirely unnatural creatures, and hence it is perhaps as well to exclude them altogether from this discussion, and to bring under consideration only such animals as may be said to be in a primitive state of Nature. And I think we shall not be far wrong in making the assertion that all *natural* animals live either to eat, or be eaten by, other animals of their own or different species—in fact, such would only be one of the necessary consequences of that law of universal battle to



which we have already referred. Neither must we draw an arbitrary distinction between these two classes, for many animals indulge in both the operations of eating and being eaten by their enemies; moreover, incredible though it may appear, occasionally the two processes go on at one and the same time in the same individual. An apt illustration of this appeared not long ago in a natural history paper. A naturalist who was travelling in Ceylon, during one of his scientific expeditions suddenly chanced upon a very fine snake, and was seized with the desire to possess its skin. He accordingly followed and shot the reptile, but what was his astonishment on proceeding to skin his prize, to find in its interior a smaller snake with a mouse firmly fixed in its throat! The small snake had evidently been in the act of swallowing its prey when it was itself seized by the large snake, and ignominiously compelled to share the fate of the poor little mouse.



CATERPILLAR  
CRAWLING UP A  
BLADE OF GRASS.



Neither need we go far from home to find an even more striking instance of this twofold process. We are all more or less acquainted with the humble caterpillar, and have often stooped to admire some



THE ICHNEUMON FLY.

*One of the species which  
attack Caterpillars.*

unusually pretty one which we have come across in the course of a country ramble; but some people—though it seems hard to imagine why—entertain feelings of loathing, or even fear, for this poor little innocent creature. I have even seen an Oxford athlete jump upon a chair at the

mere sight of one, which had escaped from its cage and was advancing towards him at a great pace. I consider that there is only one occasion when a man may be excused for giving vent to his emotions at the sight of a caterpillar—when it appears in his cabbage at dinner. Now the caterpillar has a terrible enemy, known by the name of “*Ichneumon*” fly, which has a playful habit of pricking a minute hole in the body of its unsuspecting victim with a sharp “sting” with which it is furnished for the purpose, and in this hole it deposits some tiny eggs, which in a few hours have developed into little maggots, and proceed to feed upon their unfortunate host. The latter, not unnaturally feeling very uncomfortable in the region of his internal arrangements, consumes the leaves of his food-plant with redoubled vigour, thereby unwittingly providing more nourishment for his rapacious devourers !

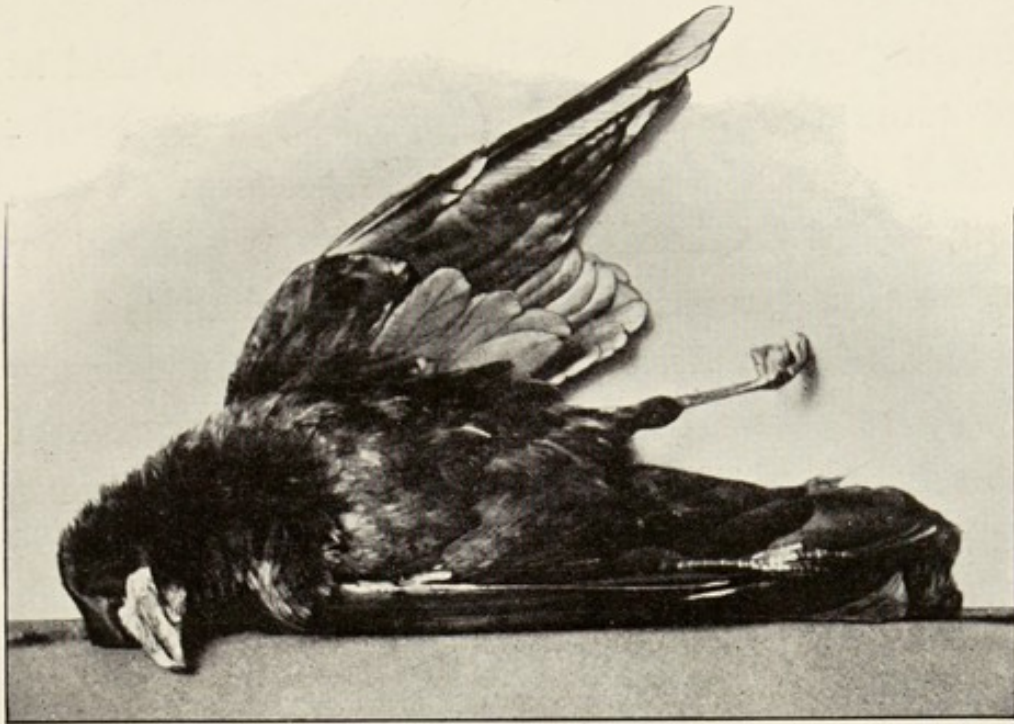
Here, then, is a good example of the dual process of eating and being eaten going on at the same time in the same individual ; and if we go a step further with our little drama, we may suppose that a passing bird catches sight of the caterpillar amongst his native leaves, and promptly swallows him, together with his mouthful of leaf, maggots and all. This is probably an incident of everyday occurrence in our country lanes and hedges ; but if we desire



to make matters still more complicated we may easily imagine that our friend the bird is still smacking his lips over the dainty morsel, when he himself is pounced upon from behind by some active weazel, whose fangs are still in poor birdie's neck when he in his turn becomes a prey to the fell swoop of a powerful hawk; and the latter soars aloft, bearing with him weazel, bird, caterpillar, and maggots, only to fall immediately by the gun of a watchful keeper. And thus the curtain falls upon the last act of this little tragedy of death, which may not have occupied more than three minutes in its entire duration.

True as ever is the old adage, "Big fleas have little fleas upon their backs to bite 'em; little fleas have lesser fleas, and so *ad infinitum*." And, for a practical illustration of these quaint old lines, we have only to examine carefully the body of the next dead rook we find in the fields, and upon it we shall probably discover several of the small parasites with which rooks are usually infested. Catch one if you can—for they are nimble little beasts, and will do their best to evade your fingers—and when you have caught one, take him home, and examine him with the help of a powerful microscope, and you will find upon his little body a still smaller parasite of minutest dimensions—an infinitesimal atom, but a living organism for all





OUR FRIEND THE ROOK.

that! However, in the event of your not being able to find anything of the sort upon his tiny body, go back to the corpse of the defunct rook, and catch a few more of the larger parasites; and if you submit them all to a thoroughly exhaustive examination, the chances are that your efforts will at length be rewarded, and you will find some of the objects of your search, and you may then, if you like, come to the conclusion that the first specimen under examination was too aristocratic to harbour foreign bodies of any sort. (A friend has suggested—during a temporary lapse of his reason—that this would make rather an interesting problem for a mathematician—viz. the rook is flying through the air at so many miles an hour, the parasite is

carcering about over the body of the rook, and at the same time the smaller parasite is disporting himself upon the body of the larger one. What, then, would be the distance per minute covered by the smaller parasite, by the combined aid of the three distinct motions? I would recommend any of my readers who may feel inclined to attempt the solution of this problem to make arrangements for a month's holiday afterwards.)

But we will take another, and perhaps more practical illustration, for the sake of those who have not the leisure or the inclination to hunt for the bodies of rooks alive or dead, or who, perhaps, are not possessed of a powerful microscope, and are unable to beg, borrow, or steal one from any of their friends. Go outside your larder window in the summer-time, and wait until you hear the monotonous buzzing sound that announces the presence of some big bluebottle fly, which is vainly trying to get in through the fine gauze netting, in order to feast upon the juicy viands within. Here comes a fine specimen, dashing himself against the window, in blind fury that anyone should have the presumption to keep him out, and most conspicuous with his glistening wings and coat of metallic blue. But our business is not with him. Let us await the arrival of one of his larger cousins, who is easily to be distinguished



from him by his black body, adorned with grey markings, and is, moreover, often nearly half as big again as most of his blue relations. It will not be long before one of them arrives, attracted by the scent of the supposed banquet. He can easily be caught as he waltzes about over the window; and if you look at him carefully you will observe a cluster of tiny parasites huddled together on the underside of his body, just where the legs are joined to the trunk. Now this fly is itself parasitical in its nature, for not content with laying its eggs upon any piece of meat or dead animal that it comes across, it will also attack the living bodies of poor helpless cattle and farm-horses, thereby raising great swellings on their bodies and driving the wretched beasts nearly frantic with the pain and irritation.

Since, then, the whole animal kingdom is dominated by the sway of an incessant universal warfare, the question might very naturally arise, "How is it that the stronger species do not after a while completely exterminate the weaker ones?" So they would, and that in a very short space of time, too, if it were not that Nature has provided those which have no natural weapons of their own with a wonderful means of protection, calculated to defy the efforts of the sharpest of their enemies. Thus we may almost say that there is another great

law, as universal and effectual as the other which we have noticed—viz. that throughout the entire length and breadth of this vast creation there exists not one single living thing, however small and insignificant, that has not *some* natural means of protecting itself against its would-be devourers. I do not mean to imply that the means is always effectual; far from it. There is an exception to every rule. And in this instance it is necessarily so, otherwise those animals which are by nature wholly carnivorous would speedily die of starvation. But the point of this law is that a much greater number of the weaker animals escape by the aid of their natural weapons than could be the case if they did not possess any defence at all. In the latter case it would be the weaker animals that would be entirely exterminated from off the face of the earth; but as it is, by the wise provision of Nature, although a certain number perish in order to provide food for the larger species, a sufficiently large proportion survives to perpetuate the race.

And it seems that this may account for the fact that in a comparative examination the smaller or more defenceless animals are endowed with a proportionately greater number of offspring. Thus, the elephant during her whole lifetime (which often extends to some 150 years) will have on an average



not more than twelve to fifteen young ones, producing rarely more than one at a birth ; the mare or cow will have some fifteen to twenty, producing one or two at a birth ; the sheep twenty or twenty-five, producing two or three at a birth ; the cat, forty or fifty, with an average of five to seven at a birth ; whereas a rabbit or rat will produce some hundreds in its lifetime, and from seven to twelve at a single birth. And the rate of production of our common mouse is very much larger even than this. (These figures will, of course, admit of a wide margin, but as an average they will be found to be approximately correct.)

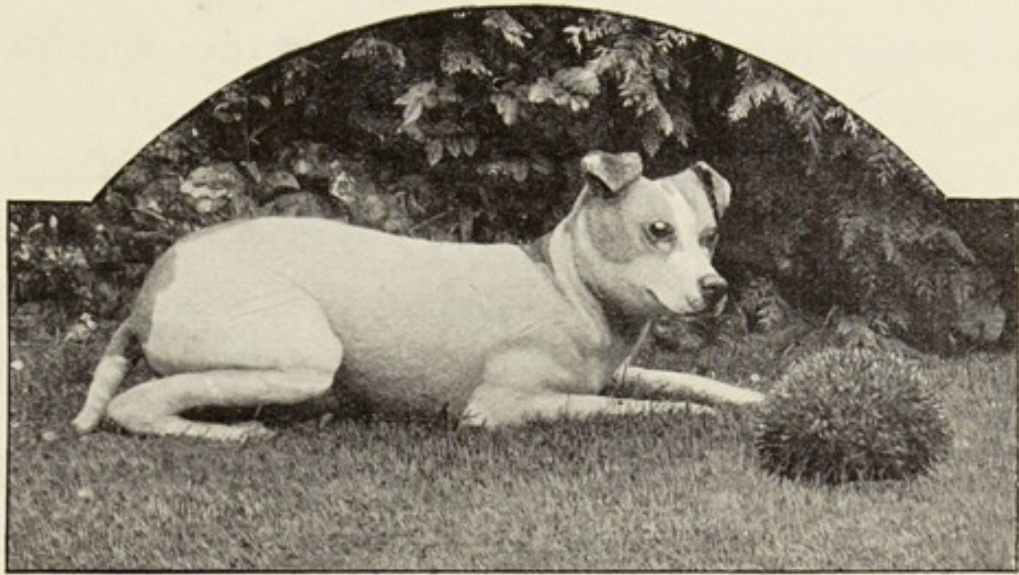
Now this natural law is full of significance, as the obvious result of it is that the smaller and more defenceless species among animals, owing to their proportionately larger rate of production, are thus in no immediate danger of becoming extinct, inasmuch as they can well afford a percentage of their offspring to provide food for the larger animals, without in any way diminishing their own chance of perpetuating their species. If it were not for some such provision it would fare ill with such defenceless creatures as mice—for they meet a foe at every turn, and it is only their enormous rate of production that enables them to continue the battle of life successfully ; in fact, *too* successfully, if the cook's opinion be worth consideration.

We ought almost to say that the house-mouse has become a domestic animal, though not with the consent of the thrifty housewife, who views with horror the macaroni in her storeroom riddled by his sharp teeth, or the mark of a treacly tail upon her immaculate shelves. The little house-mouse casts himself upon man's protection, only to be met at every corner by traps or cats, not to speak of those whose existence is summarily ended by a stern feminine hand which occasionally claps down the cover on the sauce tureen or some such vessel, into which he has too rashly entered, or seals his fate with a timely smack from the rolling-pin.



WARNING TO THE SAUCY





DOG AND HEDGEHOG.

## CHAPTER II.

### WEAPONS.

LET us now examine in detail a few of the methods by which animals protect themselves from their enemies ; and in so doing we cannot fail to notice at the outset the presence of a fundamental principle, that the higher the animal in the scale of creation, the more elaborate and powerful are the weapons with which it is endowed for its protection. Thus man—the only animal that is possessed of reason—has by far the most effectual methods of escaping from or destroying his enemies. He is the most perfect product of creation, and in him we may consider that civilisation has reached its zenith ; in him also we may notice again the truth of the statement that as civilisation advances, propor-

tionately does the use of *natural* weapons disappear.

Man's original weapons were his teeth and nails, or rather claws, as they were in the primitive savage. The first step in the course of civilisation was reached when he discovered that by standing behind a tree and hurling a large stone at his enemy, he could injure him far more effectively and with less risk to himself. After that, finding that large stones were not always ready to hand when wanted, he constructed flint arrow-heads, which, being not so cumbersome, he could carry about with him, and thus be prepared for any emergency. And so it went on, in rapidly advancing stages, throughout the progress of generations, from the spear of the savage to the catapults and battering-rams of the Greeks, and then the deadly darts of the famous Flemish archers, until the lapse of time ushered in a new era in the annals of the world with the introduction of firearms. Thenceforth inventions followed one another in quick succession, until the climax was reached in the present-day mode of warfare, when it would be possible for a general to sit in his easy chair smoking his cigar, and, by pressing a button, to cause thousands of his fellow-creatures to be blown into eternity. Before the days of torpedoes and lyddite shells, war was war, and deserved the name; and terrible though it



undoubtedly often was, it was not characterised to the same extent by the wholesale destruction that it entails in these days of enlightenment and progress. And here it may be worthy of notice, that the genus "homo" is the only species in the whole animal world that is not content with slaying his enemies in fair hand-to-hand combat, but must devise means for slaughtering hundreds at a blow.

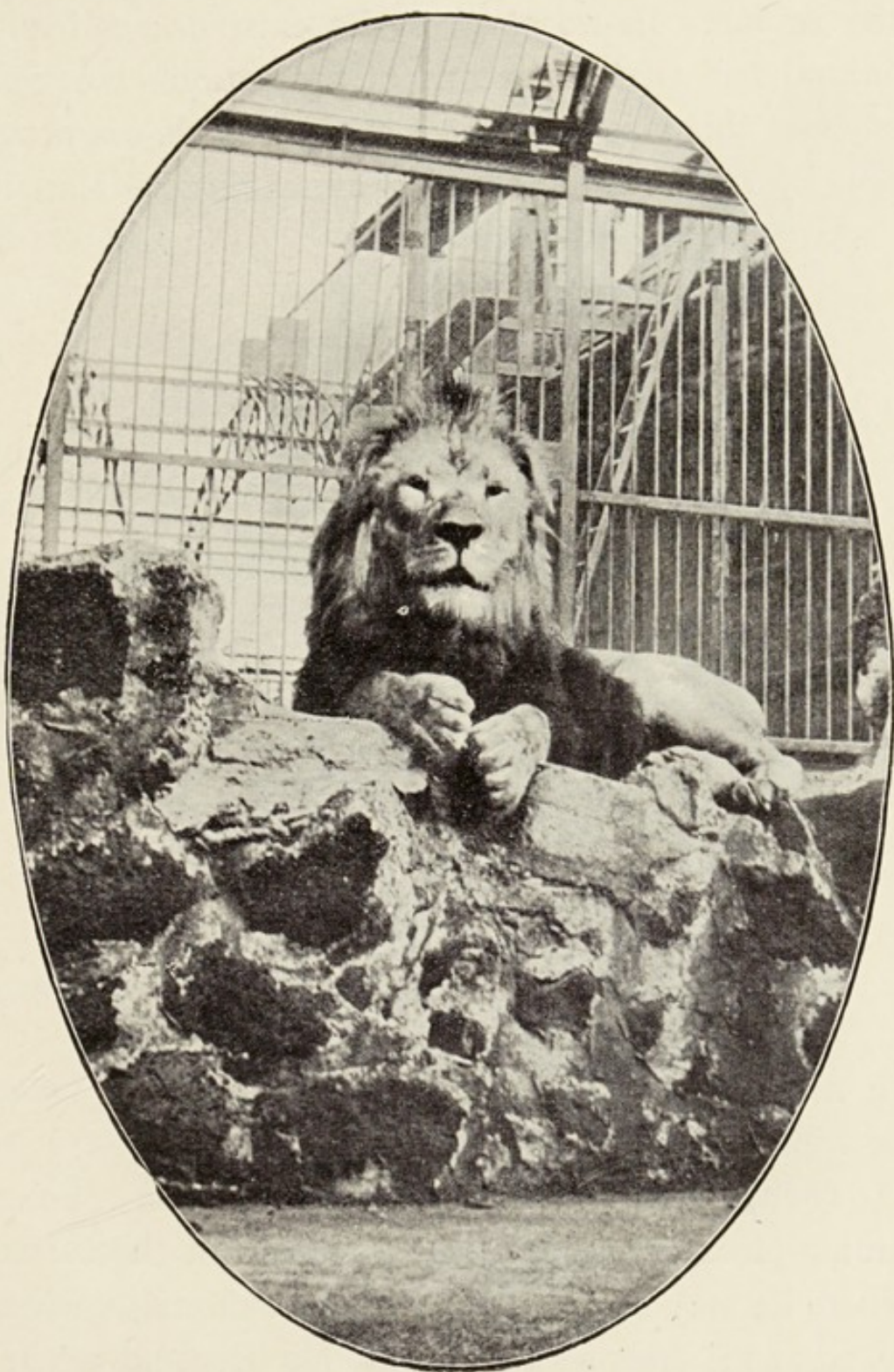
So much for man and what reason has done for him. But the lower animals, being denied this great power, have perforce to depend entirely upon their natural weapons for protection—weapons which are in some species amply sufficient to overpower any of their enemies. The African lion is rightly named the king of the forest, for what creature is there living that does not tremble at the mere approach of his footstep, or shudder at the distant rumbling of that savage roar? Full well do they know how small would be their chance if matched against that lithe, muscular form, with his powerful teeth and claws and his enormous strength. Or take the elephant, who could almost dispute the supremacy of the forest with the lion himself, his colossal form sweeping everything before it, as he forces his way through the thickest mazes of the jungle, hurling about anything and everything that dares to obstruct his path, snapping in sunder the branches that lie in his way as if they were

matchwood, and tearing up by the roots the very trees of the forest! What need has he for fear?

All beasts, however, are not so fortunate, and it is but few that are endowed with the muscles of the lion or the strength of the elephant. We do not now live in the good old days when it would have been impossible to go out for a constitutional without running the risk of suddenly disappearing bodily down the throat of some gigantic lizard a dozen yards long, or of being chased by some uncouth monster whose rate of locomotion would put our fastest expresses to shame.

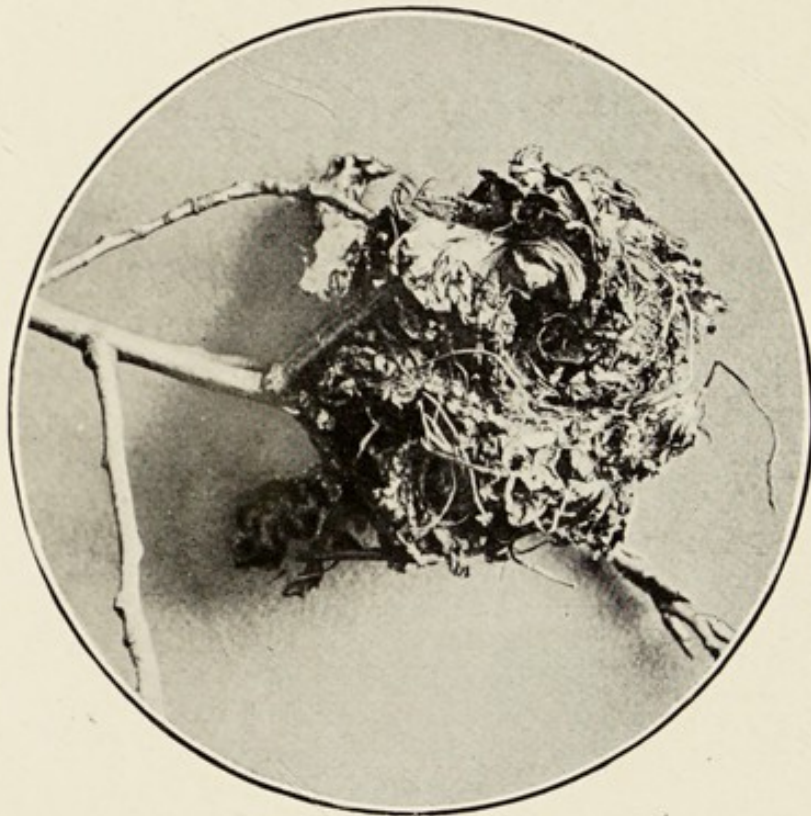
But we shall see that there are other methods of protection quite as useful as mere muscular strength. For example, the deer tribe are gifted with marvellously keen powers of scent and exceptional fleetness of foot, so that the timid hinds, which are not furnished with the mighty antlers of their more fortunate mates, may browse together in peace; for the wind will bring them due notice of the approach of an enemy when he is yet some way off, and the swiftness of their pace will easily convey them to a place of safety when once the timely warning has been given. It must not be forgotten that I am, of course, treating only of animals under strictly *natural* conditions, thereby precluding the possibility of the deer being suddenly laid low in the dust by any such unnatural





THE KING OF BEASTS.

harbinger of death as a leaden bullet speeding across the ravine. In no stage of its existence can any animal feel that its means of protection—however efficient this may be against other animals—is proof against the superior cunning of mankind. Man is



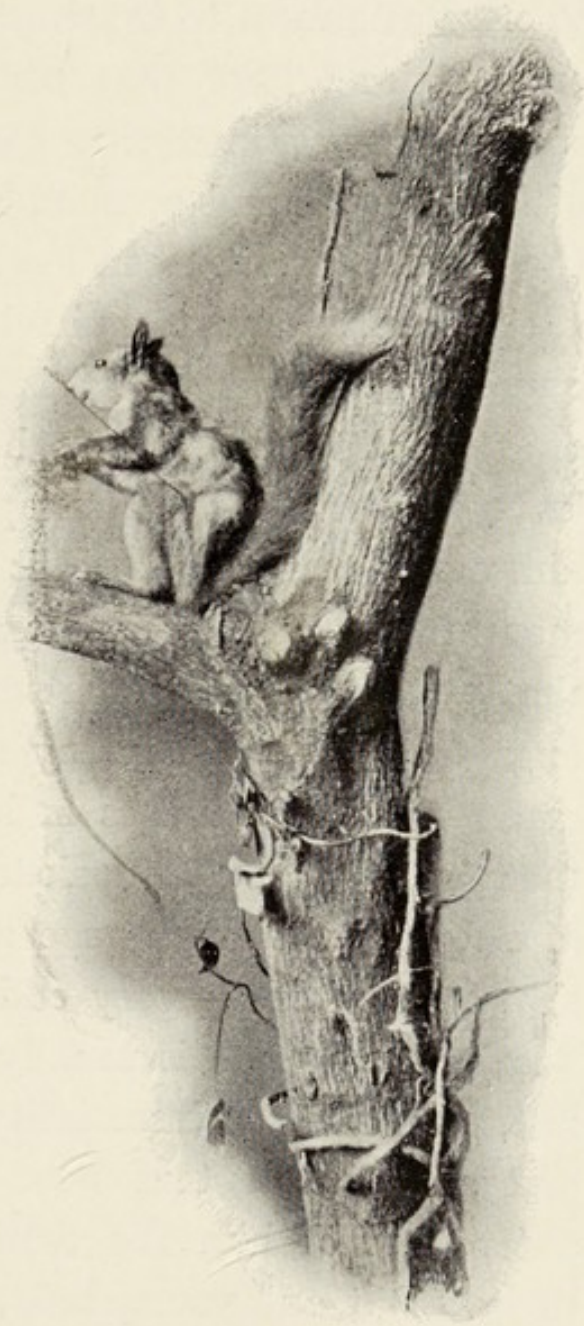
DORMOUSE'S NEST.

an utterly unnatural enemy, and as such he must be considered apart.

Then, again, there is the fox, who has a snug hiding-place deep down in the bowels of the earth, where he may lie securely during the daytime, when most of his enemies are about, for he usually ventures out on wickedness intent at night, when he



is not so easily seen, and can roam about in comparative safety. Or the Dormouse, which hides her young in one of the beautiful structures shown in the illustration. Or we might take the nimble little squirrel as an example of an animal that owes its immunity from danger to its own agility. Who has not watched this pretty denizen of our country woods disporting herself amongst the trees, and springing from bough to bough, with scarcely an effort? She is as much at home and as supremely happy among her native branches as is the rabbit below her, which gambols about under the rich festoons of bracken. Try to catch her if you can! You



STUFFED SQUIRREL ON  
HIS PERCH.

might as well try to catch the swallow that circles around yonder pool, at times flashing past so close as almost to brush your face with his wing ; or the timid hare that comes bounding by you, stopping for an instant to gaze in astonishment out of her large, round eyes, and then speeding off like the wind before you can look round.

There is a sweet squirrel sitting in an oak-tree opposite my window at this moment in an attitude of astonished expectation ; he has sat there motionless for several months (except when the wind blows him over), staring out of his wide little eyes with a mournful expression of outraged dignity. He was shot by some cruel wretch years ago, and his stuffed form found a place in my study until the moths made incurable ravages in his little coat ; he was then banished to the oak-tree for the delectation of lady visitors, who gaze at him in rapture, and shower upon him every endearing epithet in their vocabulary (which is usually considerable), until at last, puzzled at his immobility, they approach nearer and marvel at his tameness. When they get within a few feet of him the truth usually dawns upon them. But one young lady, very squirrel-like herself, was so carried away by excitement that she stood under the very tree eagerly calling to me to "come and catch the little darling sweet pet, and put it in a dear little house."



Now there is another class which has a most admirable means of protection always ready for use, in the form of a complete suit of armour. I refer to such creatures as the porcupine—or, to come nearer home, to our own vulgar little hedgehog. The latter little gentleman can wander about at his



THE BALL OF PRICKLES.

own sweet will, and rummage about with his grubby little nose in our neatest flower-beds to his heart's content ; but should a dog come along and become too inquisitive with regard to the nature of his movements, or manifest any signs of hostile intent, click ! and with the regularity of clockwork and the force of a steel spring, nothing but a ball of impenetrable prickles presents itself to doggie's disappointed and bleeding nose !

Again, we might quote the tortoise as one of the species which is provided by Nature with a complete

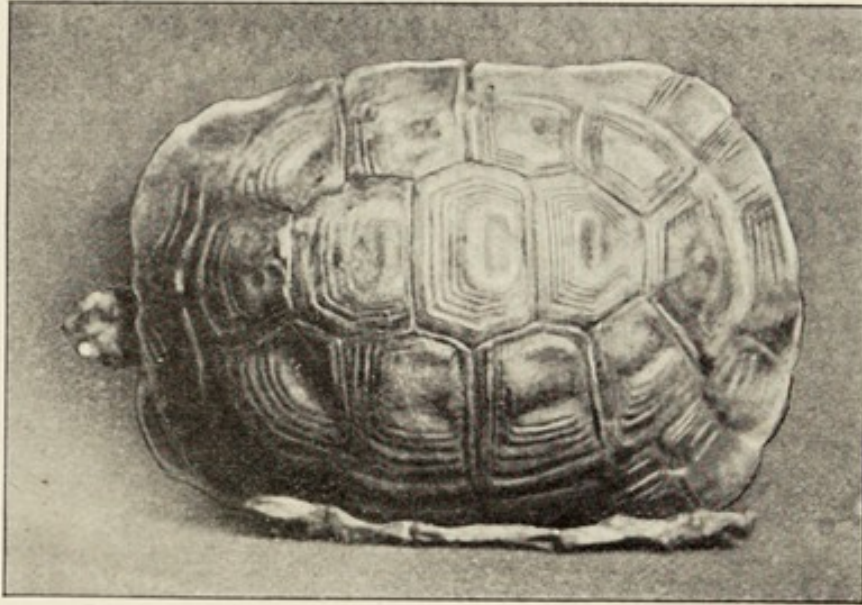
suit of armour, though of quite a different kind from that of the hedgehog, for whereas the hedgehog owes his safety to the bristling wall of prickles with which he is surrounded, the tortoise, on the other hand, has a shell which is composed of plates of horn, tough and impenetrable, almost as though they were of the finest steel, systematically arranged so as to fit in with one another exactly; and the whole thus forms a covering calculated to defy the attacks of his strongest antagonists; add to this the fact that he has the power of drawing in his head and front legs at the first sign of danger, protecting the opening with the latter, which are also hard and horny, and you will realise how absolutely invincible are his means of defence.

To illustrate the extraordinary toughness of a tortoise's shell, I will mention an incident that came within the experience of a friend of mine. My friend was out for a bicycle ride one afternoon, and on approaching an unusually steep hill he dismounted in order to walk up it. In front of him was a heavily laden waggon drawn by two powerful horses, and when half-way up the hill the driver stopped his horses and drew them across the road, as wagoners have a way of doing, in order to rest them. He then produced from the interior of the waggon an object which in the distance my friend took to be a large brick, and this he put under one of the



back wheels in order to take the weight off the horses ; but on drawing nearer the cyclist discovered, to his great surprise, that the object in question was not a brick, but a living tortoise ! On inquiry, it transpired that the eccentric carter was zoologically inclined, and kept the tortoise as a sort of pet ; and, presumably being of the opinion that it was only just and fitting that it should earn its board and lodging, he put it to this most original use. And very interesting pets they are. I had some tortoises myself when I was an undergraduate at Oxford, and I used to put them on the window-sill of my room in college, where they might bask in the sun, as they usually had the sense not to fall over the edge. But occasionally one of them would attempt a suicidal leap from the giddy height, though I never discovered whether it was voluntary or whether the other shoved him over the precipice out of spite ; at any rate, they used to arrive at the bottom safely, as long as they took the precaution to draw in their heads before they reached *terra firma*. However, one fateful afternoon, I found one of them on the ground under my window with a broken neck. Evidently he had misjudged his distance, or forgotten to draw in his head, and therefore had to pay the penalty for his thoughtlessness with his life.

Notwithstanding, tortoises do not always show



TORTOISE'S SHELL.

such crass stupidity as this one ; the monotony of their dull lives is occasionally broken by gleams of intelligence, which show up in stronger relief from the fact of their being so few and far between. Another specimen which I had when I was in lodgings a year later, surprised me once in the summer term by marching complacently into my bedroom about five o'clock in the morning. I used to keep him in my sitting-room, which was on the same floor as the bedroom, and faced west, whereas the latter had an east aspect ; and I had been accustomed every morning after breakfast to carry him across into the bedroom, and put him in the sun, which streamed in at the window, and which he mightily enjoyed. On that particular morning he had evidently arrived at the conclusion—though



it had taken him three or four weeks to do so—that by coming in of his own accord he would be able to enjoy several more hours of the delicious sunshine ; and as I generally left both my doors partly open, he had no difficulty in accomplishing his purpose. From that day forward, with astonishing regularity, I used to hear his thud, thud, as he came bumping along the passage within a few minutes of five o'clock, followed by a bang as his unwieldy body lurched up against the door ; then, if it were not actually latched, he would push it open, and waddle slowly into the room, usually accompanied by my kitten, who evinced the liveliest interest in the proceedings—sometimes rather too lively to be entirely in accordance with the tortoise's sense of decorum. It was quite touching to see his expression of dismay on a cloudy morning when there was no sun ; and on these occasions he would wander hopelessly about the room looking for it, stopping every now and then to cast a withering glance at the kitten, who considerably added to his discomfiture by executing a series of gymnastic feats within an inch of his nose.

The tortoise is essentially a lazy animal, and prefers to lead a thoroughly easy-going life ; moreover, he hates the cold, and at the earliest signs of it he retires under ground and buries himself in the earth until the warm weather returns. In

such circumstances it is not surprising that he should attain to a remarkable age, living often from 80 to 150 years; some have even been known to live as long as 200 years. Moreover, the tortoise, as we all know, is notorious for his slow rate of progress—as, indeed, is hardly to be wondered at, considering the prodigious weight which he has to drag along with him wherever he goes; and for this purpose he is provided with some very strong and well-developed claws, which he uses to propel his unwieldy body along at the average rate (counting stoppages) of about a yard in five minutes, although, if hard pressed, he can move along at quite a brisk pace. I have put in the parenthesis “counting stoppages” intentionally, for, as a rule, the tortoise is a very cautious animal, and after every step he deems it advisable to halt for a moment and reconnoitre in case any unseen foe may be lurking in ambush against him; it takes him quite a couple of minutes to make sure that there is not, and he then proceeds for another step, and so on. We must conclude that this peculiarity in the tortoise is unmistakably a sign of the degeneracy of the times, as there is a story on record—and one with which most of us are probably familiar—of one of his species having beaten a hare in an open race; but then we must not forget that the hare went to sleep for some hours during the race.



My tortoise was once the cause of getting my landlady an undeserved scolding. Every morning when I went into my sitting-room I would discover my music-stool placed in some ridiculous position in the middle of the room, and I expostulated with the good woman who was responsible for my welfare ; but she persistently declared that she never touched it, and, with the habit peculiar to her race, threw the blame upon the cat. But as the stool was one of the old-fashioned mahogany type, and the kitten too young to move it an inch, even in its wildest leaps, she had to give up this position as untenable. But no solution was forthcoming, until one morning when I was sitting at my books, with the kitten sleeping in its accustomed place on my shoulder, I was startled by seeing the music-stool slowly advancing towards me. I remembered having lent my table one evening to a neighbouring Don who was holding a table-turning *séance*, and who recounted to me the next morning wonderful stories of how the table had jumped about the room, but I hardly thought that the stool could have caught the infection ; so I got up in order to ascertain the cause of its activity. And then I found the solution of the problem which had puzzled us for so long, and it lay in the fact that the tortoise, in the course of its wanderings about the room, had contrived to get wedged in under the music-stool,

and continued to plod steadily along, taking the stool with it, until it occurred to it to draw back a step or two and rid itself of its burden. As the eccentric beast evinced a great affection for a thick wool mat which lay under the piano, and had to pass the stool each time he emerged from this resting-place—the stool in its proper position being between him and the light—it was only natural that he should try to take a short cut underneath it. Thus I was able to account for the almost daily phenomenon which had been laid upon the back (figuratively speaking) of the innocent cat.

Speaking of tortoises calls to mind an amusing incident related by that eminent naturalist Frank Buckland in one of his fascinating series called "Curiosities of Natural History," which serves to show how astonishingly limited is the knowledge of natural history possessed by some of our fellow-creatures. Mr. Buckland is relating how he was once travelling from Southampton to London with his pet monkey Jacko, which he was carrying in a lawyer's "blue bag," and a tortoise in one of his coat pockets. "While taking the ticket at the railway station," Mr. Buckland goes on to say, "the monkey Jacko, who must needs see everything that was going on, suddenly poked his head out of the bag and gave a malicious grin at the ticket-giver. This much frightened the poor man,



but with great presence of mind, quite astonishing under the circumstances, he retaliated the insult. 'Sir, that's a dog; you must pay for it accordingly.' In vain was the monkey made to come out of his bag and exhibit his whole person; in vain were arguments in full accordance with the views of Cuvier and Owen urged eagerly, vehemently, and without hesitation (for the train was on the point of starting), to prove that the animal in question was not a dog, but a monkey. A dog it was in the peculiar views of the official, and 3s. 6d. had to be paid. Thinking to carry the joke still further, I took out from my pocket the tortoise, and showing it, said, 'What must I pay for this, as you charge for all animals?' The employé adjusted his specs, and withdrew from his desk to consult with his superior; then returning, gave the verdict with a grave but determined manner. 'No charge for them, sir; them be insects.' "

I remember another story from the pen of the same author, on the subject of tortoises. "I once met a man in Oxford Street" (I quote Mr. Buckland's own words), "who was wheeling a barrow full of tortoises of different sizes. He said he had bought them from the captain of a ship then in the Victoria Docks as a speculation, and that the captain had got a cargo of them. In order to get customers he assured the passers-by that they were

'capital things to keep the kitchen clear of black-beetles.' This was simply untrue, for this kind of tortoise is purely a vegetable eater. However, he sold not a few to those who believed him. He told me that the tortoises were brought over on trays fixed inside the ship, and that the captain had many thousands of them. I bought the largest of the lot, and took him home on the top of an omnibus, the driver of which evidently had not had a zoological training, for he could not make out the nature of my prize at all. After patiently hearing my lecture on tortoises in general, he relapsed into silence; then suddenly stretching out his hand, asked for the tortoise. I gave it to him, and he weighted it—or, as a countryman would say, 'hefted it'—as the housekeeper does her goose when she is choosing her Christmas dinner. At length he returned it to me, with the remark, 'I wonder, sir, how it would eat b'iled with sage and ineons'?"

Enough of the tortoise. Before passing on to another class of creatures, I will mention another most excellent device to which animals sometimes resort for protection. Certain animals have a power of emitting a fearful stench on the approach of a foe, from which any self-respecting creature would be glad to keep as far as possible. We have a modified instance of this in our English badger; but a much more striking example came under my



notice in an article in the *Zoologist* (vol. v., p. 54) by Alwyn C. Haagner, describing the artifices resorted to by the South African polecat. Mr. Haagner writes: "I have seen this animal chased by dogs, and no sooner did they get near the polecat than it halted, humped up its back, emitted a sort of purr, raised the long hair on its back, and phew! the dogs made off in the opposite direction, howling dismally. Sportsmen friends of mine tell me that dogs do attack this animal. In this case they have another trick to fall back upon—that of feigning death. Here the smell always present in the animal must assist in completing the delusion. I have myself seen one, on getting timely notice of the approach of dogs quietly stretch itself out and feign death, allowing the canine enemy to approach quite close and even smell it. The dogs in this case do nothing but walk away again."

## CHAPTER III.

## PROTECTIVE COLOURING.

NOW this is all very well. In such instances as we have already considered the animals are very efficiently protected against would-be marauders or disturbers of the peace, but what about those defenceless creatures that are not provided with teeth and talons or ready-made coats of mail, and have no hiding-places to flee to, or agile limbs to take them there, or even an artful subterfuge like our friend the polecat? Surely one would be ready to think that such creatures would soon become extinct, and the race be utterly stamped out. Quite the reverse. Paradoxical though it may seem, their very immunity from danger lies in the fact of their utter defencelessness. Their safety is ensured by means of an optical illusion, and, moreover, slender though the thread may appear upon which the life of such a creature hangs, yet its chances are as good, if not better, than that of the tiger or the hedgehog. Their safety, in fact, consists in their natural colouring, which so exactly



resembles their surroundings that the most careful eye might easily pass them over and not notice the presence of the animal at all. In illustration of this, let my reader drop a penny upon the earth without noticing where it falls; and unless by some lucky chance his eye happens to light upon it at once, he may search for some time before he discovers it, although it is lying flat and uncovered upon the bare earth, so precisely does its colour resemble the ground upon which it fell. If he should fail to find it altogether, so much the better, for he will then be particularly well able to realise the great truth of this natural law.

And here we have an instance of how man, not content with all his latest inventions for war appliances, has himself taken a leaf out of Nature's book, and accordingly arrays himself in khaki clothing when he sallies forth against the pugnacious Boer, having discovered at last that he is less visible to the experienced eye of these hardy warriors if he clothes himself in accordance with the sandy tints of his surroundings, instead of making himself as conspicuous as possible in garments that stand out in strong relief against the dry grass of the veldt and the rugged boulders of the hillsides.

Now it is this protective colouring that affords the only means of safety to many species in the

animal kingdom which, without its assistance, would speedily be exterminated. What chance, indeed, would the timid, defenceless rabbit have against his numerous enemies if it were not that he is exactly the colour of the earth upon which he crouches? True enough that Bunny has a hole to run to if danger should threaten him, but then he cannot be expected always to remain within a yard or two of his hole; and even a rabbit may occasionally conceive a desire to wander abroad in search of "fresh woods and pastures new." And when thus engaged he would have some difficulty in regaining his hole in time if he should be suddenly attacked by some foe fleetier than himself. Then there is another point about this little friend's equipment which is worthy of notice. Have my readers ever observed that Bunny is completely brown all over with the exception of the underside of his tail, which is pure white? The explanation is simple enough. A number of rabbits are out feeding at no great distance from their holes, their sombre hues rendering them equally invisible to friends and foes alike. Suddenly one of the keener-eyed members of the fraternity spies danger. Off he scampers to his hole, and his little white tail bobbing up and down instantly attracts the attention of the others, thereby signalling the needful warning; more white tails are set in motion, and



the alarm spreading with amazing rapidity, the entire community are probably safe in their holes before the threatened danger can overtake them.

“Why has a rabbit got a white tail?” was a question that I set in a general paper for a class of boys at Winchester not long ago. Some of the answers were funny enough to tickle even the most solemn of pedagogues. One boy ventured the opinion that it was “in order to distinguish it from a hare.” That youth, needless to say, was London born and bred, and his knowledge of rabbits in an unskinned state was probably practically limited to the poulterers’ shops. Another, and a more precocious youngster, wishing to disguise his ignorance, tried to evade the question by asserting that “all rabbits have *not* got white tails.” I repeated the question to a gentleman well known in sporting circles with whom I was dining that evening. “The reason is obvious,” was his reply. “Of course a rabbit is provided with a white tail in order to give us a mark to shoot at!” “Where every prospect pleases and only man is vile,” I soliloquised, as he applied himself (rather more vigorously perhaps than the occasion seemed to demand) to a delicately served portion of one of the little brown-coated gentry who not so very long before had probably given his last signal with his own little white tail.

Nor is Bunny ignorant of the protection afforded him by his "simple coat of russet brown," for if he is far away from home and should be suddenly surprised, he will often not attempt to run away, knowing full well that he is much safer where he is ; so he crouches down as flat as he can upon the earth, and the chances are that you will walk past without seeing him, or may even step upon his prostrate form before you even notice that he is there at all. (This same device is made use of by partridges and hen pheasants, which habitually crouch down low upon their nests, the sombre plumage, with its beautifully mottled and variegated hues exactly conforming with the dead twigs and dry leaves, amongst which the eggs are laid, and rendering them just as invisible as their four-footed neighbours.)

Now, this tendency to protect themselves by their colour is strongly inherited, and we may notice that from its earliest days the young rabbit appears to understand instinctively that its best chance of safety lies in keeping absolutely still. However, this very means of safety is sometimes fatal to him, for the extremely youthful bunny, not being possessed of the same powers of discrimination as his older relatives, will obey his instinct in the letter instead of in the spirit sometimes, and therefore if you suddenly come upon him trespassing on your





RABBIT CROUCHING ON THE GROUND

tennis-lawn, he crouches down in the same manner as he would in a rough field, little realising that so far from being protected by this action, he stands out in strong relief against the short, green sward. It is quite pathetic to see in such instances the sense



of absolute security depicted in Bunny's bright little wide-opened eye as he squats thus upon the grass, as conspicuous as a ball upon a billiard-table, which is followed by an expression of intense surprise as you quietly take hold of him, and changes to one of abject terror when he finds himself being hoisted through the air by a strange, unaccountable force.

But such mistakes will only be made when Bunny is in his infancy ; when he arrives at years of discretion he knows better, and his instinct, like some strong master-hand, guides his every action, and tells him with unerring precision exactly when it would be best for him to crouch low upon the earth or when to make a bolt for safety, scampering through the maze of bracken and prickly gorse-bushes, now dodging round a huge ant-heap or leaping a tuft of grass, until at length he reaches his burrow breathless, but safe.

Again, if we want another—and perhaps the most striking—instance possible of this protective colouring, we cannot do better than take a short trip to one of our Scotch or Welsh mountains ; and as we wander through the purple heather and drink in the intoxicating air, we fail to notice until we almost stumble over them that many of what we had taken to be granite boulders scattered about over the hillside are in reality half-wild mountain sheep, which spring to their feet at our approach, and stand



for a moment staring at the intruders in mingled curiosity and fear ; and are then off like the wind, scattering in their headlong flight the loose stones around, which go hurtling down the steep hillside, gaining fresh impetus from every point they strike, and leaving behind them a ringing echo, which is multiplied afresh by every answering crag. Now, in their native country—the wilds of the Caucasus mountains or the towering slopes of the Andes—the wild sheep have many and formidable foes to contend with, and their safety largely depends upon the fact that they are so difficult to distinguish from the rocks and boulders that so constantly crop up on the hillsides ; and their natural colouring, harmonising so perfectly with their surroundings, affords them ample means of protection by rendering them practically invisible to the eye of a distant enemy, and thus they are permitted to graze in comparative security. There are many such cases in which the colouring of an animal does not at first appear to be protective, but will on consideration be found to be particularly so, thus showing that it is by no means necessary that to be protective the colour of an animal should be the *same* as its surroundings ; the point is that it *harmonises* with its surroundings, and does not create an unusual impression, which would catch the eye and so betray the animal's presence, as would be the case with anything unex-

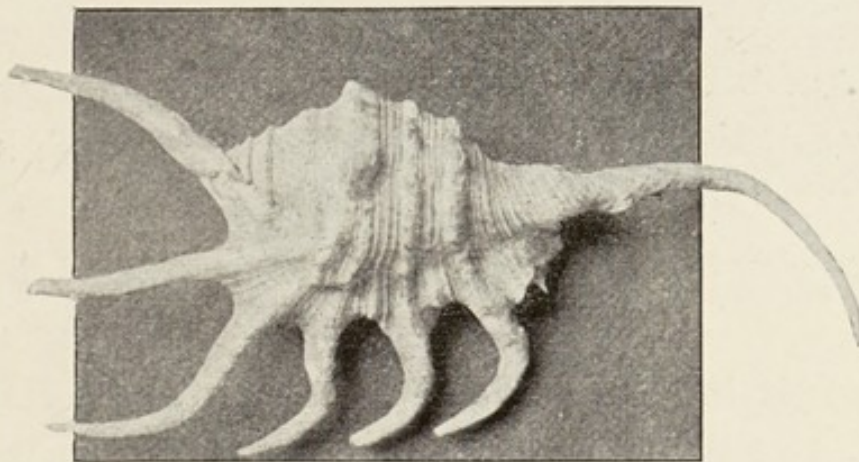




TWO BARBARY SHEEP  
ON THE ROCKS.



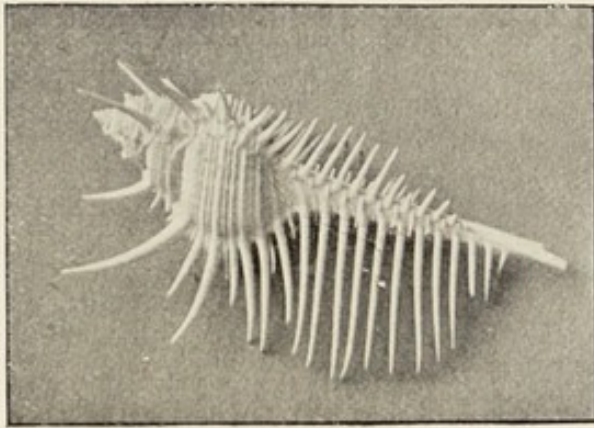
pected or startling in appearance. This case affords an easy answer to those sceptics who have objected that sheep are not coloured green, and therefore cannot be protected by their colouring, for, as we have just seen, it is often by its very contrast that an animal is best protected.



SUBMARINE SHELLFISH

As a further example of this protective colouring, we may notice that in the Arctic regions, and all lands where snow and ice abound, the animals are naturally *white*; and in the same way desert animals are sand-coloured. Amongst fish, we may see that many kinds are silvery underneath and dark on their backs; the advantage of this is obvious, for the dark back renders the fish less conspicuous to an eye looking down into the water, whilst the silvery under-surface makes them less visible from below. Or, again, there is the case of

the shellfish in the illustration on the previous page, which mimics a crab, whose coat of mail affords him

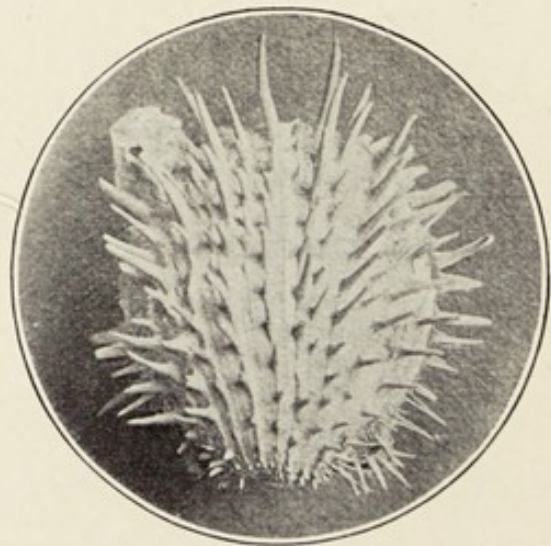


A SHELLFISH WHICH IMITATES  
THE BACKBONE OF A DEAD FISH.

a very complete protection. Countless, indeed, are the instances that one might quote to show the truth of this wonderful natural law; and any careful observer cannot fail to notice many of them

himself in his wanderings amongst wild Nature.

And though animals can never be free from this perpetual struggle for existence, we may hope and believe that they are happy notwithstanding. "In the animal world what happiness reigns!" writes Dr. Hudson in an address to the Microscopical Society (*vide* "The Beauties of Nature," by Sir John Lubbock, page 42). "What ease, grace,



SHELLFISH COVERED  
WITH PRICKLES



beauty, leisure, and content ! Watch these living specks as they glide through their forests of algæ, all 'without hurry and care,' as if their 'span-long lives' really could endure for the thousand years that the old catch pines for. Here is no greedy jostling at the banquet that Nature has spread for them ; no dread of each other, but a leisurely inspection of the field, that shows neither the pressure of hunger nor the dread of an enemy. 'To labour and be content' (that 'sweet life' of the Son of Sirach), to be equally ready for an enemy or a friend, to trust in themselves alone, to show a brave unconcern for the morrow ; all these are the admirable points of a character almost universal among animals, and one which would lighten many a heart were it more common among men. That character is the direct result of the golden law, 'If one will not work, neither let him eat,' a law whose stern kindness, unflinchingly applied, has produced whole nations of living creatures, without a pauper in their ranks, flushed with health, alert, resolute, self-reliant, and singularly happy."

I remember an interesting experience which shows that even in animals domesticated during scores of generations the natural instinct to make use of their protective colouring is not altogether lost. One autumn I was staying with a college friend in one of the prettiest parts of Devonshire,

and there were in the house, amongst other things, two cats; the one was white, or rather (save the mark) it was said to be white, though not even in the wildest flights of my imagination should I have so insulted the emblem of purity by ascribing its characteristics to that animal! However, the first day I was there it was thoroughly impressed upon me, and drilled into my reluctant head, that the colour of that cat was white, and in time I almost began to believe it. But that is neither here nor there. Let it be granted, for the sake of hypothesis, that it was white, or nearly so. Well, the other cat was of a kind of nondescript hue, that was described by its mistress in a moment of enthusiasm as "black." An entirely unprejudiced observer would have called it "smut-coloured," but I would not have dared to say so in public; at any rate, we will grant it was black, or nearly so. But perhaps, after all, accuracy is the better policy, so we will effect a compromise by calling the one "light-coloured," and the other "dark-coloured"—expressions which, though strictly in accordance with the actual facts of the case, could in no wise offend the susceptibilities of their fond mistress if this description should ever come before her notice. Now the curious part about these two cats, to which my attention was soon directed, was that when the light-coloured cat desired the luxury of a nap, it





TABBY CAT ON LIGHT-COLOURED CUSHION.



TABBY CAT ON RUG HARMONISING WITH  
HER OWN COLOURING.

almost invariably chose for its resting-place a light-coloured cushion, upon which it would remain somnolent and invisible (always provided that it was not accidentally sat upon or otherwise disturbed) until the bell rang for dinner, when once again that ball of light-coloured fur became animate. In the same way the dark-coloured cat always chose for its siesta a dark-coloured cushion—that is to say, one that would match its own dark coloration as nearly as circumstances would permit.

Another instance of the survival of habits peculiar to a former wild state—although not of any protective significance in this example—is worth mentioning. When a dog is about to compose itself for a nap, he will often turn round and round once or twice before doing so, after the manner of a kitten trying to catch its own tail, without any reason that we can see, and he will then lie down without apparently having gained anything by his preliminary revolutions. Now what can be the explanation of such antics? I asked that question also in an examination paper once, but not a boy could tell me. One answer ventured the statement that it was “in order to make sure that he was not going to lie down upon any sharp pricks.” The real reason is that in its primitive wild state the dog lived amongst long grass, and therefore, when



it wanted to lie down, it was necessary to prepare a place first by turning round two or three times in order to trample down the grass. And doubtless the dog was equally careful to choose a resting-place in conformity with its own coloration.



THE COMMON GRASS SNAKE.

## CHAPTER IV.

### A PERFECT OUTFIT.

WE have now considered two different classes of animals—viz. (1) those which are provided with various kinds of natural weapons upon which they rely for their protection; and (2) those which, being devoid of weapons, depend entirely upon their protective colouring.

We will now pass on to a third class, comprising such animals as are not only provided with weapons, more or less efficient, but in addition to this are also endowed to a certain extent with protective colouring. This latter class, as one would readily imagine, is far better off than either of the other two; for in those species whose natural weapons are strongly developed, their combination with the



protective colouring must necessarily render the possessor a most formidable opponent. In fact, this class comprises most of the beasts of prey, and, indeed, they may be said to have the rest of the animal kingdom more or less "under their thumb," if such an expression be permissible.

If it were not that we have already taken the king of beasts as an instance of the first class with which we have dealt, we might fittingly take him as an example of this class also, as his tawny-coloured coat harmonises beautifully with the sand of the desert which he frequents. Let us, therefore, take another, and, indeed, a scarcely less powerful animal, as our first instance—that magnificent product of creation the Bengal tiger. His native haunts are among the thick undergrowth of a tropical jungle, his vertical stripes rendering him scarcely distinguishable from the tall, upright stems of the coarse, rank grass amongst which he crouches as he watches the movements of his quarry, or his foe, as the case may be, motionless, save for the nervous twitching at the tip of his sensitive tail and the fire which seems to flash from his lustrous eyes. And there he crouches, awaiting his opportunity; then a savage roar, a stifled cry, and all is over; and woe to any living thing that has come within reach of that fatal spring! Rightly, indeed, may such an animal be termed the terror of the jungle.

Then there are the leopards and various kinds of tree-cats, whose coats are spotted, so that they present the appearance of rays of light seen through the trees, and thus deceive the eye as effectually as do the striped coats of their cousins.

There are many others of this latter class which I might mention did space permit—that relic of a prehistoric age, the crocodile, which will float like a log on the surface of the water until some unlucky thing ventures within the reach of his rapacious jaws or the sweep of his powerful tail ; the gorilla, which lies in wait amongst the lower branches of a tree until some unsuspecting victim passes beneath, when out stretches a long, muscular arm, and hauls up the unfortunate creature to be strangled for the mere love of killing.

But we must not pass on without a few words about a most interesting family of reptiles, which may justly be said to belong to what we have styled our third class—the serpent family. Though many of these are quite harmless, some species, as everyone is aware, are possessed of a supply of poisonous fluid, which is contained in glands secreted at the back of the teeth ; and when the reptile bites, some of this poison is let loose and thus injected into the wound made by the fangs ; and so deadly is it in some kinds that death results within a few moments of the bite. There is amongst rustics a



common delusion about snakes which is as harmful as it is false. It is often supposed that the beautiful forked tongue which is to be seen darting in and out of a snake's mouth is its "sting," and that it is by this means it poisons its victims; and others believe that it is the *bite* of the snake that does the mischief. The former of these theories is entirely without foundation, as the forked tongue of a snake is as harmless as a piece of string; the latter theory, however, has just a suspicion of truth, for although the actual bite is in itself of no account, it prepares the way for the poison by making a small puncture to admit it.

Speaking of poison, Sir John Lubbock remarks: "If we had not been so familiarised with the fact, the possession of such a fluid might well seem a wonderful gift. That a fluid, harmless in one animal, should yet prove so deadly when transferred to others, is certainly very remarkable; and though the venom of the cobra or the rattlesnake appeals perhaps more effectively to our imagination, we have conclusive evidence of concentrated poison even in the bite of a midge, which may remain for days perceptible." ("Beauties of Nature.")

Now the serpent, besides this formidable weapon—which alone is often sufficient to put a finishing touch to any of his enemies—is moreover endowed with a large degree of protective colouring, for his

skin is exquisitely striped or mottled in exact concordance with the grass and leaves amongst which he crawls, and is therefore admirably calculated to defy observation, as he lies like a dead stick, or winds his sinewy coils along the branches of the trees.

Fortunately, we have but one species of poisonous snake in this country, and that one is by no means common, so that the majority of people have but a very remote acquaintance with it. There is, however, another species of snake, the common grass snake, which is indigenous to our island, and which is quite harmless. It is a singularly beautiful creature, and well worth examination. With its black and grey mottled body, and conspicuous yellow markings on the back of the neck, it is easily distinguishable from its obnoxious cousin the viper, which latter has a row of clearly defined black V-shaped marks down the middle of the back. But the grass snake, in lieu of poison, is provided, by way of compensation, with a most powerful and pungent effluvium, which it can make use of at will, with the result that any living thing whose olfactory senses are at all ordinarily developed is only too thankful to give it a wide berth. The snake loses its power when it has been a little while in captivity—or, at any rate, entirely ceases to use it; and it then becomes a most delightful and interesting

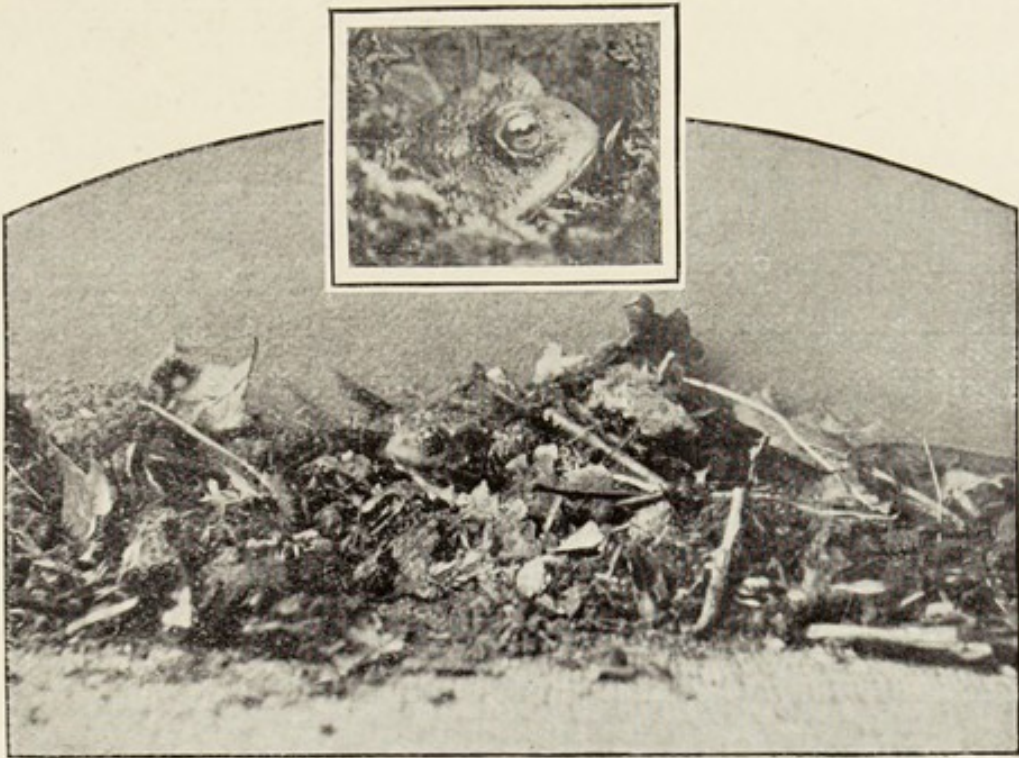


pet. I had two or three of them when I was at Oxford, and used to keep them in the breast-pocket of my coat. At first they naturally evinced signs of restlessness, but as soon as they became accustomed to their new abode they were quite contented ; and while I was reading they would creep out and twine their graceful coils round my neck, or else lie quite motionless in the bottom of my pocket. But as soon as I got up to go out, they would poke their little heads out—without, however, attempting to get away—and survey the passers-by with bright, glistening eyes, the while flashing in and out their peculiar forked tongues. I need hardly say that they produced a great sensation wherever I went. My college friends, as a rule, tolerated their presence, though some of them I could see were inwardly not a little alarmed at the sight of two bead-like eyes staring at them from the corner of my pocket ; but they tried to assume an expression of indifference as they enquired whether my strange pets “ could bite,” for it would not look well for a big, brawny rowing-man to confess that he was afraid of an innocent little snake ! Ladies, however, were much more outspoken in their opinions, and when I received an invitation to tea or some other function, it generally contained a postscript either particularly to request for, or rigorously to exclude, the company of my “ monsters.” I nearly got into

trouble on one occasion through one of them manifesting a sudden and unusual desire to explore. I was at a lecture, and one of the snakes had succeeded in forcing a hole in the bottom of my pocket, and in this way had got into the lining of my coat quite unbeknown to me, for I was, of course, giving my whole attention to taking notes of the lecture, as men always do on those occasions! Suddenly, however, and without a moment's warning, the reptile made his appearance at the back of my neck, and waved his head aloft in triumph. The lecturer's face was a study. Had he not been a strong-minded man, a hardened athlete (for lecturers do sometimes figure in the world of sport), and, moreover, a personal friend of my own, the consequences might have been far from pleasant. As it happened, the genial Don asked me to breakfast the next morning in order to enquire more closely into the nature of the strange apparition, and he then suggested that it might be as well in future to ascertain that the corners of my pockets were thoroughly snake-proof before coming to a lecture.

Another reptile that deserves a moment's attention is the humble toad, whose fat, repulsive-looking body is mottled with precisely the same prevailing tints as the ditch in which he has his home; in addition to this, he is also provided with a kind of poisonous saliva, which, however, he rarely uses,





THE HUMBLE TOAD.

except when attacked by a dog, and then he proceeds to give his tormentor a lesson which is not easily forgotten, and doggie sets up a pitiful spluttering. He cannot at all understand it. He only wanted to have a game with that ugly-looking round thing. Of course, the game might have resulted in the death of the round thing, but then accidents will happen, and the result is that he finds his mouth filled with the most nauseous taste that his doggish imagination ever conceived. But he takes good care in future to give a wide berth to the horrid thing that gave him such a bad time of it, and to choose something that will be rather more appreciative of his offer of a game, or at any rate

will be less likely to resent it in so unpleasant a manner.

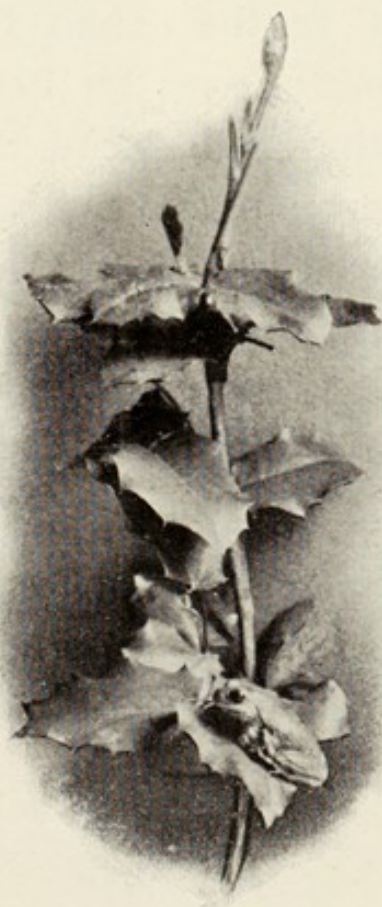
This peculiarity in toads doubtless gave rise to the superstition about toads spitting fire, and the highly exaggerated stories which nurses and such ilk used to love to relate with great gusto. But, as a matter of fact, the toad rarely or never makes use of this poison upon human beings ; on the contrary, they are most harmless and interesting animals, and they do such incalculable good in our gardens by destroying the slugs that they have well earned their sobriquet of the "Gardener's Friend."

Perhaps the most beautiful instance of protective colouring amongst reptiles is that of the green-tree frog. This extremely pretty little creature is not a native of the British Isles, although it is to be found in profusion in many parts of the Continent. It lives amongst the branches of trees, and its upper surface is of a most vivid green, so that it is well-nigh impossible to distinguish the frog from the leaves among which it is resting. Its shrill voice can be heard at some distance, but on approaching the spot whence the croaking proceeds it is by no means easy to locate the sound, owing to its ventri-loquial effect ; and even when that task is accomplished there is still the difficulty of discovering whether each separate piece of green belongs to a leaf or to a frog. The bright little eyes of the creature



glittering like tiny jewels amongst the green go a long way towards eventually betraying its whereabouts. This species of frog is very often kept as a pet by ladies, who evince great delight in watching its peculiar antics, and the eager manner in which it will devour any insect within reach. And, indeed, great amusement may be derived from placing one of these frogs upon the window-pane in hot weather, when flies are numerous, and watching it make a dart at the dainty morsels. It experiences no more difficulty in climbing up the windows than do the flies themselves, as its toes are provided with a sort of sucker, which enables it to cling with ease to the side of any perpendicular object, and it is thus beautifully adapted to its natural haunts among the branches.

But even the Green Tree-frog is altogether dwarfed by the eccentricities of a distant relation of his, the Chameleon. This weird creature is not indigenous to our islands—being found in Southern



THE GREEN TREE-FROG

Europe or North Africa—but nevertheless his strange habits deserve a few words. His appearance is grotesque in the extreme—in form resembling a lizard, with feet like those of a parrot in structure, and a long curling tail. Add to this the fact that he is able to move his eyes about independently of each other, so that if you come across him huddled up on a twig he will concentrate the mournful gaze of one eye upon the intruder and still keep the other focussed upon a fly over his head. He, moreover, has the power of adapting himself to his surroundings to an astonishing degree, though not to the extent that some exaggerated stories would assert; for I can remember being told by an enthusiastic friend that a chameleon could at once change his normal green tint to blue or red, if placed upon a cushion of that colour, whereas in reality he draws the line at different shades of green, grey, brown or yellowish tints, according to the leaves amongst which he lives.



Part II.

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BIRDS.







IN the preceding chapters we have considered the general principles of the lifelong struggle for existence, which is as ceaseless as it is necessary under the existing condition of things amongst all natural animal life ; and I have endeavoured to show in the case of beasts, as distinguished from other living creatures, how Nature has provided each one with some means of defence, drawing special attention to that protective colouring which plays so great a part in effecting this object. I now propose to deal with birds on practically the same lines as we took up with beasts, and to bring especially under consideration the enormous share that is taken by protective colouring throughout the entire duration of bird life, but more particularly in the earlier stages, when, owing to their utter defencelessness, the assistance of such a protection is so sorely needed.

## CHAPTER I.

## THE WINGS OF THE MORNING.

THE idea which we generally associate with birds is that of wings and motion through the air; and then, after consideration of a power which is denied to animals, we should feel inclined to exclaim: “What a marvellous protection the bird must have in this power of flight!” To us poor lowly mortals, who can only crawl upon the surface of the earth, and whose repeated attempts to imitate the power which comes so naturally to the smallest of the denizens of the air have proved but futile and abortive—to such, indeed, this strange faculty of supporting themselves in the air, and propelling themselves whither they list, with an ease and grace of motion far beyond the loftiest attempts of mere earth-grubbers, might at first sight justly savour of the supernatural. If we had been brought up on some desert island where there were *no birds*—if we can imagine such an impossible condition—and were to be suddenly transported blindfold to a different part of the earth, can we picture what indescribable feelings would be ours, as soon as we



saw *the first bird*? And how we should thrill with an unutterable wonder, as we saw many other similar bodies darting through the air, impelled by a mysterious motive-power entirely new to us! And what admiration and envy would be ours, as we noticed what absolute control even the smallest bird possesses over this wonderful mechanism, which enables it to bid defiance to the laws of gravitation as it glides at will through the light air, all with an effortless ease which contrasts strikingly with the awkward and laboured exertions which are necessary to convey one of their poor earth-grubbing neighbours even a few yards! And doubtless our first impulse would be to try to do the same, and then we should discover that we did not even know how to begin. If we had lived in a wingless world, and some great Edison were to arise and *invent* a bird, verily would not the whole world go out after him? And would any human words suffice to describe the intense beauty of his invention? Or would any honours and rewards be too great to be showered upon him? But it is not so. We have been brought up all our lives amidst plenty of birds—for even the dingiest of our dirtiest cities is not without its own particular soot-begrimed sparrows, and so we are not struck with the wonderful nature of the phenomenon, and we seldom stop to consider that singular

gift that raises the vulgar sparrow so immeasurably above the lords of creation.

And yet, when we come to think of it, a bird's wing is after all only a sort of arm, developed in a different way. We have not been blessed with the *wings* of a bird, it is true, but then the bird has not got any arms like ours, so that we may say the laugh is not entirely on their side. If a man could induce feathers to grow upon his arms in proportionate size to those on a bird's wing, provided also that his body were of proportionate weight, there is no doubt that he would be able to fly. But that is where the difficulty comes in—a bird's body is fashioned with a view to assist it in its flight, owing to its extremely light weight and general buoyancy; whereas a man's body, which is intended for totally different purposes, is constructed with a view to strength and endurance. So that even supposing the advance of civilisation were to progress so far as to enable a man to grow feathers on his arms, he would still have to reckon with his heavy body, which would prove to be as a "millstone hung round his neck," to drag him earthwards; his wings would, indeed, have to be of the most colossal proportions—in fact, infinitely greater than he would have strength to wield. The experiment has been tried certainly, although it turned out to be but a dire and dismal failure.



I once read of a mad enthusiast who determined to see if he could not create a new era in the history of mankind by inventing a device which would enable him to soar aloft on pinions rivalling those of the birds of the air; so he constructed a machine of vast dimensions, and affixing it to his shoulders, he sallied forth to test his new treasure. He climbed to the summit of some lofty precipice, and then jumped off. I forget whether he broke his neck as well as both his legs, but at any rate it was his first and last attempt in that direction. I remember well that in my boyish dreams I used to cherish extravagant ambitions of some day becoming a benefactor to myself and the human race by growing up to be a great surgeon and discovering the art of grafting on to a man's shoulders the wings of some mammoth bird. The one that appealed to me most as a suitable subject for my experiment was the mythical "roc" that one reads about in fairy tales. I believe the idea originated in my youthful mind as the result of an exciting story told by a highly imaginative governess about one of those mythical birds which used to pick up boulders the size of a house in their claws, and then drop them suddenly down upon innocent and unsuspecting ships. Another idea that occurred to me later on, when I discovered, to my grief, that rocs were fictitious,

was to graft the wings of an ordinary eagle on to the shoulders of a baby (poor baby!), and that then as the baby grew older the wings would grow proportionately also, so that they would always be sufficiently strong to bear the child's increasing weight. In a weak moment I confided my scheme to the successor of the lady with the imaginative temperament, and was much disgusted with the hilarious manner with which she received my confidence. She went down several pegs in my estimation, and I longed for the enthusiastic story-teller back again, for I felt sure that she would have sympathised with the pet scheme with which I intended to revolutionise the world. Possibly in the dim and distant future there may arise some colossal intellect who shall discover the key to the problem, and shall devise means to make mankind as much at home amongst the waves of the air as he is now upon those of the ocean; but as yet we have not even caught a glimpse of the golden casket, much less obtained the "open sesame" to the treasure within.

But I am digressing.

Let us again return to the little bird and consider his powers of flight as a means of protection. And the value of such a means is too obvious to need comment—for, bereft of his wings, the bird is completely at the mercy of any being who wishes



to molest him. His little beak is fashioned with the object of providing for his daily wants, and for preening his soft plumage, and would be of little service in repelling the attacks of an enemy ; his delicate claws are intended to afford him a sure foothold on the branches, whither his wings have taken him, and would be equally useless as weapons of warfare. There are, of course, exceptions, just as we noticed there were amongst the beasts. The talons of the eagle are as powerful in their way as are those of the cruel tiger, and his fearful beak could well split the skull of anything that dared to dispute his supremacy. There is the ostrich, too—whose wings are of little use for any practical purposes, but are used rather as sails, to assist him when running across the desert at his usual stupendous pace ; but those muscular legs of his can give a kick which will disable a horse or tear a man almost in pieces. Or, again, we might take the graceful swan, which looks so picturesque and inoffensive as it glides upon the bosom of the lake ; but in breeding time it becomes very dangerous, and as it can break a man's arm with a blow from its wing, it is as well to be careful not to approach too near at these seasons. I have myself had a very unpleasant encounter with one of these infuriated birds when I was out in a small canoe on the river near Oxford, and had ventured up a

lonely backwater, which was apparently sacred to a family of swans ; and it was only my dexterity with the paddle, aided by a certain amount of luck, that saved me at any rate from an upset, and possibly something worse.

The albatross, who scours the briny deep in search of prey, is a source of dread to the shipwrecked sailor as he clings to his plank, and he will find that he has to contend with a far more formidable foe than the greedy billows if he should be spied by the keen eye of one of these scavengers, and the remainder of his failing strength will soon be exhausted in battling with the crushing blows of his new assailant.



## CHAPTER II.

## IN SECRET PLACES.

SO we see that *some* birds have need of no other protection than that which is afforded them by their own beaks and claws, and, as we noticed amongst beasts, such birds to a great extent comprise those that prey upon others. *Most* birds, however, having no such means of protection, have to depend entirely upon their wings to take them to a place of safety at the approach of danger; and this protection affords them quite a sufficient security against any of their enemies which are themselves wingless; for, numerous though such foes may be, they are powerless if the bird takes to flight. But against his feathered foes Birdie has not the same chance, though, fortunately for him, these are not so numerous.

Now we must not forget that there is a time in every bird's life when his wings are of no avail to him—I refer, of course, to the time when he is a callow fledgeling and his wings are as yet immature; or, to go even further back, when he is still encased within the delicate egg-shell, and lying in

the downy nest that his parents have prepared for him with such infinite care. Of what use to him, then, is the fact that he will have wings some day? If his mother be a noble eagle, she will protect her defenceless nestlings, and the intruder will have first to break through the bristling barrier of talons that will impede, and probably effectually prevent, his progress, even when he has succeeded in scaling the giddy height at which the eyrie is lodged. But not so with the gentle linnet or the bright-eyed robin. Should anything attack the nest of one of these tender mites, knowing full well the futility of attempting to protect it, her instinct prompts her to make off as fast as she can, with the object of endeavouring to save her own skin, lest she should perish in company with her ill-fated brood.

At this point comes in the wonderful instinct with which birds are endowed, and which prompts them to conceive all sorts of plans for the effectual concealment of their young ones. That some measure is indeed necessary the most casual observer cannot fail to notice, if such defenceless birds are to succeed in rearing their young ones, especially when we consider the fact that it is a period of four or five weeks from the day on which the first egg is laid to the time that the young birds are ready to fly; and during all that time,



from their defenceless condition, they must perpetually be exposed to danger. But the parent birds are equal to the occasion ; and realising that if their young ones are to be kept safe during their nursery days they must be securely hidden, they proceed to devise means to hide them. Many birds effect their object by building their nests in the most inaccessible places, where, indeed, they are often conspicuous enough, but are nevertheless quite safe, owing to the fact that it is impossible for any marauder to get at them. It is easy enough to see *where* the little sand martin has her nest, as she flies in and out of a hole in the side of a steep precipice ; but it is quite another thing to scale the precipitous height and then force a way, while clinging on for dear life, into the tiny gallery at the end of which the martin has hidden her eggs. Neither is there any difficulty in spying out the rooks' nests in the tops of yonder spinny ; but anyone who has tried it will admit that it is no easy task to get within reach of any one of them, poised as they are at the ends of the slenderest branches.

The house martin places her little dwelling on the side of a house wall, under the shelter of the overhanging eaves, where she is most effectually protected from any of her natural enemies. Truly this bird may be classed amongst the most accom-



SWALLOW'S NEST UNDER THE  
EAVES OF A BARN.

plished of Nature's builders, for the nest of a martin is a model of neatness and symmetry. It is a very pretty sight, as well as most instructive, to watch the birds at work. How they fidget about in making the all-important choice of a site for the nest, flitting backwards and forwards, and chattering as if they were the most important beings in creation; but once their minds are made up, they set to work in real earnest. Layer



by layer the outer wall of the nest grows, as the busy parents journey to and fro incessantly to bring fresh stores of mud from the nearest pond or river bank; or, failing that, even a roadside puddle will be acceptable. One layer is always allowed to dry and harden before the next is put on, so as to form a firm foundation for it, until at length the whole is completed, and only a tiny aperture left at one side for the parents to pop in and out; then the inside is lined with a delicious cushion of feathers and wool, ready for the reception of the beautiful porcelain-like eggs. And such a chattering and cheeping as goes on during the process of construction! They could hardly make more fuss if it were a St. Paul's Cathedral they were at work upon; and certainly the little mud erection will compare very favourably with the edifice designed by Sir Christopher Wren, and undoubtedly has far more importance in the eyes of the little builders themselves. It has always been a mystery to me how the martin succeeds in making the mud stick on to the house wall, but they do not seem to find any difficulty at all in accomplishing their purpose, although man, without the help of his complicated machinery and years of practice, could never produce anything to be compared with it. A naturalist writes: "Touching the construction of nests by birds, a

great deal of poetic nonsense has been written. Most nests are pleasing objects, and some are extremely artistic; but it is not true that the most elaborate nest is entirely beyond imitation by a skilled workman; indeed, I am satisfied that a Chinese artist would be able to fashion an excellent copy of the nest of a long-tailed tit—that most beautiful of English types—in a tithe of the time occupied by the birds.” Granted; but does the writer remember that the “skilled Chinese artist” has had many years of practice in which to bring his skill to perfection, and can, moreover, avail himself of any variety of tools that his fancy may suggest? How much practice, on the other hand, has fallen to the share of the little bird before she makes her first attempt? And where is her workshop and its stock of appliances? Her only tools are her beak and claws; and she requires no practice, for it is her first attempt that produces the beautiful structure that no mere man could imitate, with the slightest degree of success, without the aid afforded by a long experience of handicraft. Therefore, it surely seems obviously unfair to underrate the bird’s work for the sole reason that it can be equalled by an accomplished human artist. Would you expect a coalheaver to score a century against the Australians at the Oval? Would you expect a jeweller to be able to plough



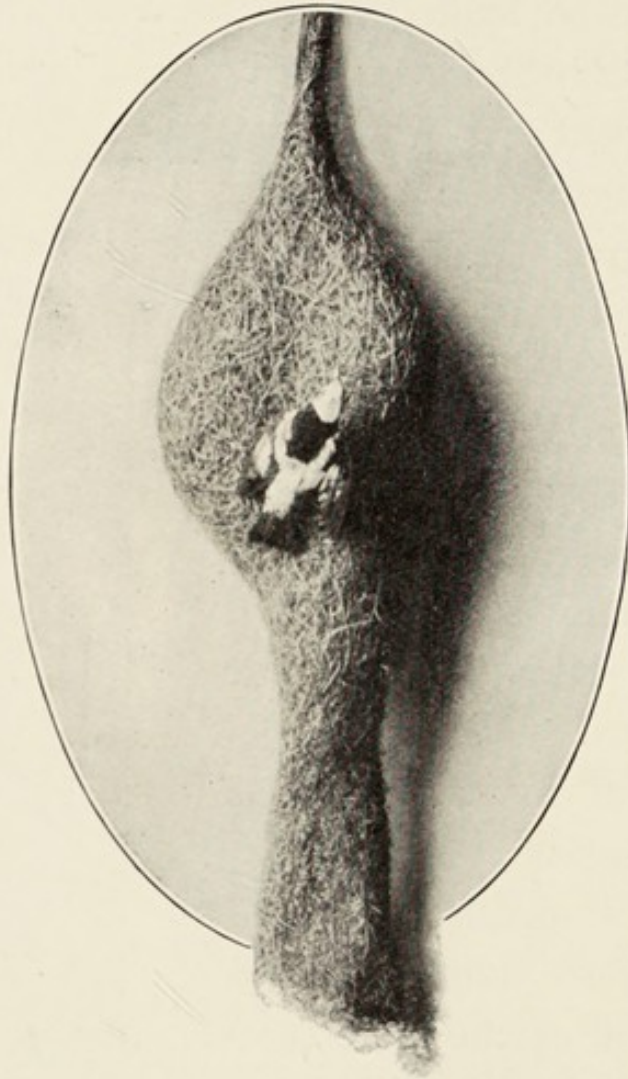
a straight furrow, or a baker to manufacture an umbrella, or a blacksmith to write a correct translation of Aristotle's Ethics? And yet any of these would only be analogous to what the little bird accomplishes. She has lived but a few months, and has spent the whole time in enjoyment and pleasure; but when the right moment arrives she sets straight to work, and without any previous practice or any model to copy, she produces a masterpiece, of which the "skilled Chinese artist," with all his extra advantages, might well be proud. Does it seem fair that praise of such an achievement should be described as "poetic nonsense"?

What a masterpiece, indeed, is the simplest bird's nest! Some of the more complicated kinds must be examined before one could believe it possible that a bird could raise such a structure with no tools except its little beak, and no material besides what it can pick up in the fields and hedges.



NEST OF THE  
WEAVER-BIRD, NATIVE  
OF AFRICA.

Pause a moment, thoughtless schoolboy, ere you tear yonder nest from its bower of green ; consider the hours of patient labour and tenderest



NEST OF THE TAILOR-BIRD,  
NATIVE OF AFRICA.

care that were necessary before that pretty design was finished ; listen to the agonised cries of the tiny parents in the bush hard by, as they watch you stretching forth your hand ; think of the two



little bleeding hearts you will leave behind you if you rob them of all their earthly possessions, for they *have* hearts—only you too often forget this— hearts just as real and warm as the one that you keep somewhere in the region of your waistcoat, hearts which even now are wildly throbbing with intense misery in the fear of losing their little ones ; think of this a moment, and then you cannot, *you absolutely cannot*, do such a deed of bitter cruelty for the gratification of your own thoughtless pleasure. By all means take an egg for your collection if you want one, though not unless there are more than three in the nest ; and, oh ! be careful not to disturb the nest ; take the egg with a spoon, so that the tiny mother may not smell the presence of human fingers. If you want the nest as well, leave it until the little parents have done with it, and you will probably find that it will be in excellent condition.

Talking of martins, I remember hearing of an incident which speaks very highly for the intelligence of these birds. A pair of martins had completed their nest, lined and prepared it ready for the eggs, and went off to take a day's holiday before settling down to the responsibility of a family. But, alas ! during their absence a couple of sparrows happened to pass, and coming to the conclusion that the nest would suit them admirably,

they calmly proceeded to instal themselves in the vacant nest, and Mrs. Sparrow even had the impudence to lay an egg in it. The excitement of the martins on their return may better be imagined than described. In vain did they protest against so unwarrantable an intrusion, making use of every argument in the bird vocabulary, which, judging from the volubility of their utterances, must be considerable. But it was of no avail, and an attempt to assert their right to the stolen property by the forcible ejection of the interlopers was equally futile. No miser ever watched his golden hoard more jealously than those intruders guarded their new home. "Finding's keeping," said Mrs. Sparrow, "and we've come to stay." "Very well," replied Mrs. Martin, "you *shall* stay." And forthwith the martins set to work to block up the opening with an extra strong layer of mud; and the unfortunate sparrow, who was engaged inside in the interesting occupation of laying another egg, and evidently did not seem to realise what was happening until it was too late, found herself a close prisoner in complete darkness. As she was unable to get out, she soon had to pay the penalty for her crime by being suffocated for want of air.

Another bird which displays considerable ingenuity in the choice of a nesting-place is the tom-



tit. She chooses a hollow in some tree or the crevice in a wall, taking care to select one with an aperture only just large enough to admit the entrance of her own tiny body—that is to say, about the size of a mouse's hole. Thus it is extremely difficult for anything else to enter, or even to reach, her nest; for inside the hollow often goes down some way, and at the bottom of it she makes her nest. I know of an old-fashioned stone wall, in a lovely garden in Kent, which is literally crammed with tits' nests. The wall is somewhat loosely put together, and the mortar has got displaced through long exposure, leaving numerous cracks and crevices, and as it overhangs a deep ditch filled with brambles, it is a most suitable position for a colony of tits. I was walking along by this ditch once during the nesting season, and noticing quite a number of birds flying in and out of the cracks in the wall, on closer examination I found that a large quantity of tits had taken advantage of the accommodation so delightfully provided for them. I explored the recesses very carefully with the aid of a long spoon—it was quite impossible to get more than a couple of fingers even into the entrance of the holes—and was pleased to find a goodly supply of eggs of two species of tits—the tomtit and the great tit. The birds themselves were very much in evidence,

popping in and out of the holes, considerably discomposed at the presence of an intruder ; but they were apparently reassured when I went off again and left them their full complement of eggs.

My earliest acquaintance with a tomtit's nest was made when I was a little boy at school. The incident is strongly imprinted on my memory, and indeed, it was one calculated to make an impression on any youthful mind. In company with some of the other boys, I had got leave to go out "birds'-nesting," which being interpreted does not necessarily, and certainly did not in our case, mean taking birds' *nests*, but merely an egg or two for our collections, when we thought the birds would not miss them. On this particular occasion we saw a tit fly into a hole in an old tree stump, and being very anxious to possess a tit's egg, we rushed to the spot in great delight. The smallest of the party was selected to put his hand into the tiny hole where we had seen the bird enter ; but no sooner had he done so than he withdrew it again with great rapidity, as a most alarming and unaccountable hissing sound proceeded from the cavity. Visions of snakes floated before us, and remembering that that wood was known to be the haunt of adders—in fact, I myself had found one the week before, not more than a quarter of a mile from the spot—we unanimously decided





GROUP OF TOM-TITS ON BOUGH OF APPLE-TREE.



that, in this case at any rate, discretion was the better part of valour, and the mysterious hole was left severely alone, no further attempts being made to penetrate the mystery. The next time we passed the spot, boylike we all rushed to the mysterious tree, and stood gazing at it from a respectful distance. What a strange fascination there is in a spot that has some mystery about it, or the association of some great or ghastly deed connected with it! How we love to gaze at it spellbound, and with a kind of awestruck, respectful feeling, to picture to our minds the scenes or deeds that transpired upon that fateful spot—from the bloodstained board on the deck of the *Victory* where Nelson fell, or the private chamber in Holyrood Palace where Rizzio's life-blood flowed from more than fifty wounds, down to the particular tree in the old garden at home where we loved to climb in our childhood's days. The sudden discovery of a broken toy in an old cupboard will bring back to us unbidden memories of bygone times, with a flood of old associations that fill us with a feeling of infinite tenderness.

Two or three weeks afterwards, on revisiting the "tomtit tree," as we had come to call it, we were surprised to see a brood of young fledgelings poking their heads out of the hole, and we were sorry then that we had not made at least another attempt



to secure an egg. I did not know till some years afterwards that it is a regular practice of some species of the tit tribe to protect their nests and young by imitating the peculiar hissing of a snake.

Tits will sometimes build in very curious places. They may easily be enticed to frequent a country garden in the winter months. If a cocoanut be hung up in a tree, a piece about the size of a penny having been previously cut out from the side, the birds will come and pick out the kernel, of which they are extremely fond, and will very often make their nests in the empty shells when the breeding season comes round. Occasionally a pair of these birds will conceive a desire to nest in a country post-box, or some equally extraordinary place. The pocket of an old coat left hanging in a shed, and, again, the drawer of an old table in an outhouse, have been used for this purpose. There is an interesting nest preserved intact in the Natural History Museum at South Kensington, whose history is as follows: In the year 1888 a pair of great tits built in a post-box in a little village in Sussex. The nest was disturbed before it was completed, so the birds left it; but in the following year they again chose the same spot, and completed a nest inside the post-box, obtaining access by the slit where the letters were thrown in. The eggs were laid in due course, and the parent bird sat on them,

in spite of the shower of letters and postcards which came pouring in daily; in fact, she was even found, when the box was opened for collection, with a pile of letters lying on her back as she sat on her nest! The post-box was taken down and sent, together with the nest intact, to the Natural History Museum, where they may now be seen in one of the galleries. A new box was put up in place of the old one, and the birds took possession of this also, and continued to build there for several years in succession.

In one of our Kentish gardens a pair of tomtits made their nest in an old disused pump, which stood in a corner of the shrubbery. The fact only came to light when the pump was discovered by some of the younger children of the family during a game of hide-and-seek. Childlike, their first impulse was to work the handle of the pump. They did not tell me whether they had expected *water* to come out of a pump which had not been used for years, but they certainly were not prepared for the little stream of eggs which came tumbling down the spout! Those which were not broken were somehow put back again, and later on the children used to watch the bird popping in and out of the spout.

The robin is undoubtedly the most notorious bird for building in queer places. Nothing seems



to come amiss to him, an old kettle or hat being frequently found with a family of robins in possession. But even the eccentricity of the robin cannot beat that of a pair of tomtits, many years ago, which chose for their nesting-place the skeleton of a man who had been hung for murder and left upon the gallows !

As some other examples of sagacity in the choice of a nesting-place, we might quote the golden-crested wren, which has a most ingenious plan of suspending her nest underneath the bough of a fir tree by means of a kind of loose woven cord ; or the magpie, which is equally clever in a different way, for it constructs over the top of its nest a roof of twigs similar to those of which the nest is composed, presumably to protect its young from the rain and wind—a very necessary expedient, considering the lofty and exposed position in which the nest is placed.

The Dabchick is a most enterprising individual, for she is not content with any of the ordinary methods of hiding her nest, but inclines towards something much more original. She apparently is of the same mind as the knights of bygone days, and considers that the most satisfactory plan is to have her home surrounded by a large moat. Accordingly she selects one of the convenient tufts of rushes which so often grow in

the middle of a sluggish stream or in the shallow water at the edge of a lake or river, and upon this foundation she erects her little castle, mooring it,



REED-BUNTING ABOUT TO ENTER HER NEST  
IN A CLUMP OF RUSHES.

if necessary, to a stronger tuft ; and no doubt she feels as safe within her walls of water as does the eagle on the side of her Highland precipice. Moreover, to make assurance doubly sure, she



covers over the eggs with weeds when she leaves her nest, that they may be less easily seen. This habit causes the eggs to lose their white colour



NEST OF THE REED-WARBLER, PLACED AMONG  
THE STEMS OF RUSHES.

after a while, and become very dirty when the period for hatching draws near. The young dabchicks take to the water as soon as they are hatched, so that there is no fear of their falling out

of the nest and being drowned in the natural moat which surrounds their home.

The reed-warbler also chooses a rather similar situation, making her nest between the upright stems of the rushes growing in the shallow water, and fastening the nest very deftly on to the rushes, which are thus used as supports.

The common gulls and guillemots place their nests—or rather, I should say, their eggs, for they make no nest at all—on the sloping ledges of the sheer precipitous cliffs which surround our coasts; and on these apparently impregnable fortresses they are also as secure as any of the feathered tribe. The guillemot is a terribly lazy bird, for she does not trouble to make any nest at all, but just lays her egg anyhow, in the most casual fashion, upon the bare rock. The egg, which is large, is thick-shelled and rough, so that it receives no detriment from the contact with the hard rock on which it is laid; and neither is it likely to roll off, owing to its peculiar shape, for at one end it is thick, and at the other it tapers almost to a point, and consequently, if accidentally moved by the parent bird when taking flight, it turns as if on a pivot, but does not fall off. Although, by the unscalable nature of their nesting-places, these birds are admirably protected from their enemies, they are by no means



immune from the attacks of man; and in the Orkneys and many parts of the coast of Scotland the breeding-season of these birds is the harvest-time of the natives. Either by being let down by ropes from above, or by climbing up from below, the egg-collectors invade the dominions of these feathered tribes. The birds are captured for the sake of their feathers, and the eggs are taken for food. Huge baskets of the latter are sometimes brought to the markets of seaport towns, where they fetch a higher price than hens' eggs, for they are not only much larger, but are also of a delicious flavour. But, as I said with regard to beasts, man is an unnatural enemy, and if it were not for him the poor gulls would have but little to fear.

Some birds, such as the skylark or the peewit, try to protect their nests by means of a very ingenious artifice. They invariably build upon the ground, the plover being particularly fond of the ridges in a ploughed field, while the lark prefers long grass, though she is not at all averse from ploughed land also by way of a change. I have found as many as between thirty and forty larks' nests within a single acre of meadow grass. The lark, unless very suddenly disturbed, never rises immediately from her nest, but runs for some way through the grass before she soars

upwards, in order to mislead any observer, and give quite a wrong impression as to where the nest actually is. She has been known, when dis-



LARK'S NEST IN THE SIDE OF A BANK, WITH  
THE MOTHER-BIRD ABOUT TO ENTER

turbed by mowers, to build a kind of dome erection over her nest, as a substitute for the



natural shelter which it derived from the standing grass.

The lapwing (or peewit), however, has nothing with which to hide her nest, but places it quite openly upon the bare earth, with very little preparation of any kind, and merely brings together a few straws or bits of stick into a hollow depression in the ground, and in this she lays her eggs. The young birds can run directly they are hatched, and they hide themselves by lying on the ground, and then the parent bird watches over them with the greatest care and anxiety. She circles round and round overhead, continually giving utterance to that peculiar long-drawn cry from which the bird obtains her name, and it sounds very weird and unearthly to the traveller upon a lonely moor. If anyone should approach too near the spot where the young ones are lying, the mother-bird will fly off to a distance, and then alight in a conspicuous place, and try to attract the attention of the intruders by shamming lameness, or pretending to have a broken wing. I have seen this bird tumbling about on the ground and flapping her wings about precisely as if they were fractured; but, on approaching the spot, she would get up and fly slowly along the ground for a little distance, and then continue her ridiculous contortions, until she thought she had drawn

the pursuer far enough away from her young ones. Another bird which resorts to this plan of decoying the pursuer away from her nest is the dotterel, which makes her nest upon rough moorland, and she will sit so tightly upon her eggs that one may almost step upon her; or else she will flutter away in the same fashion as the plover, and as soon as she has drawn the pursuer away for some distance, she gets up and flies back again, and she knows full well that he will hardly be able to find the nest again, so exactly similar is it to its surroundings.

The eggs of the plover are considered a great delicacy, and in the London markets will often fetch almost fabulous prices, when they are at all difficult to procure. When I was an undergraduate at Oxford my college servant came into my bedroom one morning with the usual parrot-like—"Seven o'clock, sir. What will you take for breakfast, sir?" When I had given him some sleepy order or other, he informed me that "they have got some plovers' eggs in the kitchen this morning, sir." Aroused by this information to a state of semi-consciousness, I enquired the price, and was most effectually awakened by the announcement, "Well, sir, they run about eight shillings a couple," and he added parenthetically, "but they are not quite as fresh



as they was, sir." "Who on earth pays that price for them?" I exclaimed aghast. "Well, sir, the Dons eat 'em, and some of the gentlemen; they don't ask the price till they sees 'em in the bill, sir, and then I lay they carry on awful."



MR. AND MRS. LAPWING AND FAMILY  
AND ADDLED EGG.

(By permission of Mr. Charles Thorpe.)

## CHAPTER III.

## GIANTS AMONG MEN.

THE instances which I have already quoted show how some of our little feathered friends protect their nests and young from their enemies, either by hiding them, placing them in inaccessible spots, or by enticing the would-be destroyer from the spot. We may easily imagine, therefore, how additionally well-protected such birds would be which, besides putting their nests far out of reach of any interference, are also able to defend them, if necessary, with powerful weapons. As an example of such the most obvious, of course, is the eagle, to which I alluded above. Her nesting-place is aptly described by the old patriarch Job (xxxix. 27): "Doth the eagle mount up at Thy command, and make her nest on high? She dwelleth and abideth on the rock, upon the crag of the rock, and the stony place. From thence she seeketh her prey; and her eyes behold afar off. Her young ones also suck up blood: and where the prey is, there is she." On the sheer precipitous heights of some rocky fastness, wild and desolate, and far remote from haunts



of men, there the royal eagle may be found at home.

“On the beetling brows of a yawning abyss  
By a precipice vast overhung,  
The eagle hath chosen her nesting-place,  
And there she hath laid her young:  
Jealously guarding the cradle of rock  
That serves for the infant nest,  
Bathed in the halo of fleecy clouds  
Which cover the crag-crowned crest.”

It is easy enough to *see* the spot where she has placed her eyrie, but woe to anyone who tries to reach it. If he succeeds in scaling the side of the well-nigh impregnable fortress, he has still to run the gauntlet of those sword-like talons and terrible beaks. Neither is there any difficulty in spying out the nest of a kestrel hawk in the top of a gigantic fir-tree, which rises spire-like far above the leafy heads of the rest of the forest; but it would require an enemy of more than ordinary intrepidity to ascend in quest thereof, for before he can secure his prize, clinging on as best he can in his perilous position, he has to do battle with the infuriated parent-birds, who whirl around his head, the while beating at him with their wings and making fierce grabs with their sharp beaks and cruel talons.

Such birds, indeed, naturally constitute the birds of prey. Now, supposing that one is lucky

enough to find the parents away from home, and is able to secure an egg in their absence, the battle is by no means over, for the egg has yet to be conveyed to the ground in safety, which is not an easy task when arms and legs are fully occupied



KESTREL HAWK FLYING OUT FROM A CLEFT  
IN THE ROCKS. THE HEN BIRD IS SEEN  
WITHIN, CROUCHING ON THE NEST.

with clinging on to the tree. Almost the only practicable way is to bring the egg down in one's mouth—a process which needs considerable care and practice on *terra firma* before it may be indulged in with impunity among the tree-tops, for, as may be readily imagined, such a practice is necessarily



attended with no small risk to the climber of being forcibly compelled to sample the contents of the eggs ; and should this take place while he is as yet in mid-air, the consequences are, to say the least of it, disagreeable, especially if, as my college servant so naïvely expressed it, the egg is “not so fresh as it was.” An addled egg can make itself uncommonly unpleasant at any time, and even at a respectable distance ; but in such close proximity it—well, it were better not to dwell on the subject. It is, moreover, very difficult for the novice to convey an egg in safety for any distance in his mouth without letting it knock about or rattle against his teeth, which would inevitably break—or at least crack—so fragile an article, although after some practice it is quite possible to carry even two or three small ones together in this way with a considerable degree of comfort and with very little risk of injuring them.

Talking of kestrels, one must say, in justice to this beautiful bird, that he by no means deserves the evil reputation accredited to him by most farmers and gamekeepers ; he is, in fact, one of the farmer’s most valuable allies, though he be the last to recognise him as such. The farmer perhaps one day catches him in the act of soaring aloft with one of his best fluffy chickens in his talons, and immediately puts him

down as a thief and a robber, and proceeds forthwith to shoot every one he can, without taking into account the fact that this bird destroys countless beetles, the grubs of which would gnaw away the roots of his crops, caterpillars which would devour the foliage, and, above all, mice which would fatten on his grain. Mr. Johns, in his "British Birds," mentions that a specimen was once shot in the craw of which were found no less than seventy-nine caterpillars, twenty-four beetles, a full-grown mouse, and a leech! How now, Mr. Farmer? If you deliberately leave your young chickens unprotected, you cannot expect a passing kestrel to resist the temptation, any more than you would refuse a bottle of gin if anyone presented you with one. You may argue that it is not a parallel instance—that the bird has no *right* to steal your chickens. Quite so, my friend; but the bird has just as much right to take your chicken as you have to take his life. Moreover—and this is a point that will probably appeal to you more—if you were able to exterminate his species, as you would like to do, you would find a marked depreciation in your crops. True indeed is the old saying, "Give a dog a bad name and you may hang him for it," and the poor kestrel is a remarkably good instance of it. And it must not be forgotten that if while hovering



for mice he should occasionally spy a young partridge in a hayfield or a chicken in a farmyard, and should yield to the temptation of appropriating it as a *bonne bouche* for his young ones, yet an occasional offence of this kind is far outweighed by the immense advantages he confers as a consistent destroyer of vermin.

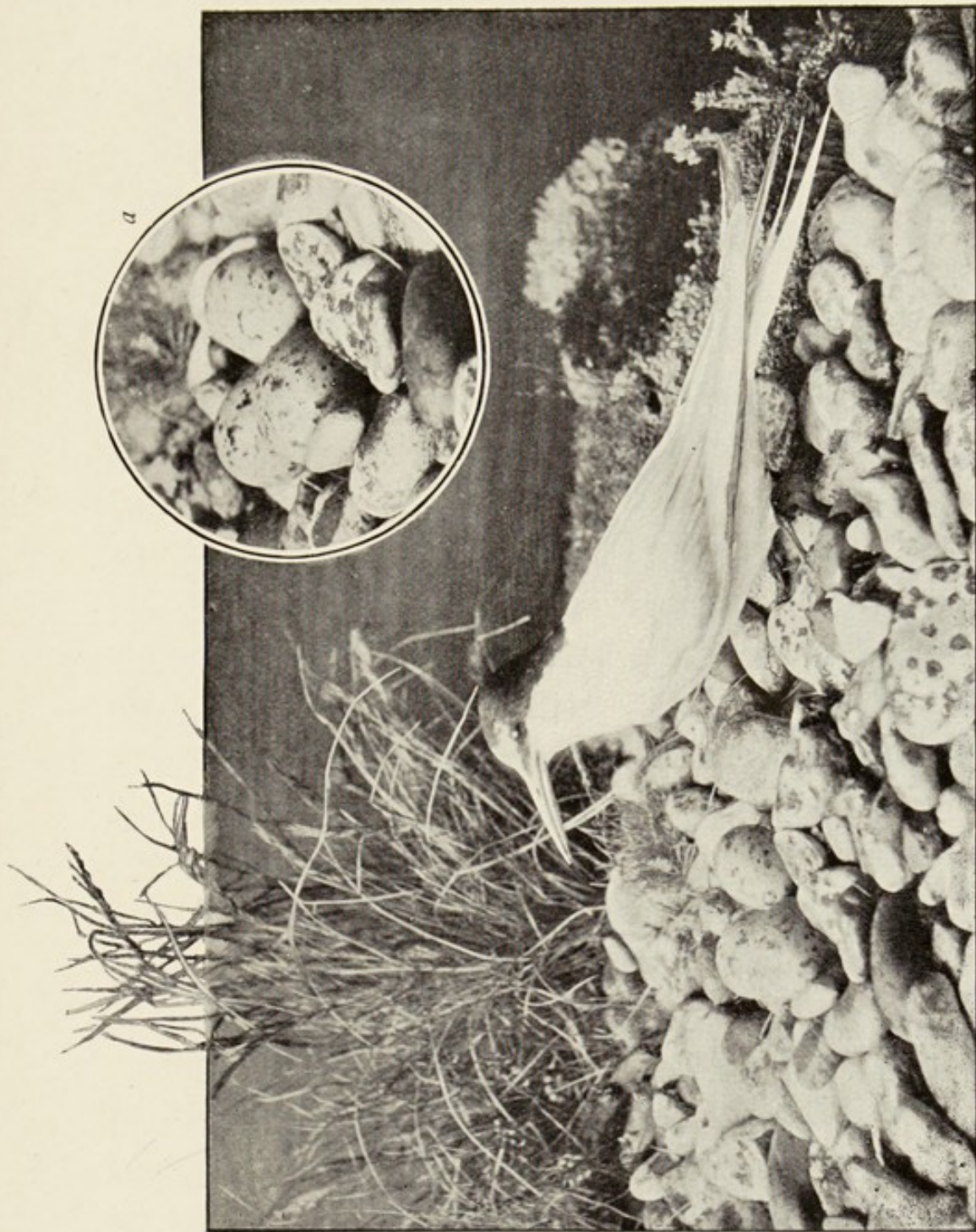
It might not be amiss to remark here that, as in the beast world so also in the bird world, the smaller the species and the greater the number of its enemies, so much the larger, proportionately, is the rate of its production. Thus the eagle will only lay two or three eggs in her nest, the blackbird or thrush four or five, the finch and linnet tribes five or six—I have found a linnet's nest with as many as eight, but that is very unusual—tits from eight to ten, and wrens from ten to fourteen. The long-tailed titmouse—otherwise known as the bottle-tit and a variety of other names—is one of the smallest of our British birds, and she lays an extraordinary number of eggs. Her usual quantity averages about sixteen, and a nest has even been found with as many as twenty-four. In such cases, however, when the young birds are hatched, the inevitable result of so large a number is that a certain proportion die in the nest of suffocation.

## CHAPTER IV.

## PROTECTIVE COLOURING.

WE must now pass on to the other means used by the feathered tribe for the protection of their nests and young, and which also serve to a great extent for themselves as well. I allude to the protective colouring, which we noticed before in relation to beasts, and we shall see that it plays a much greater part in the bird world. And in order to be able to realise in some degree what a wonderful protection is afforded by this natural colouring, one cannot do better than pay a visit to the bird gallery in the Natural History Museum at South Kensington, where there are many beautifully arranged groups of birds and their nests, together with their natural surroundings. This method simplifies the study of many of the scarcer birds and their habits, which would take too long or be too difficult for many of us to get at in their wild habitats. In one of the cases the floor is covered with pebbles of various shapes, sizes, and colours, just as they are found on the beach round some of our coasts; and one may stand in front of it for some time before noticing that





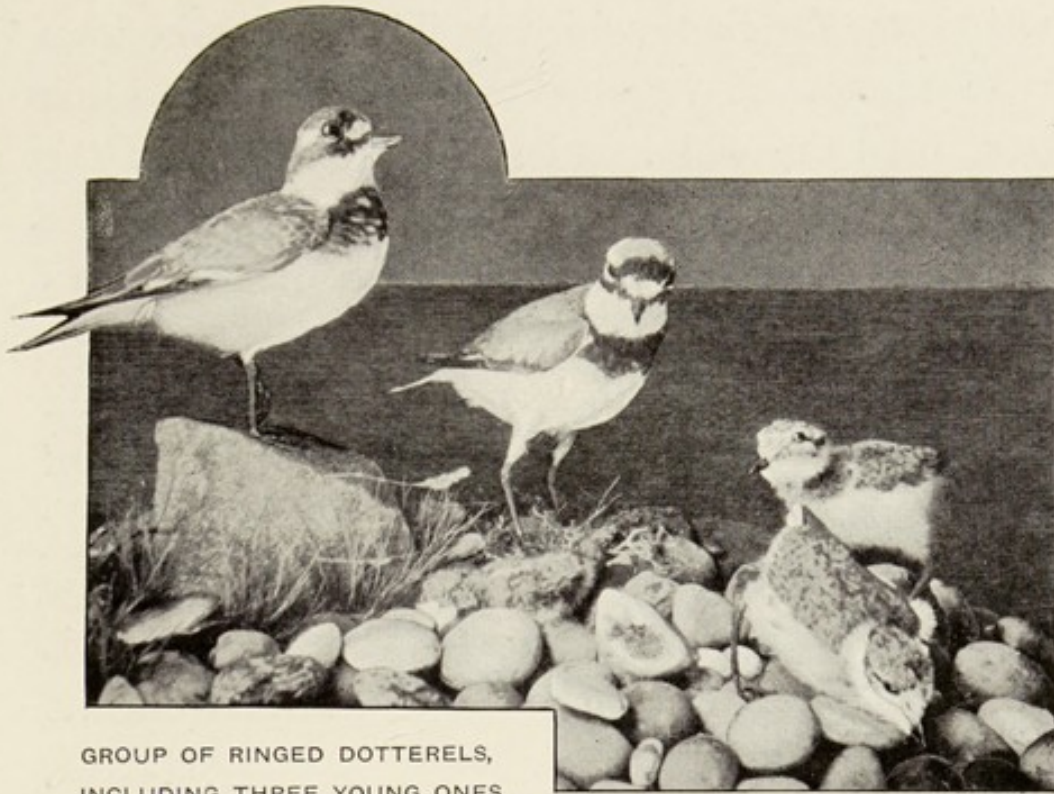
LESSER TERN, WITH THREE EGGS, DEPOSITED AMONG  
PEBBLES OF A SIMILAR COLOUR.

(a) *The Eggs on larger scale.*



some of the objects that we took to be pebbles are in reality eggs—the eggs of the common tern. They are laid openly amongst the shingle, and without even the faintest apology for a nest; and after searching carefully, one may find others of the same kind in other parts of the case, any of which would be quite unobserved by the passing eye, so exactly are they in keeping with their surroundings. In another case may be seen a similar surface of pebbles, amongst which are lying the eggs of the Kentish plover, which breeds on the shores of Kent and Sussex; and the young fledgelings are there also, lying prone among the stones. But it is even more difficult to detect the presence of the latter, though after looking for some time they will probably be betrayed by their bright little eyes, peering out from a cushion of variegated down or feathers, and surroundings of similarly mottled stones. Farther on may be seen a case containing a nest of grouse, beautifully hidden amongst heather and bracken, in excellent imitation of the natural surroundings amongst which they build in their native Highlands. Wonderfully mottled are both eggs and birds; and the mother bird, when sitting on her nest, well knowing that her greatest chance of safety is in lying low upon her nest, crouches tightly upon her eggs, and will almost allow the





GROUP OF RINGED DOTTERELS,  
INCLUDING THREE YOUNG ONES.

passer-by to step upon her ere she will move. In like manner the nightjar, or goatsucker, which makes no nest of any sort, but lays her eggs on the ground, chooses for her purpose a spot where there are pieces of dry and withered sticks lying about; and being herself adorned with longitudinal streaks of brown and grey, in precise imitation of these, she is quite invisible as she sits upon the eggs. Another case contains a nest of the lesser gull which was made in the very middle of a sheepwalk, where the bird used to sit upon her eggs, quite regardless of the sheep, which had even to jump over the sitting bird! In yet another group may be seen the nest of the

spotted woodpecker, which builds in the hollows of tree-trunks, preferring those of the silver birch tree; thus the white and brown markings on the backs of the birds, coinciding with those of the branches, afford them ample protection as they climb about the trunk.

The ptarmigan, which nests on the Scottish moors, is mottled with brown and patches of white, and it hides amongst the bits of similarly coloured rock which abound on the moors. In the winter its plumage turns pure white, so that it is then as invisible in the snow as it is on the heather in summer. Mr. Johns, in his "British Birds," quotes a very interesting paragraph by the Rev. A. C. Smith from the *Zoologist* (vol. viii., p. 2977), referring to these birds. "The male bird," writes Mr. Smith, "has been seen, during a snowstorm in Norway, to perch himself upon a rock which overtopped the rest, and to sit there for some time, as if enjoying the cold wind and sleet which was drifting in his face, just as one might have done on a sultry summer day on the top of the Wiltshire downs, when the cool air was stirring there." The same writer observes: "I have generally found the ptarmigan concealed among the grey, lichen-covered rocks on the summits of the fjelds, and so closely do they resemble these rocks in colour that I could hardly ever





NIGHTJAR AND TWO EGGS.



see them on the ground ; and sometimes, when the practised eye of my guide found them, and he would point out the exact spot, it was not until after a long scrutiny that I could distinguish the bird within a dozen yards of me. Frequently we would find them on the snow itself, and many a time has a large circular depression in the snow been pointed out to me where the ptarmigan has been lying and pluming himself in his chilly bed. He is a noble bird, free as air, and for the most part uninterrupted in his wide domain ; he can range over the enormous tracts of fjeld, seldom roused by a human step, and still more seldom hunted by man. When the winter clothes his dwelling in a garb of snow, he arrays himself in the purest and most beautiful white ; when the summer sun melts away the snow, and the grey rocks appear, he too puts on his coloured dress, and assimilates himself once more to his beloved rocks. But the young ptarmigans are my especial favourites. I have caught them of all ages ; some apparently just emerged from the egg, others some weeks older. They are remarkably pretty birds, with their short black beaks, and their feathered toes ; and so quickly do they run, and so nimble and active are they in escaping from you, that they are soon beneath some projecting stone, far beyond the reach of your arm, where



you hear them chirping and calling out in defiance and derision. The call of the old ptarmigan is singularly loud and hoarse; it is a prolonged grating, harsh note, and may be heard at some distance."

We could not, indeed, wish for a better instance than the ptarmigan of the manner in which the colouring in some species will alter with a change of surroundings, so that the bird is equally well protected at every season of the year.

But an example which will appeal to us perhaps better, as being more easily within our reach, and one which it is possible for anyone to see for himself, is the common pheasant. Although the cock birds are brilliantly coloured, the hens are very dull in appearance, and are mottled with brown to resemble the dead leaves amongst which they rest. During a ramble in the woods one may often come across the sitting bird crouching upon her nest, and can almost take hold of her before she will move. The partridge, too, has just the same habit of crouching on her nest, and is similarly protected by the sombre hue of her plumage. I once came across a very interesting fact with regard to this bird, which I believe is not generally known. When out for a walk one day near Winchester, I observed a partridge fly out from a clump of grass about forty yards off,

and on examining the spot I found a nest, but apparently no eggs. I was on the point of going away, supposing that the bird had not yet begun to lay, when I thought I saw something glittering underneath a leaf, and on stooping down I discovered some fourteen eggs beneath a slight covering of leaves. Presumably the mother-bird had kicked the leaves over the eggs in order to hide them from view while she was away. I made several subsequent expeditions to the nest, and the result of my observations was that whenever I found the bird absent, the eggs were covered with leaves ; but if the bird was on the nest when I came up and disturbed her, the eggs were quite bare when she flew off, thus proving that she must have covered them intentionally when she went off on her own account. I do not know whether this is the usual practice of partridges, or merely an idiosyncrasy of this particular bird ; but we noticed that the little dabchick covers her eggs with dead weeds, and there is no reason to suppose that the average partridge is at all inferior in intelligence.

Talking of intelligence, the palm must undoubtedly be awarded to a little sea-bird that lives in the Hebrides, to which Mr. Digby Pigott refers in his delightful book, "London Birds." He tells us that the young of this bird run about





KINGFISHER SEATED OUTSIDE THE HOLE  
BY WHICH IT OBTAINS ENTRANCE TO THE  
GALLERY AT THE END OF WHICH ITS  
NEST IS PLACED.



on the ground, and as soon as they are aware of the approach of an enemy, they turn over on their backs, lying close against the ground, and hold a dead leaf over themselves, so that they are completely hidden from view. Surely such cunning would be difficult to surpass.

I have heard sceptics object to this theory of protective colouring, taking as an argument the case of the kingfisher, and saying that a bird of such dazzling brilliancy cannot possibly be protected by its colouring. But this is merely another of Nature's riddles, which they do not take the trouble to try to answer. In reality, the kingfisher is singularly well protected, and by that very brilliant colour to which they object ; for the kingfisher has his habitat among shady streams and pools, over which the ever-varied rays of light keep flashing through the leaves of the overhanging trees ; and as the kingfisher darts to and fro over the water he closely resembles one of these streaks of light, and would probably altogether escape the notice of anyone who was not on the look-out for him.

Another feature of this protective colouring, which plays by no means an insignificant part in ensuring the safety of the feathered tribes, is the fact that at the approach of winter, when the leaves begin to fall, the birds to a considerable



extent lose their bright plumage, and assume a sober winter dress, which renders them much less easily seen among the leafless branches than they would be were they to retain their bright summer garb. For the same reason, the hen birds are almost invariably less brilliant than their mates, and in many cases, whilst the cock is arrayed in gorgeous style, the hen is quite humbly attired, and presents a very shabby appearance by the side of her gaudy companion.

Many birds protect their young by making their nests of the same material as their immediate surroundings; hence, although the nest may be perfectly open to the eye, and quite unhidden by any screen of leaves or other form of protection, it is, nevertheless, nearly impossible to find it except after the most searching scrutiny. The long-tailed tit, to which I have made reference before, makes a most beautiful nest of this description. She is fond of building in the fork between two branches of an old lichen-covered apple-tree, and as she covers the exterior of her nest with the same lichen, moulding and shaping it so as to conform exactly with the surface of the branch, in such a position the nest absolutely defies detection, and the prevailing tints of the bird herself being of a similar grey, she also escapes notice when perched on the bough beside her nest.

In the side of the nest, and quite hidden from sight, there is a tiny hole scarcely large enough to admit a man's thumb, by means of which the bird obtains entrance to the luxurious feather bed within. The chaffinch is another bird which chooses the same sort of nesting-place ; and though

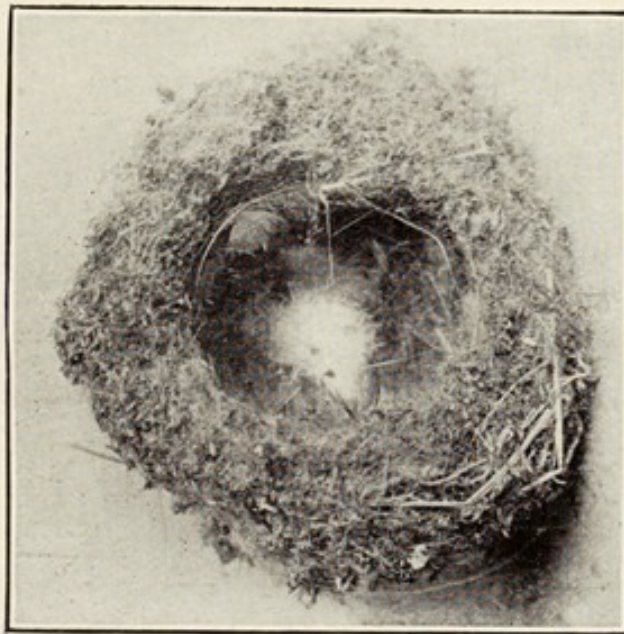


LONG-TAILED TIT AND NEST  
IN GORSE-BUSH.

her little home is not nearly so elaborate as that of the long-tailed tit, it is nevertheless a marvel of symmetry and neatness. She shows a strong partiality for apple-trees, and if she selects a



lichen-covered branch, she is always careful to cover her nest with the same material; she is also fond of fir-trees, and should her choice fall upon one of the latter, she composes the outside of the nest with green moss, so that it may be as invisible in the fir-tree as among the lichen in the apple-tree. She would never be guilty of such an enormity as to put a green nest in a lichen-covered tree, or *vice versâ*. The interior of the chaffinch's nest is lined with a dainty arrangement of feathers, horsehair, and wool.



CHAFFINCH'S NEST



BLACKBIRD'S NEST.

## CHAPTER V.

“EYES AND NO EYES.”

I HAVE given a few instances of the ingenuity of various birds in hiding their nests, but as an example of crass stupidity in the selection of a nesting-place the blackbird or thrush would take a lot of beating. Indeed, these birds seem to take a peculiar delight in putting their nests in places where one simply *cannot help seeing them*; at any rate, that is the case with a thrush in my garden, which has located her nest within a foot of the carriage drive, with nothing whatever to



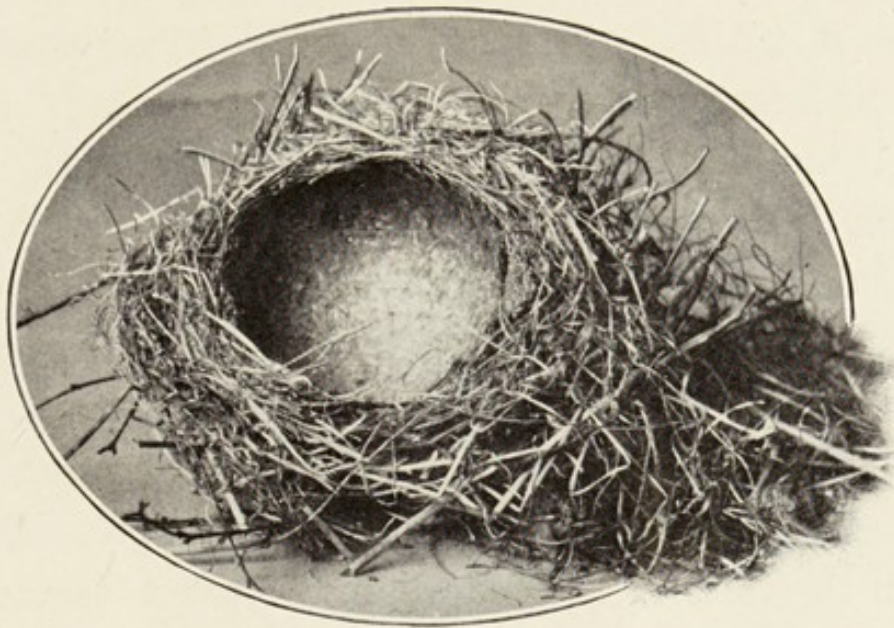
protect it from the public gaze. The bird sits on the nest and watches the passers-by with an anxious expression ; and if anyone should stop for a moment in front of the nest, off she goes like a Jack-in-the-box, and scolds from a neighbouring tree until she considers it safe to return. That bird evidently suffers from nerves ; and this being the case, it is quite inconceivable why she did not choose a more secluded position. Possibly she has found out from her relations that nests are held sacred in this garden, and so made the experiment to see whether the statement is true. At any rate, it is a very severe test, and I hope she may not be disappointed, for she presumably forgets the existence of such creatures as telegraph boys and that ilk, who usually develop strong symptoms of kleptomania at the sight of a bird's nest. I once came across a less nervous bird—a blackbird—that built in a garden in Kent where I used to live ; she put her nest in a rhododendron shrub, just outside the hall window, from which point of vantage it was perfectly conspicuous. We used frequently to amuse ourselves by watching the parent bird sitting on the nest, and afterwards the antics of the young fledgelings. The bird seemed not to mind being watched in the least, for she would never fly off the nest, even when stared at through the open window.

These instances may be considered quite typical of the general practice of these birds with regard to the choice of a nesting-place. Occasionally, of course, the acute observer will come across a very well-hidden specimen, which would have escaped the majority of eyes ; but such are quite the exception, the favourite place being a hedge or bush, in which the nest is very scantily hidden, and often only a few feet from the ground, and its large size would render it still more easily detected. I found a very pretty blackbird's nest in the spring of 1899 on a piece of gorse-covered common near Winchester. The nest, which was in a low hawthorn, was composed almost entirely of the thin strips of paper that one finds in the tops of biscuit tins, and which had evidently been dropped by some picnic party, and promptly commandeered by the enterprising blackbird. The effect was as beautiful as it was striking, although it did not exactly tend to make the nest less conspicuous, as I "spotted" its unusual appearance when I was still several hundred yards away from the bush.

I must not pass on without a few words about the little robin redbreast, for to him, of all others, must be awarded the palm for eccentricity in the choice of a nesting-place. In spite of the case I quoted before of a pair of tomtits which built



in a man's skeleton, the robin is more consistently eccentric even than the tomtit. His natural place is in the hollow of a mossy bank, under a rotten tree-stump, or in an ivy-clad wall; but if he can discover anything belonging to a human



NEST OF SONG THRUSH.

being, he will for a certainty make use of it. A workman's coat hung up under a tree and forgotten has been found to contain a robin's nest in one of the pockets. Hang up an old kettle or jug in a tree in your garden, or throw an old boot under a bush, and the chances are that friend robin will build in it. The hollow in a statue, a disused bee-hive, a cast-off hat, a battered water-can, a flowerpot, and a thousand other equally extraordinary places have been chosen by this

eccentric character. In fact, nothing comes amiss to him, as long as it is something belonging to his great friend—Man. If a man were to lie on the ground with his mouth open, I wonder whether Mr. Redbreast would take advantage of the opportunity and build in it, provided, of course, that the man lay still long enough. This would be an interesting experiment for anyone who might feel inclined to try it. Seriously, though, even such a thing as this could scarcely seem more wonderful than the habit of some little birds in Egypt, which hop about between the wide-opened jaws of a sleeping crocodile, and pick out from between his teeth the little scraps of meat from his last meal, thus obtaining a supply of food for themselves besides doing a great service to the crocodile by providing him with a living tooth-pick, to save him from the horrors of toothache. Herodotus tells us that such is indeed the case, and the story has been confirmed in modern times by a French naturalist, who pronounces the bird in question to be identical with our Kentish plover.

Truly may the robin be called the friend of man. There seems to be a sort of mysterious sympathy between it and the human race, so that it appears almost as if it cannot get on without him, and that if he became extinct the robin would also cease to exist. At every turn you meet



him; the gardener pauses in his work to chirrup to the little red-coated friend who hops around his feet, or perches upon the very barrow he is using. The lonely traveller, stopping to rest for a moment, will have his eyes gladdened by the sudden appearance—he knows not whence—of a little bright-eyed companion who has come to cheer his solitude; the mourner, kneeling by the grave-side in the deserted churchyard, will feel inexpressibly soothed by the soft twitter of the sympathetic little being perched on the headstone. It lends an additional charm to his presence that he does not herald his arrival with a noisy fluttering, but stealthily, silently, creeps to within a few inches of you, and you *feel* that he is there long before you see him. In all weathers, and at all seasons, he is the same staunch friend. On a hot, sultry, summer afternoon, when you are having tea under the trees in the garden, he will come and deliberately pull the bread and butter off the plate, or—

When summer's rosy fragrance has vanished from our  
sight,  
And winter's icy fingers, with canopy of white,  
Has sprinkled Nature's wonders, and buried all beneath  
A cloke of radiant beauty, as with a bridal wreath,

then will his little footprints on the window-sill testify how he has trotted through the snow to

seek for warmth and protection—for it is *he* who now stands sorely in need of sympathy—and if you open the window he will very likely even hop fearlessly inside. Even as I am writing, there is one pouring forth his little song of thanks within a few feet of the window, regardless of the hurricane raging around him or the blinding torrents which almost drive him from his perch.

There is, moreover, an odour of sanctity about him. He is the only bird which, of his own choice, frequents the insides of churches. The jackdaw will build in the tower, the starling in the water-pipes, and the sparrow amongst the festoons of ivy that hang over the old porch; but it is left for the robin alone to hop around the pillars, roost in the pulpit, and make his nest behind the altar or in the organ pipes. I have read of three robins' nests being found in the pipes of the same organ in a village church. He makes the sacred edifice his home. He could get out if he wanted to do so, but he is quite happy, so he stays there; and any who could have the heart to turn him out would assuredly be guilty of sacrilege.

There was a certain robin which became very much attached to me in the old days when I lived in Kent, though I am sorry to say that it was only a case of "cupboard love." I had an erection known as a "moth-trap"—a device for catching





GREENFINCH'S NEST WITH EGGS.

moths, which I had made with plates of glass so arranged that the moths can fly in, but cannot get out again. The "trap" was stationed at the bottom of the garden, and a powerful lamp in the back part of the trap shone across the valley. Every morning I would go out before breakfast, to examine the night's captures, when the specimens that were worth keeping were deposited in pill-boxes, and the others were dismissed with a caution not to trespass again where they were not wanted. Now there was a certain member of the redbreast fraternity which had apparently been in the habit of observing my movements with great interest, and being even more curious than the rest of his brethren, he at length determined to find out for himself the use of the strange erection with a bright lamp in it, and why a weird-looking object with a broad-brimmed white hat and a camp-stool should come down every morning to visit it, preceded by a dignified collie dog. This latter always watched for me to come out every morning, and after the usual greetings he used solemnly to walk in front of me down the garden till we reached the scene of action, when he would leave me, returning as soon as I had finished, to escort me solemnly back again; and doubtless the robin thought that the dog was one of the necessary adjuncts to the proceedings.



Accordingly, one morning I found him in an apple-tree (the robin, not the dog), awaiting my arrival with ill-concealed impatience. As soon as I had sat down in front of the moth-trap and began to take out the glass slides, he hopped down into the path quite close to me, and began the most unusual sort of chattering, which was his way of asking me to let him know what was going on inside. The first moth that I did not want I threw down into the path as usual; and being a thick-bodied *Noctua*, it did not attempt to fly. But hardly had it reached the ground when robin, with a triumphant chirp, had diverted its course to a bodily disappearance down his own throat. He had now solved the mystery, and as he swallowed the dainty morsel, and discovered that, in his case at any rate, the pleasures of realisation far exceeded those of anticipation, he awaited with a quiet chuckle the appearance of the next moth, which promptly shared the fate of the first. From that day forward he was a regular attendant at the morning performance. Every day as I approached the spot I would give a little chirp, which was instantly followed by an answering one from the apple-tree, and my pretty red-breasted friend would appear, keeping up a rapid volley of eager and impatient remarks in his own expressive language. After a few mornings he



THE SAME NEST WITH YOUNG BIRDS.

discovered where I came from, and would often wait for me at the top of the garden, and would accompany me all the way down, hopping from tree to tree. Occasionally he would be a little bit late, and not be there when I arrived, in which case I would suspend the proceedings until I heard the answering chirp in the distance. His subsequent antics were too funny for description. As soon as a moth touched the ground he would raise himself on tiptoe, cock his little head on one



side, and gaze at it for two or three seconds ; then a pounce, and it disappeared ; and as it went down his throat he would put on such a ridiculous expression of sublime satisfaction that at times I could not refrain from bursting into a roar of laughter as I watched his absurd mannerisms, at which he would jump a few feet off, and his expression change to one of such genuine astonishment, that I would laugh all the more. But after a while he got used to these outbursts on my part, and learned to treat them with the contempt which, in his opinion, they doubtless deserved. Whenever I put a moth into one of the pillboxes, instead of throwing it down to the robin, he would give a most resentful chirp, evidently considering that all the proceeds were his perquisites, and that I had no business to appropriate even one. I wonder if he thought that *I* ate them too ! The number that he would consume would occasionally make me tremble for his digestion ; but although he was quite equal to accounting for twenty or thirty big fat moths every morning—and they usually went down wings and all—he never seemed any the worse for it. There was one species in particular for which he showed a special liking. I soon found this out by the extra excitement that followed the appearance of one of this kind, and the more

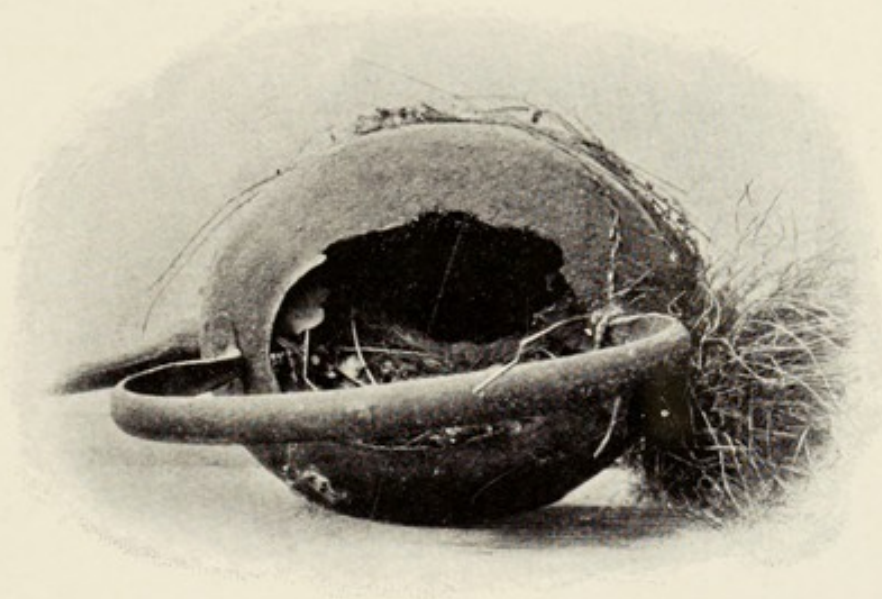
than usually comfortable expression on his little face after the moth had disappeared.

\* \* \* \* \*

One word, before I leave birds altogether, about our old friend the cuckoo, that harbinger of spring—for who does not welcome the first sound of his well-known voice, and look for the warmer days of which he is the herald? We are all familiar with the cuckoo's evil habit of placing its eggs in the nests of smaller birds, so as to save itself the trouble and responsibility of them—an example of meanness which it would be hard to beat, so I will not expatiate upon it. But I have mentioned the cuckoo intentionally, as it is one of the few British birds which protects itself by mimicking the habits or attributes of another bird. In general appearance the cuckoo bears a strong resemblance to the sparrow-hawk, and as such it seems to exercise a sort of fascination over the smaller birds, who thus minister to all the wants of the young cuckoos even after they can fly; and moreover, there is a small bird known as the "cuckoo's mate," which seems to be under a continual mesmeric spell, for it follows the cuckoo about almost wherever it goes. This resemblance to the hawk is so striking that it would quite account for the old theory which at



one time was very generally held, that in the winter the cuckoo turned into a merlin—a belief that gained weight from the fact that the merlin migrates to Southern Europe just at the time when the cuckoo disappears.



ROBIN'S NEST IN AN OLD KETTLE.





Part III.

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INSECTS.







x



COMMON YELLOW SLUG BENEATH  
STONE, MARKED X.

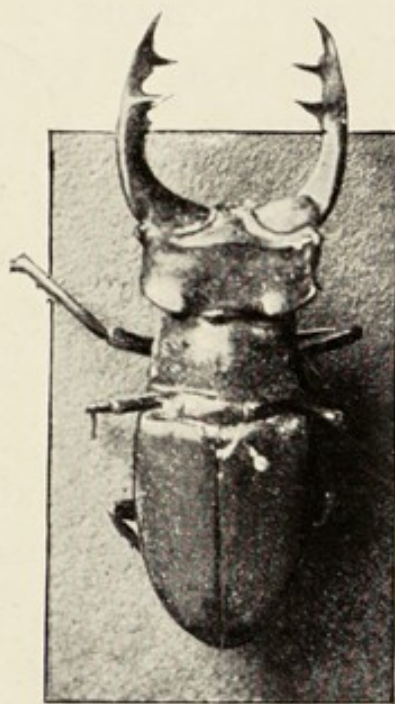
THE answer to Nature's Riddle is not yet complete—that is to say, complete enough to be considered satisfactory, for it could never be dealt with *quite* completely in any volume smaller than the Post Office Directory. We have already discussed the higher forms of animal life in this connection, and it is quite time that we turned our attention to the countless forms of lower creatures that swarm around us. And if the various means of protection that we have noticed among birds and beasts are by them so sorely needed, much more are they necessary in the insect world; for insects, being the lowest grade of animal life, become the most natural prey for the larger beasts, and there would soon be none left were it not that their defences are proportionate to their weakness. Look at the ants which are shovelled up wholesale by the long, sticky tongue of the ant-

eater; or in our own country, where thousands of them go to form a breakfast for any brood



THE WOOD-  
LOUSE WHICH  
ROLLS ITSELF  
INTO A BALL.

of young partridges that happens to pass their way. Do not such things need protection far more than any of their greater neighbours? But there is a class that is even more defenceless—for the ant is a warlike little beast, and can often hold his own against larger enemies—which is scientifically known as “Lepidoptera,” and more familiarly called butterflies and moths. And it is from this group that I propose to take my instances, as it is here that we shall find the most striking ones, for throughout all the many changes that take place in the life of a little butterfly, his defencelessness is so complete that he has to be entirely dependent upon that protective colouring that may almost be looked upon as the mainspring of his existence. I will therefore confine myself to him and his kind, and will not do more than touch upon the other groups of lesser



STAG-BEETLE



beasties—the bees and wasps, whose stings afford them quite as much defence as they require; the beetles, which are well protected by their horny shells, as with a coat of mail; or scorpions, spiders, and that ilk; not to mention the countless myriads of wonderful living things to be found in any of our roadside ponds, or beneath the broad bosom of the sea. And, although I may occasionally do otherwise, I will keep as far as possible to species which are to be found in our own country, as such could most easily be brought within the reach of our individual observation.



TARANTULA SPIDER.



RED ADMIRAL BUTTERFLY.

## CHAPTER I.

### COLOURS OF THE RAINBOW.

THE butterfly is essentially a child of pleasure—a giddy, playful creature, without a thought for the morrow, or a care to trouble him. But what a dull, uninteresting place the loveliest garden would be without him! The most beautiful flowers seem tame without his fairy-like form floating amongst them, to show off their colours by the rich contrast of his own. How



supremely happy he is as he hovers with exquisite grace over some especial favourite, or rests for a moment on the edge of its delicate blossom and samples the nectar within, the while basking his beautiful wings in the refreshing sunshine, and then darting off to join a passing comrade, and to perform a series of acrobatic evolutions in the air as they rise higher and higher, and at length disappear over the trees.

Child of the sun, pursue thy rapturous flight,  
Mingling with her thou lov'st in fields of light,  
And where the flowers of Paradise unfold,  
Quaff fragrant nectar from their cups of gold.  
There shall thy wings, rich as an evening sky,  
Expand and shut in silent ecstasy.

(*Rogers.*)

Few of Nature's wonders can compare with the regal splendour of the Red Admiral butterfly—common in our country gardens and fields—as he perches on one of the blossoms of his favourite valerian, or even right in the pathway in front of one; and there he sits, expanding and folding his brilliant wings in the sunlight, as if conscious of their beauty, and gently quivering them until their dazzling colours almost remind one of a peep into a kaleidoscope. Truly it may be said of him that “Solomon in all his glory was not arrayed like one of these.” He is as vain as any peacock, and I am sure that he does it to get the

admiration that he knows is due to his handsome plumage. I use the term "plumage" advisedly, for if viewed under a microscope each tiny speck of dust with which his wings are clothed will appear in reality to be a beautiful feather. Certainly he is conspicuous enough as he sails about in his robes of cardinal and black; but watch him a moment. He has just settled on a stone wall, and is slowly waving his wings to and fro as if they were drinking in the bright sunshine; the sun goes in for a moment; you take your eyes off his Imperial Majesty just for an instant to look at the threatening storm-clouds which are obscuring the sun, and when you again cast your glance in the direction of the butterfly—lo, he is gone! You are rather surprised, as you only looked away for three seconds, and thought you would surely have seen him fly off. You stand for a moment waiting to see if he will return, and as the sun again peeps out from behind the clouds, the butterfly suddenly reappears in the same spot as he was before, though you were watching all the time and never saw him return. Look a minute longer, and you will soon find the solution of the mystery. The sun goes in again behind a bigger cloud, and a spot of rain falls. The butterfly instantly closes his beautiful wings, letting the upper ones slip down inside the lower ones, and as he does so



he becomes invisible. Then you understand that he never left the wall at all the



BUTTERFLY IN NATURAL  
RESTING POSITION.

first time when you looked away for a moment, but merely closed his wings in this peculiar manner. You draw nearer to look closer at this remarkable phenomenon, and you will see that the undersides of his lower wings—which, in his present resting position, are alone visible—are mottled with various shades of grey and light brown, exactly resembling the

wall upon which he is sitting. You take a few steps off, and then look back towards the wall again; but look as you may, you cannot see him, and as the rain begins to fall more heavily he crouches still closer to the sheltering wall, and you go away and leave him, realising, as you never did before, how exquisitely he is protected, although apparently so defenceless, as he sits at rest.

And this principle holds good with other butterflies, for although the upper sides of their wings may be radiant with all the colours of the rainbow, yet underneath they wear a sober aspect, so that if the insect wants to rest he can do so undisturbed. Even the Purple Emperor, whose throne is on the summit of a lofty oak, and who, in the immortal words of Lord Byron,

: : : : rising on its purple wing,  
The insect queen of Eastern spring,

is accustomed to soar above the highest tree-tops; and, seldom descending within reach of danger, is not in such great need of protective colouring as those which live nearer the ground; yet the undersides of its dazzling pinions—which, as in all butterflies, are alone visible when it is at rest—have no share of the gaudy purple, but just a mixture of soberer tints. But alas! this lovely



creature only too often falls a victim to its own depraved tastes, for, rejoicing in the flavour of a piece of carrion or a dead cat lying in a ditch, it will often descend to regale the imperial palate upon the nauseous juices that exude therefrom, and while thus employed it would readily fall a prey to any passing enemy, for so intent is it on its occupation that it will usually permit one even to take it up between the finger and thumb. Alas, that so regal a being should indulge in so degraded a taste!

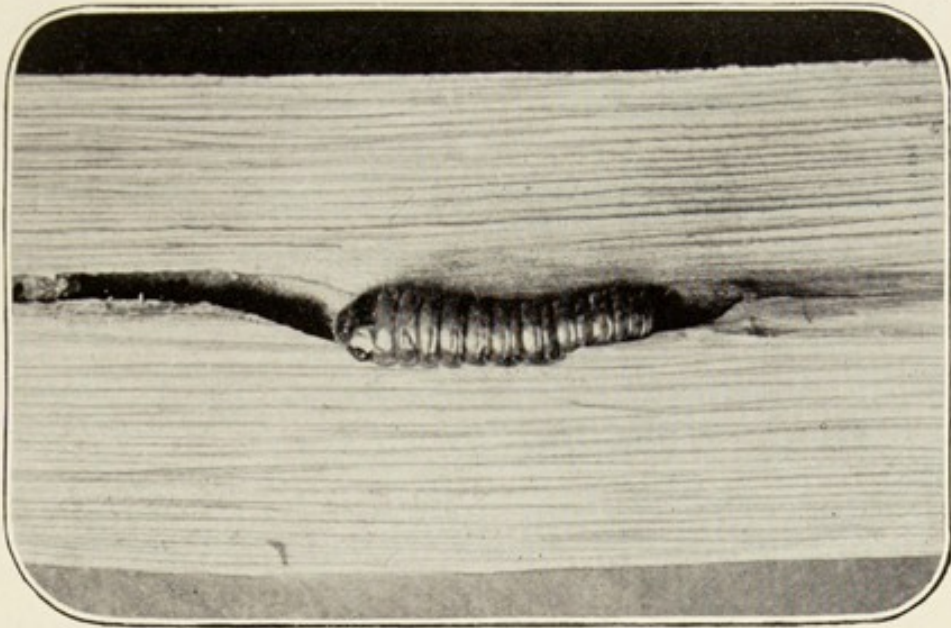
The majority of butterflies, however, have much humbler resting-places than the tops of trees, and therefore depend, to a very great extent, upon their protective colouring for their safety, and, of course, almost entirely so during the earlier stages of their lives.

And so, throughout the entire duration of a butterfly's life—first as the tiny egg, then the caterpillar, then during the long sleep of the chrysalis state, and lastly as the perfect insect—we may notice that its protective colouring is the chief source from which the creature derives its safety; and that often, like the rabbit, it is from its immobility alone that it will find the surest means of protection. More especially is this the case in the earlier stages of its existence, for the defenceless caterpillar has not the pinions of the butterfly

to take it out of danger, and its unwieldy body is often not adapted for rapid locomotion: the chrysalis is still more defenceless, as it has no means of locomotion whatever, and—except in a few cases—very little power even of movement. But I will deal more fully with each stage as I come to it in its proper order.

And perhaps it would be as well just to mention, for the benefit of the uninitiated, what *is* the proper order of a butterfly's life, though I will not go into it at any length. The egg is, of course, the first stage, from which in due time the young caterpillar emerges, and at once starts feeding voraciously, beginning usually with the remains of his own empty egg-shell, and then turning his attention to the leaves of his food-plant, on which he lives for a period of from a fortnight to ten weeks, or even longer, according to the species, during which time the caterpillar has changed his skin some four or five times. Then comes a more important change. He ceases to eat, which in a creature of such a healthy appetite is a sure indication that something very unusual is going to happen; he then changes colour, and prepares to turn into a chrysalis. Now this process is accomplished in a variety of ways. Whereas most species of *moths* bury themselves in the ground, or hide themselves in a cocoon of silk, *butterflies*





CATERPILLAR OF GOAT-MOTH  
IN TRUNK OF ASH TREE.

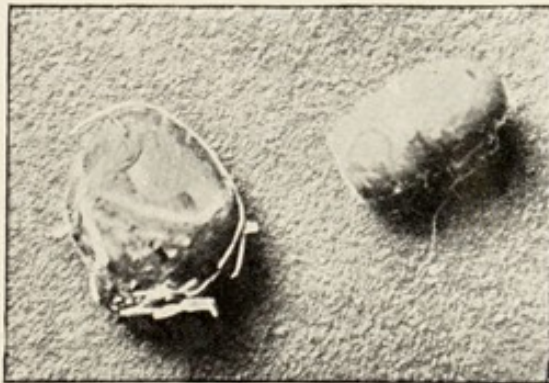
merely fasten themselves with a band of silk on to a wall, or twig, or stalk of their food-plant, or some convenient spot. In the chrysalis state, the insect remains for a period of from a fortnight to six or seven weeks, and many species even wait through the following winter before emerging, and some longer than that. Then the husk is broken, and out therefrom appears a poor draggled object, which crawls up a handy stalk, to wait until his wings have grown; and after a few hours he is ready to fly away and enjoy his new lease of life. The perfect insect lives not for a day only, as some imagine, but certainly for several weeks—barring accidents—and often for months, and sometimes even sleeps through

the following winter in some crevice. This latter habit explains the sudden appearance of butterflies on a warm day in midwinter—especially the beautiful golden Brimstone butterfly. They have *not* just come out from the chrysalis, as is the popular belief, but have merely been waked from their long winter sleep by the unusual warmth. And, lastly, when the bonny butterfly feels the end of her life approaching, she lays her eggs and then dies.

There are, of course, exceptions to these rules in the butterfly's life, as to the length of the various stages, which varies infinitely in different species—for instance, the Goat moth, which spends three or four years as a caterpillar, living inside tree-trunks and feeding on the solid wood. This caterpillar, which grows to an enormous size, was the "Cossus" of Pliny and the old Roman epicures, and was considered a very great delicacy. A creature more repulsive in appearance and smell would be hard to imagine, so that the tastes of the ancients must have been distinctly peculiar. Another species, the Small Eggar, spends a couple of winters very often in the chrysalis state. I have in my possession a very curious double cocoon of this species, two of the caterpillars having apparently agreed together to spin a joint cocoon, and the result is a most peculiar structure. Un-



fortunately, neither of the parties ever came to maturity, and I fear that we must conclude that it was a case of familiarity breeding contempt, for the state of chaos inside the cocoon showed that they must have seriously fallen out, in a manner that left them too mutilated to be able to take upon themselves the chrysalis state with any degree of success.



COCOON OF THE "SMALL EGGAR"  
AND DOUBLE COCOON FORMED BY  
TWO OF THE CATERPILLARS TOGETHER.

## CHAPTER II.

## EGGS AND CATERPILLARS.

LET us now consider the different states separately.

It is in the egg stage that the insect undoubtedly has the least need of protective colouring, as, indeed, is obvious, for by its very diminutive size the egg would more readily escape detection than could the more bulky caterpillar or chrysalis. And yet we must not imagine that on this account the parent butterfly is wholly careless of where she places her eggs, or trusts to luck that they will not be seen because they are so small. On the contrary, she is exceedingly particular about the choice of a situation for them, and most fastidious in the selection of a suitable spot. Moreover, nearly every species has her own peculiar way of depositing her eggs. Most butterflies—as distinguished from moths—prefer to lay them singly or in batches of two or three at a time. Watch the movements of the next “Large White” butterfly that you see hovering over the cabbages in your garden. You will see her settle on one of the succulent leaves, becoming invisible as she



does so, for the underside of her wings exactly harmonises with the yellowish green of the cabbage ; and when she flies off again, if you will examine the leaf where she has perched, you will very likely find one or more beautiful little objects about the size of—I will not make use of the proverbial “ pin’s head ” as a comparison, and leave the reader in doubt as to whether I mean a common white pin, an entomological pin, or a lady’s hat-pin ; but I will borrow Mr. Newman’s expression, and compare it with a diminutive wine-bottle with the head knocked off. Let my readers try to imagine such an object, about one-twelfth of an inch in height, standing upright like a nine-pin upon the leaf. Look closer, and you will discover that it is of a whitish-yellow colour, beautifully iridescent, and looking as if it were composed of the finest porcelain ; it has, moreover, on its surface numerous longitudinal ribs, as well as delicate transverse lines. Such an object would well repay examination under a microscope, for a butterfly’s egg is a far more beautiful and artistic piece of workmanship than the finest and costliest bit of china ever produced. The eggs are firmly attached to the surface of the leaf by means of a gummy secretion which the parent has inside her body for this purpose, although some butterflies dispense with it altogether

—for instance, the common blue butterfly, which drops her eggs helter-skelter among the grass and clover without attempting to attach them in any way. Now this insect shows great sense in taking this wise precaution, for were she to fasten the eggs on to the clover on which the caterpillars feed, or other low-growing plants, the greater number would inevitably be devoured by the sheep which browse upon the herbage. For the same reason the Marbled White butterfly scatters her eggs at random amongst the grass, knowing perfectly well that the young caterpillar on emerging will be able to crawl up a stalk of the grass which forms its food. This device of letting the eggs slip down among the grass puts them out of the reach of the sheep until the young caterpillar emerges, in which stage it is better able to take care of itself, and it does so by falling off the leaf as soon as it feels it shaken by the approaching sheep.

However, most butterflies and moths fasten their eggs, with the help of this natural gum, on to the leaves or stalks of the food-plant, and whereas the *butterfly* generally only puts a few together in the same place, many kinds of *moths* lay their eggs in a huge cluster or compact mass of perhaps hundreds together. The Lackey moth lays her eggs in a neat series of beautiful rings



round the twig of an apple tree; another, the September Thorn, places them in the form of a crescent longitudinally along the twig of an oak or birch. The Vapourer, which never leaves the outside of the cocoon from which she emerges, covers the whole cocoon with her eggs in a great mass. The Puss moth lays her eggs, by twos and threes, on the surface of a sallow or poplar leaf. These eggs are brown in colour, and in shape like an inverted bowl, and very much resemble the minute warts that are often to be seen on poplar leaves. I remember an amusing incident in connection with this species which occurred at Winchester, when I was teaching there for a time. There was a group of poplars in a corner of the cricket-field, and some of the boys displayed great enthusiasm in collecting the Puss-moth eggs which were generally to be found on these trees. One day, after dinner, a boy came up to me with something in his hand, and such an unusually innocent expression upon his face that it at once put me upon my guard—when a sharp boy puts on an innocent expression, it is the surest indication that he is up to some mischief. He had a poplar leaf in his hand, upon which were two or three little brown objects, which he presented for my inspection, with the query, “Please, sir, can you tell me what eggs

these are ? ” I took the leaf from him, looked at it, and returned it to him with the answer, “ It is a very good imitation, I will admit, but you won't take me in with *fig-seeds* ! ” The cunning young rascal had saved some fig-seeds from his dinner, noting their resemblance to Puss eggs—which was certainly very striking—and had carefully gummed them on to a poplar leaf, and thus prepared this elaborate hoax for my benefit. “ *How* did you know, sir ? ” he asked, crestfallen, for the “ human boy ” enjoys nothing so much as when he can succeed in taking a master in, and his unusual vivacity during the latter part of dinner, and for which he had been more than once rebuked, was no doubt occasioned by the contemplation of the glorious realisation of the little scheme that he was brewing within his curly head. He certainly had done it extremely well, and I explained to him that although the imitation might be sufficient to take in a casual observer, yet the more practised eye of a naturalist could not fail to detect the imposture at once ; and I further suggested to him that he should try it on someone who had a less intimate acquaintance with the eggs of the Puss moth, which he accordingly did, and his subsequent irrepressibility during evening school testified that his efforts had at last been crowned with success ; and I tried not



to smile when the head-master, over his after-dinner coffee, remarked what a sharp boy J——e was to be able to find such diminutive objects on a big tree, or the next morning when the matron—who owed me a sore grudge for having instilled into the boys an unholy affection for caterpillars, though it was not my fault that they chose to keep them in the pockets of their Sunday clothes—asked me in a tone of disgust whether I knew where J——e had put those nasty things that he found on the poplar tree!

This incident reminds one of the old story of a country squire, who boasted to a party of friends who were lunching with him that his gardener was so clever that he could classify any plant or even *seed* that was shown him, and he forthwith defied any of the company present to puzzle the man. One of the guests accepted the challenge, and expressed his intention of bringing over some seeds for the omniscient gardener to inspect. Accordingly, he arrived with a boxful of herrings' eyes carefully washed and cleaned, which were presented to the gardener. That worthy examined them, and asked that he might be allowed to try them; and it was therefore agreed that the same party should lunch there again, on that day week, to see the result of the trial. The day came round; and, after lunch,

the party repaired to the kitchen-garden, where they were met by the gardener himself, who informed them that the seeds were "coming up beautiful," and requested them to follow him to the spot that they might see them for themselves. They followed the man to a secluded plot of ground, where, with a twinkle in his eye, the gardener pointed triumphantly to a long row of herrings' heads, which were apparently just poking their noses up through the soil!

Although the eggs of the Puss moth are uniform little brown objects, those of many butterflies and moths are very beautiful, and of every conceivable variety of shape, colour, and pattern. Some are oblong, others pear-shaped; some are perfectly round, and others are like a loaf of bread. Some have the surface sculptured with carving, of workmanship so exquisite as was never yet accomplished by human hands; others, again, are perfectly smooth, without any markings of any kind, but a surface like polished marble, and glowing like mother-of-pearl. Some, again, are completely covered with a network of raised lines, or with a series of minute warts all up the side, and converging into a point at the top, whilst some have a little door at the top, which the young caterpillar lifts off when it is ready to emerge.



However, although we find such immense diversity in the eggs of different species, those of any particular species will always conform to the same characteristics—a fact which is of great help to the practised eye in determining at once to what species any egg belongs.

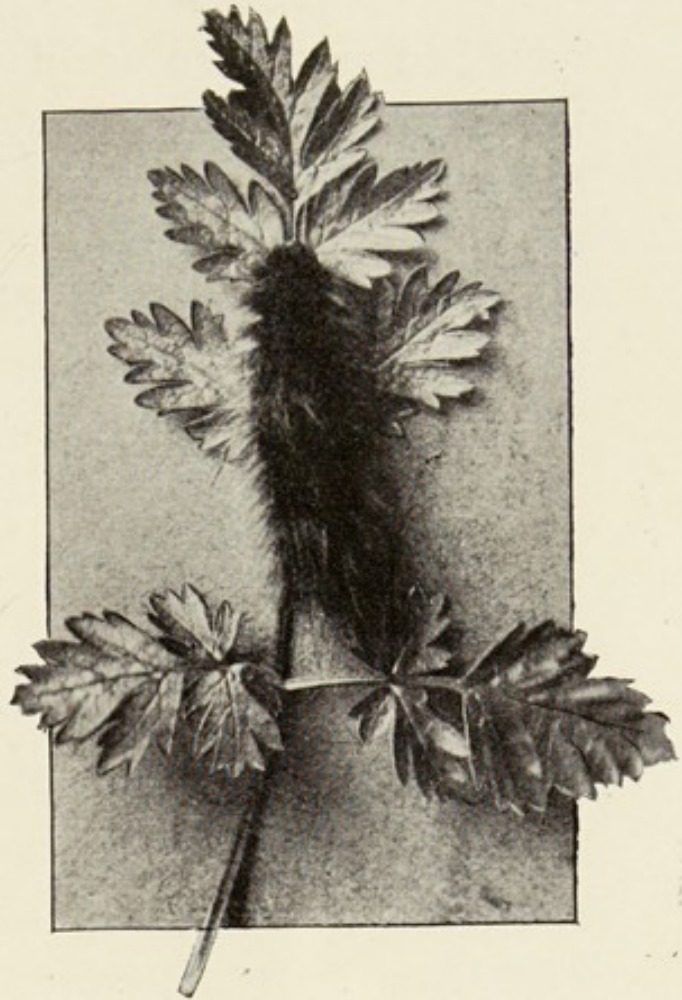
And it must not be supposed that because butterflies and birds both lay eggs, there is any similarity in the composition of the eggs, for they are totally different. Whereas the shell of a bird's egg is brittle, that of a butterfly or moth is hard and horny in texture, and is filled with a sort of green fluid, but has nothing resembling a yolk.

Now the parent butterfly or moth shows the most remarkable powers of discrimination in the choice of a food-plant upon which to deposit her eggs, and she never fails to select a suitable one. Moreover, we might almost say that she is, in her own way, quite an accomplished botanist, for should she be unsuccessful in her search for the required plant, she will often be content with a closely allied species, but she never makes a mistake and lays her eggs on anything that her children would not approve of. It is partly for this reason that many moths and most butterflies can with difficulty be persuaded to lay their eggs in captivity, unless they are provided with the proper

leaves, so particular are they in their choice. Now this selection is by no means so easy as the popular opinion would lead one to infer. Many people, if asked what a caterpillar feeds on, will answer, "Leaves," and there their knowledge of the matter probably begins and ends. This is undoubtedly true, but it is not "the truth, the whole truth, and nothing but the truth," as our legal friends would put it. It is true, inasmuch as by far the greater majority of caterpillars certainly do feed upon leaves; but it is not the *whole* truth, for "leaves" is a general and very broad term. There are many thousands of different kinds of leaves, and it is by no means the case that anyone of them would prove equally acceptable to the prospective parent of embryo caterpillars. Some caterpillars are much easier to feed than others, and are much less particular with regard to their diet. The caterpillar of the common Tiger moth, commonly called the "Woolly Bear," and by a variety of other local names equally descriptive, will apply itself with the same vigour to almost any leaf with which it is presented, from a rose-leaf to a stinging-nettle. Ladies and children should be careful how they handle this caterpillar and other hairy species, for the hairs of certain kinds are extremely liable to come out and stick in the skin of a delicate hand, thereby producing intense



irritation, amounting in some cases almost to a form of erysipelas—in fact, I have seen a girl's face in such a state of irritation from this cause that it was thought to be incipient measles, or something of the kind, until it transpired that she had been playing with one of these caterpillars, and had then put her hands up to her face. One of the worst



CATERPILLAR OF  
FOX MOTH.

offenders in this respect is the Fox moth; indeed, if I hold my hand up to the light after touching one of these caterpillars, the tips of my fingers are seen to be positively bristling with the tiny hairs with which this species is adorned. I would advise my readers always to rub their fingers carefully on their coats or some other rough substance after handling a furry caterpillar, so that they may not run the risk of getting the hairs transferred to the face. I

have had more than one dose, when a boy, of the unpleasantness that a hairy caterpillar can cause, and it did not tend to make me wish to repeat the experience.

Another caterpillar I might mention as being quite a cosmopolitan in its tastes is the common Vapourer, for it will devour the leaves of almost any shrub or tree with equal gusto. By way of experiment, I once got a few of these caterpillars and started them on willow, changing their diet repeatedly, with the result that they fed freely on no fewer than twenty-seven kinds of leaf. But the omnivorous tendency evinced by these caterpillars is in striking contrast to many other species, for, as a rule, they are rather fastidious than otherwise with regard to their victuals, and occasionally even to such an extent that they will prefer to die of starvation rather than eat a leaf of which they do not approve. I might quote an instance of this that came before my notice in Scotland, where I was staying in the summer of 1896. I had been hunting among the dwarf birch trees that were growing in profusion on the railway banks, in pursuit of the beautiful golden Miller caterpillar, and I chanced upon a half-grown specimen of a scarce species (*Notodonta dictaeoides*) feeding on a small, isolated bush. I took it home, and, knowing that the



species feeds exclusively on birch, I provided it with some leaves from a tree in the garden, and went out for the day, feeling satisfied that my treasure was all right. As I did not get back until very late, I had no opportunity of looking at it until next morning, when I found it dragging itself wearily about the cage in a half-starved condition; but not a leaf was so much as tasted. I gave it some fresh leaves, but they were likewise spurned; so at last, in despair, I rushed off to the place where I had found it, although some miles off, and brought back some leaves from the identical bush upon which I had found it. The caterpillar immediately tried to eat one, but was too far gone to be able to work its jaws properly, and it therefore succumbed, a martyr to its own daintiness. On comparing the leaves I discovered that the birch on which I had found the caterpillar was one of the smooth leaf species, whereas the leaves which I had subsequently given it on my arrival home had a rough and almost woolly surface, and hence its refusal to touch them. If this particular caterpillar had been brought up on the woolly leaves, it would doubtless have eaten them readily, and without any fuss; but having been accustomed to the daintier variety, it refused to have anything to do with the coarser leaves. So we see that the

humble caterpillar is not altogether different from many larger members of the animal creation in this respect.

Now the parent butterfly, with true maternal instinct, never fails to choose a leaf of which her offspring will approve, and of course she cannot be expected to guard against the possibility of her precious children being conveyed bodily away from the parental tree. I have often watched a butterfly flitting along a hedgerow, anxiously searching for her own particular leaf, and absolutely disdainful of the many other varieties that are in her way, until at length she finds a bush of the kind she wants, rests for a moment on one of the leaves, and then, leaving a tiny egg or two behind her, she flies off to continue her inspection further down the hedge. In parts of the country where the particular food-plant is scarce, the butterfly might often have a tremendous hunt before she discovered one of the required species; so in such cases she seldom passes by even the most insignificant plant as long as it has sufficient leaves to afford food for her progeny; and this accounts for the frequent occurrence of caterpillars on isolated bushes, when there are perhaps no others within a mile or two. There is an old saying that "where the carcass is there will the eagles be gathered together"; and this



is very true in the insect world, for where the food-plant is there will the caterpillars be gathered together. The knowledge of this principle is very useful to the entomologist when in search of a particular caterpillar, especially if he knows that the object of his quest is one that confines itself to certain plants. When I was at college I used often to go out in the afternoons to scour the country round Oxford, in company with an enthusiastic fellow "bug-hunter," and one afternoon, in the course of our ramble, we came across a certain bush which in some parts of the country is by no means common, and knowing that a rare species of caterpillar fed almost entirely upon this plant, we were naturally overjoyed at finding it there. Nor were our hopes disappointed, for a short search sufficed to show us unmistakable signs of its presence, and we were soon able to fill the pill-boxes, with which our pockets were stored, with a goodly supply of the desired caterpillars, as well as one or two other species which are also to be found upon this plant. Subsequently, when I was at Winchester, I came across one of these bushes, and, immediately setting to work to search for the caterpillar, was rewarded with even greater success than at Oxford. So we see that these powers of discrimination are possessed by the parent

butterfly or moth as well as by the caterpillar ; and, indeed, they are even more acute in the former, owing to the fact that whereas the former is able to discern the plant even at some distance, the latter is not at all so fortunate. The eyes of the caterpillar are formed after a very different pattern. They are twelve in number, so one would think that they ought to be able to see well ; but they are minute and microscopic. They are placed close to his mouth, six on each side ; and Mr. Newman tells us that these eyes are like highly convex lenses, comparing them with a Coddington lens ; and, moreover, so extremely convex are they that they are of no use to the caterpillar unless they are brought almost in contact with the object which he wishes to survey, and consequently the caterpillar seems to the observer to be examining the leaf with his mouth before he begins to eat it.

We have noticed that the *egg*, from its diminutive size, has but little need of the protective colouring with which Nature adorns her creatures ; but not so the *caterpillar*. As soon as the young caterpillar emerges from the egg it commences a new and a more active era of its existence. No longer is it content to lie passive and motionless ; nor can it trust to its small size to escape detection, for it has now become a lively creature,



and henceforth increases in size at a prodigious rate. It is therefore very necessary that it should be provided with some efficient means of protection, for the caterpillar is a juicy morsel in the eyes of many larger creatures, and admirably suited to hungry palates; but Nature has not failed to supply this deficiency. We have noticed amongst beasts, as also in some degree with birds, that in many cases this purpose is effected by means of weapons; but we could hardly expect to find it the same with caterpillars. However, even caterpillars are not entirely without such a means, for there is a curious weapon possessed by certain species which is well worthy of mention; and it is, moreover, one of which I am quite well able to speak from personal and very bitter experience. The caterpillars of certain insects are provided with a store of acrid fluid which they are able to eject at any enemy that threatens to attack them; and so poisonous are its properties that few would care to risk a second dose. Some caterpillars, moreover, are not content with using their fluid merely to repel an enemy at close quarters, but have a most aggressive habit of squirting it out to some little distance. One caterpillar that possesses this power in a most extraordinary degree is that of the Puss moth, of which we have already spoken in

the egg state. To illustrate the remarkable force with which this natural artillery is brought into play, I will narrate a most unpleasant experience of which I was myself the victim, before I had discovered the properties possessed by this caterpillar. One morning in July I found three fine nearly full-grown Puss caterpillars upon a willow bush; and after having carefully secured and taken them home with me, I put them in a flower-pot with some leaves, and covered over the pot with a sheet of glass. On the following morning I took off the glass to see if the caterpillars wanted fresh food, when one of them suddenly squirted up a jet of poisonous fluid with great force into my right eye. In the most intense agony I rushed off to the doctor, who pronounced the eyeball to be in a serious condition, and said that the poison must have been of a very virulent nature to produce such extreme inflammation. For several hours after the bandage had been removed I could not see at all with the injured eye, and it was some days before it had properly recovered. At the time of the accident my eye was quite *two feet* away from the aggressive caterpillar, which shows the great force that it is capable of using. I recorded the incident in the *Entomologist* at the time, and the editor kindly informed me that the fluid which caused the un-



pleasant effect was "formic acid," and it is ejected by the caterpillar from an orifice placed on the under side of the segment immediately following the head. One would suppose that this caterpillar would enjoy a perpetual immunity from its enemies, if it were able to bring into play such a powerful and accurate artillery. We have here a striking example of what an effective weapon this caterpillar possesses, and my experience was by no means an exceptional case of its making use of it with such effect, for not long after recording the occurrence I received a letter from a correspondent who had seen my account in the paper, and he informed me that he himself had had a similar experience that same year. Fortunately, however, the incident in his case was not attended with quite such disastrous consequences, as the volley caught him on the nose, with the result that it actually took the skin off—a fact that gives a good idea of the extreme virulence of this acid.

This poisonous fluid, which caterpillars use in self-defence, must not be confounded with the fluid ejected by the moth or butterfly on emerging from the chrysalis. The latter is of a perfectly harmless nature, and is merely discharged as superfluous matter, and not with any idea whatever of being used as a means of defence.

However, this apparently simple fact in Nature has at times been the cause of much superstition in many parts of Europe. The fluid ejected by some species—as the Small Tortoiseshell butterfly—is of a bright, red colour, and of much the same consistency as blood; and when the time comes round for the butterflies to emerge, the rustic population are terrified by the sight of drops of blood scattered about over the leaves, and, being ignorant of their origin, are filled with feelings of superstitious dread, and their bucolic minds are forthwith agitated by horrible presentiments of dire calamities about to overtake them. This absurd superstition has at times had far more disastrous results than one would be inclined to believe, as is shown by the following instance. One year in the early forties there was an unusual abundance of the Small Tortoiseshell butterfly in a certain district in the south of France. Probably the season was particularly favourable for the caterpillars, so that an exceptionally large number arrived at maturity. When the time came for the insects to emerge, the natives were astonished and horrified beyond measure to find the whole country strewn with small red drops, which their ignorant minds at once imagined to be caused by a shower of blood. So great was the consternation produced by this apparition



that a universal panic prevailed in that part of the country, and the majority of the peasants abandoned their usual occupations, and even neglected their trades, passing their time in lamentations at the thought of the terrible fate which was doubtless impending. It is impossible to say how long this state of things might not have continued had not a fortunate circumstance happened to dispel the illusion and allay the panic. A scientific man, residing in that part of the country, had in his possession some of these caterpillars, and he had noticed that when the butterfly emerged from the chrysalis it deposited a little red drop, and by the simple process of putting two and two together the learned man thus solved the problem which had caused such trepidation in the rustic minds.

In my humble opinion, most of the alarming portents that have occurred from time to time in various parts of the world, and spread panic in the minds of the inhabitants, could be accounted for by a little closer observation of natural phenomena. For instance, this innocent peculiarity in a butterfly would explain one, at least, of the strange apparitions described by the old historian Livy; for among the many absurd portents which he mentions (all of which were, of course, ascribed to supernatural causes), by

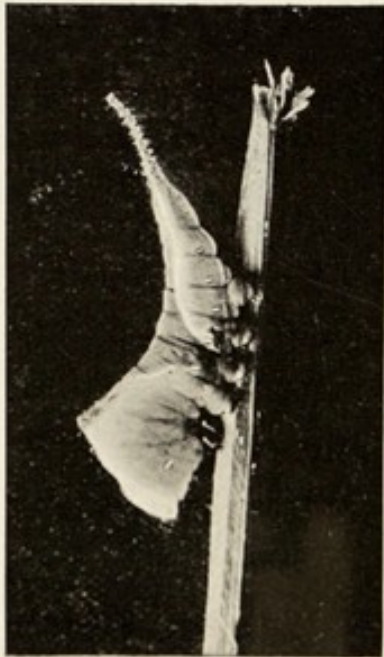
far the most frequent was the appearance of blood in various places. For example, one fine morning the statues in the Appian Way were found to be "sweating with blood," a discovery which was more than sufficient to excite almost to frenzy minds which were already overcharged with superstition in every form, and which could never think of assigning a *natural* cause to such an occurrence. As a matter of fact, the explanation would probably be simple enough, for it is quite reasonable to suppose that in the immediate vicinity of the statues there might have been some large clumps of nettles, and these would naturally enough have been chosen as a breeding-place by the Small Tortoiseshell butterfly, which feeds exclusively on nettles, or by any of its kindred species which also feed upon the same plant. The perfect insects on emerging would at once crawl up the first convenient wall or tree as a resting-place while their wings were expanding, and would be quite as likely as not to choose for this purpose one of the precious statues, as being near and handy for them. There they would sit until their wings were dried, and each would then deposit his little drop of red fluid before taking flight, thereby becoming the innocent cause of much dismay among the people, who immediately proclaimed days of supplication



and vowed all sorts of offerings to their gods, whom they further tried to propitiate by having huge banquets in their honour. These banquets seem to have been a very favourite arrangement when some imaginary calamity was impending—I suppose on the principle of “Let us eat and drink, for to-morrow we die”—and, judging from the accounts that have come down to us of these feasts, the people certainly acted up to their intentions on these occasions.

## CHAPTER III.

## THE CATERPILLAR'S MEANS OF PROTECTION.



PUSS-MOTH  
CATERPILLAR.

THE caterpillar of the Puss moth may be said, for the sake of comparison, to hold the same position amongst its fellows as the lion or tiger among animals, or the eagle among birds, inasmuch as, besides its very effective weapon, it is also supplied with the most striking protective colouring in all its stages. Have you ever observed upon the leaves of the

willow a kind of gall which grows in the form of a brown lump about the size of a pea, and surrounded by a red ring? If you have not, examine the next willow that you come across, and you cannot fail to find plenty, for every willow abounds with them. This gall has a peculiar significance, for the head of the Puss caterpillar when full grown is an exact imitation



of it, being of the same brown colour, and surrounded with a precisely similar red ring; and, as its huge green and brown body is a most faithful representation of the willow leaves and twigs themselves, the whole caterpillar thus forms a unique deception. I have often found these caterpillars—which from long practice becomes quite easy—and I have shown them to friends who have happened to be with me at the time, who have stood staring at the caterpillar; but although the insect is often three inches long and proportionately fat, they have been quite unable to distinguish it, even when I pointed to it. Some caterpillars, although they are very conspicuous, are protected by the fact that they possess a very nauseous flavour, and are thus unpalatable to the birds and their other enemies; and although a young bird may sometimes through



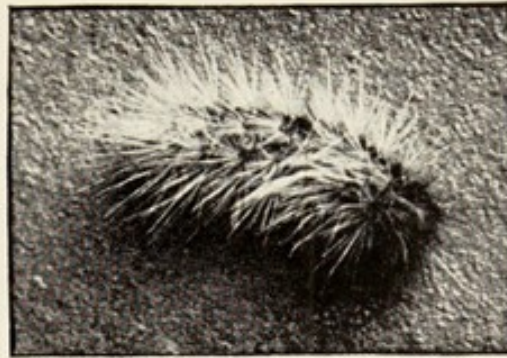
CURRENT MOTH AND  
CATERPILLAR.

ignorance make a mistake, they soon get to know the objectionable kinds, and learn to leave them severely alone. A good instance of this is the common Currant or Magpie moth, as it is often called, that lives among the gooseberry and currant bushes, to which it does incalculable harm. The caterpillar is not a morsel that proves suitable to the birdish palate, and there are few birds that will touch it except the cuckoo, so that, though it is a conspicuous object with its markings of yellow, black, and white, it nevertheless obtains an immunity which it does not deserve.

Other species are protected by a thick coat of long hairs, such as the well-known Woolly Bear, to which I have already referred, and with which children are so familiar. How well I remember the fun that we used to have with these caterpillars when I was a small boy at school! We used to keep them in our desks and have the most exciting games with them, making them race across the desk; and as they would frequently escape during school hours, the master on duty had to keep his eyes very wide open, and a successful pounce on his part would often result in the capture of some half-dozen or more of these furry treasures, and they were transferred at once to a box in his own desk, which he kept specially for the purpose. What eventually



was their fate we could never determine, though there were many conjectures on the subject. But later experience, from the *master's* point of view, has taught me that he probably let them go again in some secret and far-away spot, where he felt quite sure that the boys would never find them again. We used to search for Woolly Bears during our Sunday afternoon walks; and by the end of the week most of them would have been confiscated, excepting those which belonged to the small percentage who, like myself, kept them not merely as playthings, but in anticipation of the moths which they would eventually produce, and who therefore took the trouble to see that they were always secured in such a way that they would not be able to escape. Such coats of fur as that possessed by the Woolly Bear make the owner very repugnant to many of its enemies, especially to birds, the majority of which would naturally prefer a hairless morsel. There are one or two birds, however—the nightjar and the cuckoo, for instance—which seem to consider the hairy caterpillar a special favourite.

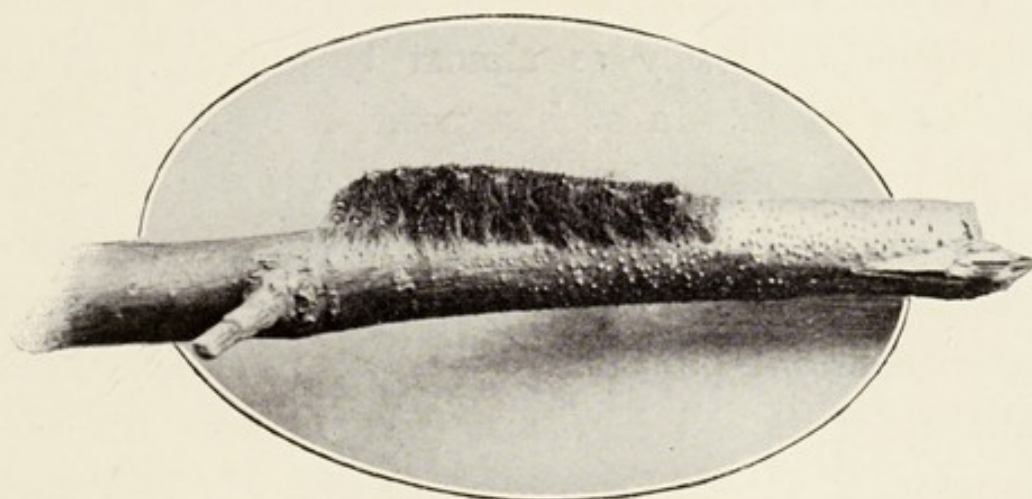


"WOOLLY BEAR":  
CATERPILLAR OF TIGER MOTH.

Such caterpillars, as I have mentioned already, have undoubtedly a very fair chance of holding their own in the universal struggle for existence; but what about the very large proportion that have not got any poison-squirts or fur cloaks to protect them, as is the case with their more fortunate relations? Are they to be snapped up with impunity by the first comer? No, for again Dame Nature comes to their rescue. And as I remarked in a previous chapter that all living things are provided with some means of defence against their enemies, though, of course, not necessarily always effectual, so we shall see that this rule is wonderfully true with regard to caterpillars, and those that have no actual weapons or such means of defence as we have already considered are always coloured more or less in conformity with their surroundings; so that when they are at rest they are protected by their resemblance to the leaves and twigs among which they live. This is quite in accordance with the principle which we have noticed among beasts and birds. Moreover, if we begin at the very earliest stages of a caterpillar's life, we shall find that the tiny creatures on first emerging from the eggs are generally green in colour; and as they are at that time extremely small, they are not noticeable among the green leaves on which



they feed. But as they grow older and increase in size, and therefore become more conspicuous, their whole colouring changes; and as they get still bigger, more and more do they grow in conformity with their surroundings. This object is brought about in many caterpillars by the fact that they gradually develop longitudinal streaks



CATERPILLAR OF LAPPET MOTH

and lines of green or brown, which have the effect of breaking up the surface, so that the caterpillar fails to catch the eye by presenting any unusual appearance. And, in still further pursuance of this principle, may be found the fact that if a caterpillar be removed to a plant of a different colour, its own hue will often change gradually, in accordance with its new surroundings. This is splendidly illustrated by an experiment which I once saw carried out by Professor E. B. Poulton

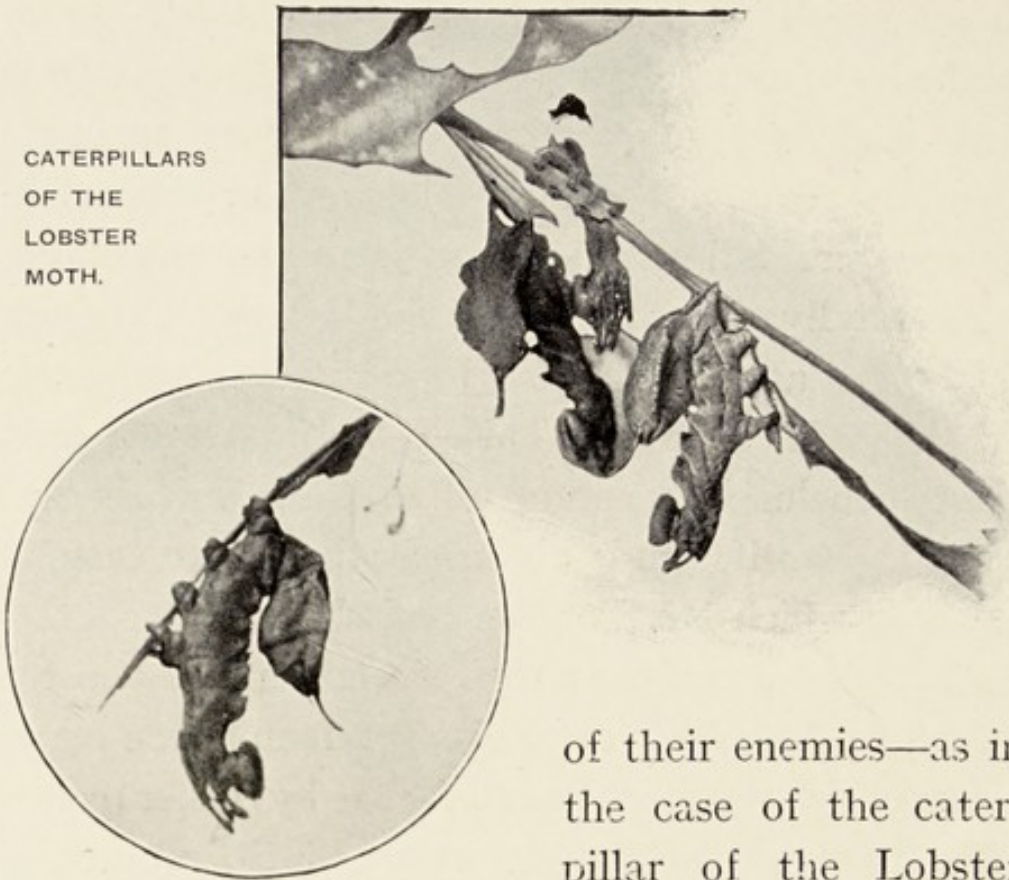
at the Oxford University Museum, and which I have myself repeated since, with the same result. The caterpillar of the Lappet moth lives on plum and hawthorn and several other trees; and when not actually feeding it has a habit of resting on the twig or bough of the tree, stretching itself out perfectly flat along the twig, which it exactly resembles in colour, and in this position it clings so closely as almost to appear part of the twig itself. In such a position the caterpillar is as nearly invisible as anything can be, in spite of the fact that when it is full-grown it is an enormous object, often reaching the length of over four inches. Mr. Poulton's experiment, which was most interesting, was as follows. He obtained a batch of Lappet moth eggs (or of young caterpillars—I forget which), and provided some of them with twigs of hawthorn covered with grey lichen, while the remainder were placed upon twigs of a normal brown colour, and he was very careful to see that the same sort of twigs were always given to the same caterpillars, so that one batch should always have the lichen covered twigs, and the other batch the brown ones. The consequence was that the caterpillars which were kept upon the lichen twigs gradually developed grey markings on their upper surfaces, in exact imitation of the grey lichen; whereas



those which were among the brown twigs remained the normal brown colour, with the result that each was equally invisible when reposing upon its particular twigs. Thus, when the caterpillars were full-grown, those from the one batch were totally different from the others, although they were all of the same brood and the progeny of the same parent. This very interesting and most conclusive experiment I subsequently repeated myself, and obtained the same results as those which Mr. Poulton had shown me.

Wonderful as is the nature of the instance which I have just described, there are yet many even more remarkable devices resorted to by other caterpillars, for the better attainment of their purpose. For instance, certain caterpillars have an ingenious plan of imitating some natural object that is often found among their surroundings, but at the same time in no way connected with them. The caterpillar of the Alder moth is one of these, for when about half-grown it is an exact imitation of one of the bird-droppings that one so often sees upon any hedge; and as the young caterpillar always rests in a curved position, the illusion is thereby rendered the more complete. Other caterpillars, again, will mimic some living object, which has a naturally formidable appearance, in order by this means to strike terror into the hearts

CATERPILLARS  
OF THE  
LOBSTER  
MOTH.



of their enemies—as in the case of the caterpillar of the Lobster moth, which is about the weirdest-looking creature that one could ever come across. It feeds usually upon beech, and has a body something like a lobster—hence its name; but, unlike any other caterpillar, it has very long front legs like a spider's. Moreover, when it is at rest on a beech twig, it tucks up these long legs so that they become invisible, and the caterpillar then strongly resembles the brown cast-off leaf-sheaths that one sees on beeches; but if an Ichneumon fly or any other enemy should appear on the scene, out go his legs at once, and his appearance changes, as if by the touch of a magic wand, to



that of a particularly evil-looking spider, to the great discomfort of the enemy. I have had many of these caterpillars at various times, and should certainly be inclined to agree with the Ichneumon fly as to the extraordinary appearance they present.

Another caterpillar, that of the Elephant Hawk moth, is in itself quite a conspicuous object, and indeed is rendered the more so by the presence of two large eye-like spots, which tend to give it a most formidable appearance; in fact, anyone who sees one of these caterpillars will be struck by its resemblance to a snake, and the so-called "eyes" make the deception more complete. Moreover, the ring round the body, on which these eyes are placed, is very much swollen, and the caterpillar has a habit of drawing in its head and front segments on the appearance of danger, which gives it an additional resemblance to a small reptile. Sir John Lubbock mentions an experiment made by Weismann to prove that small birds are actually afraid of these caterpillars, which are, however, of course perfectly harmless. My quotation is from "The Beauties of Nature," page 30. "Mr. Weismann put one of these caterpillars in a tray in which he was accustomed to place seed for birds. Soon a little flock of sparrows and other small birds assembled to feed as usual,

One of them lit on the edge of the tray, and was just going to hop in when she spied the caterpillar. Immediately she began bobbing her head up and down in the odd way that some birds have, but was afraid to go nearer. Another joined her, and then another, until at last there was a little company of ten or twelve birds all looking on in astonishment, but not one ventured into the tray; while one bird, which lit on it unsuspectingly, beat a hasty retreat in evident alarm as soon as she perceived the caterpillar. After waiting for some time Weismann removed it, when the birds soon attacked the seed." Undoubtedly it was only the insect's appearance that saved it, as there is no reason to suppose that it is not just as tasty a morsel—from a bird's point of view—as any other caterpillar. Sir John Lubbock goes on to say that "other caterpillars are probably protected by their curious resemblance to spotted snakes, and one of the large Indian caterpillars has even acquired the additional power of hissing."

There is another very curious class of caterpillars commonly known as "stick" caterpillars, from the singular resemblance which they bear to pieces of stick. They belong to the class known in Science as "Geometers," from the peculiar habit which the caterpillars have of walking.



Mr. Newman, in his "British Moths," gives such an excellent description of the Geometer or Looper caterpillar, that I cannot do better than repeat his own words. "As a general rule," writes Mr. Newman, "the caterpillars of butterflies and moths, like the insects when they have arrived at the perfect or winged state, have six legs, but they also have, on the underside or belly, a number of circular disks fringed all over with delicate hooks, by which they adhere to the twigs or leaves of the plants upon which they feed. These adhering disks have been called 'prolegs,' 'abdominal legs,' or 'false legs'; but the proper name is 'claspers,' because they clasp the substance on which the caterpillar is feeding, and this so tightly sometimes that the caterpillar cannot be forced away without injury. The caterpillars of butterflies, as well as most classes of moths, have almost invariably ten of these claspers, but the Geometers have only four, and these are



THE LOOPER CATERPILLAR  
SHOWING ACTION IN WALKING



CATERPILLAR OF THE  
LARGE THORN MOTH, AT  
REST UPON APPLE-TWIG.

quite at the tail end, so that the middle part of the body of the caterpillar has no means of taking hold. When, therefore, the caterpillar walks, it first takes hold of the twig with its six proper legs, and holding tightly, lifts up its claspers, and

bringing the two ends of its body almost together, again takes hold with the claspers, the back of the creature making an arch or loop." Hence the common name of "Loopers" which is frequently applied to them. Such caterpillars are always smooth-skinned and never hairy, and are very easily distinguished from other classes by their peculiar appearance and mode of walking. Most of these Stick caterpillars when at rest have a habit of holding on by their claspers alone, and raising their bodies up in the air nearly at right angles to the twig on which they are resting; and whilst in this posture the caterpillar loses



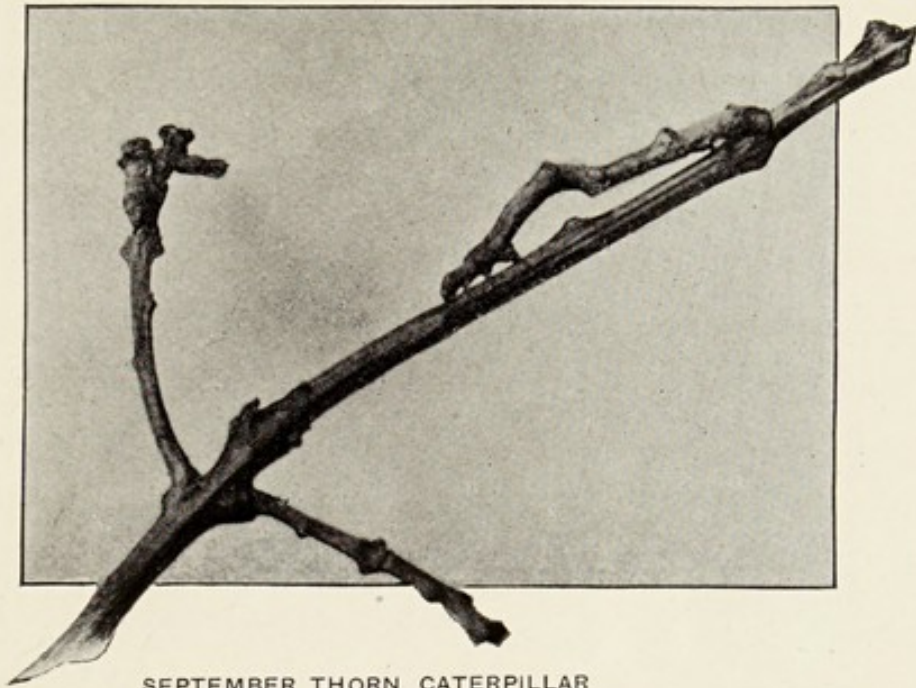
all semblance of an animate object, but appears to be part of the plant, and so perfect is the deception that the most careful scrutiny is necessary before it can be detected. The best examples of this class are those contained among the *Ennomidæ* or Thorn moths, as they are called; and perhaps the most perfect of all is the caterpillar of the September Thorn. The chief food-plant of this caterpillar is oak, and it is of the same prevailing brown tint as the twig, being mottled and marbled in a similar manner, and adorned with little humps on several of the segments, in imitation of the little notches that are to be found on oak twigs. The head of the caterpillar, moreover, resembles one of the leaf buds; and when it is resting it folds its front legs close up together and then sticks them out at right angles to its body, thus apparently forming another leaf-bud with the folded legs, and in this position it will remain motionless for hours together. I have often taken one or two of these caterpillars, and after putting them on a bare twig of oak, have exhibited them in this position to friends, and the most careful observers were unable to detect the caterpillars even at close quarters, and found it necessary to touch them before they could determine which were twigs and which were caterpillars. To increase the deception, such species

will generally, if taken forcibly off the plant, lie quite motionless in the hand and feign death, and even submit to a considerable amount of "mauling" without showing the least sign of life. This is only one example of the caterpillars which belong to this class; many of the others are almost equally wonderful, but it would be impossible to enumerate them all here. There are other species of caterpillars besides the Loopers which mimic their food-plants; and, in accordance with the same principle, we shall find that those kinds which feed on grass are generally streaked longitudinally and mottled with various shades of green and brown, so that when they are standing up on a blade of grass they are just as good an imitation of the grass as their neighbours are of the twigs in the oak-tree over their heads.

Before passing on to the chrysalis state, I must mention the deadliest of deadly enemies with which the poor caterpillar has to contend: an unseen, lurking foe, whose injury is not of the kind that can be met in the open field, but secretly, stealthily is the blow inflicted, and the miserable caterpillar is done to death by a process of slow torture that knows no escape. I refer to the Ichneumon fly, which I casually mentioned just now. This insect lays its eggs in the bodies



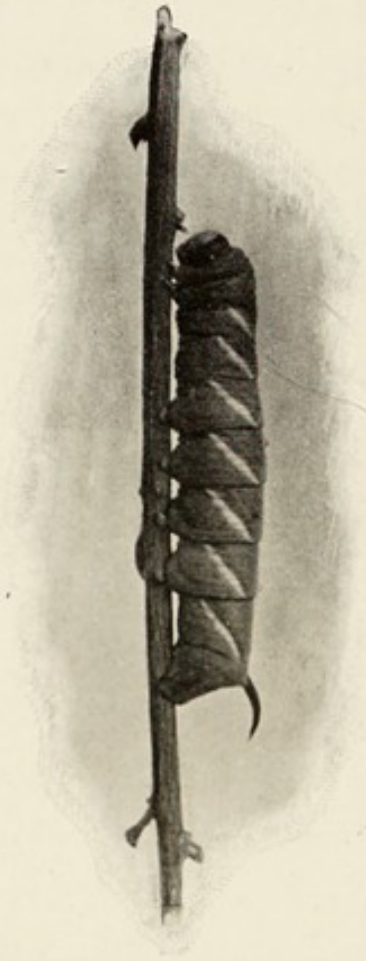
of living caterpillars, and these soon develop into tiny maggots, which proceed to devour their unfortunate host. They are, however, "worldly wise," and are therefore careful not to destroy his vital organs; otherwise Mr. Caterpillar would give up the ghost altogether and thus summarily



SEPTEMBER THORN CATERPILLAR  
IN THE ACT OF WALKING.

cut off their food-supply. Accordingly, the small cannibals wait until they are themselves ready to assume the chrysalis state, before finally demolishing their victim. So that, although a caterpillar burdened with these unwelcome lodgers may succeed in reaching the chrysalis state, it can never arrive at maturity, for the maggots inside it will inevitably give it the *coup de*

*grâce* as soon as they are ready to pupate themselves. Alas! the poor caterpillar which has once been "stung" may well consider itself doomed, for nothing can save it. A deadly foe indeed!



CATERPILLAR OF THE  
PRIVET HAWK MOTH.

And how is the wretched caterpillar to protect itself against an enemy that cares not for hairy coats, is not affected by consideration of the question of nauseous taste, and scorns such little artifices as protective colouring? Many species are quite at his mercy, and fall victims in their millions to his fatal thrust; and it is only through their great numbers that they are able to hand down their race to posterity. But there are a favoured few which have developed a means of defence specially adapted to protect them

against this particular enemy, and, moreover, with considerable success. Therefore, as soon as they are aware of the approach of an Ichneumon, they will endeavour to ward off his attack by assuming a ferocious attitude, rearing up their heads and



making themselves appear very formidable, just as a hen will ruffle herself up if an intruder should venture too near her nest, and the Ichneumon is often effectually scared away by this means. Some of the Hawk-moth caterpillars and several others have this habit. The Puss-moth caterpillar "goes one better," for besides being able to strike an attitude in which it appears the very incarnation of evil, it also possesses two horns on its tail, out of which it protrudes two long, wavy red filaments, which it waves about in the air like a red danger signal; and though to us it may look merely comical, one can nevertheless quite understand any self-respecting Ichneumon being decidedly "put off" by such an apparition! The caterpillar of the Lobster moth, which we have mentioned before, strikes a similar attitude, and its spider-like front legs are doubtless of great assistance in keeping these deadly enemies at a respectful distance.

It is this same instinct for self-protection that accounts for the fact that a great many caterpillars come out to feed only at night, when most of their enemies are not about, lying quiescent and hidden during the day-time; and some species even hide in the ground or amongst the grass and moss during the day, and crawl up the stalks of the food-plants as soon as it gets dusk, in order

to satisfy the cravings of the "inner man." Many caterpillars, again, have the habit of rolling up in a ring and falling to the ground the instant they are touched, or the leaves shaken on which they are feeding, and thus save themselves by getting lost amongst the foliage. So we see that the caterpillar's life would indeed be a precarious existence if it were not for the many subterfuges to which he resorts for his protection, and a closer investigation of the habits of various species would show us many more than I have space to mention here.



## CHAPTER IV.

## THE CHRYSALIS STATE.

WE now come to a most interesting stage in the caterpillar's life, when he ceases altogether to eat, and is ready to assume the chrysalis state. And as this is perhaps the most defenceless period of his existence, he has to make careful provision to ensure for himself freedom from interruption during his coming sleep. Moreover, considering that this long trance lasts for weeks and often for months, during which time the chrysalis lies like a log, powerless to escape, we may quite believe that such precautions are very necessary. Such things as weapons or means of escape are of course quite out of the question for the chrysalis; and as its enemies are very numerous during this state, its only means of safety lie in effectual concealment or imitation of some natural object. And this purpose is attained in a variety of ways, but I will only describe a few of the most remarkable.

Anyone who studies the subject will soon make the discovery that moths and butterflies do not by any means confine themselves to one stereo-



CHRYSALIS OF THE "SMALL  
TORTOISESHELL" BUTTERFLY.

typed rule as to the method of their change into the chrysalis state, although individuals belonging to the same species seldom, if ever, stray from the particular method which has been handed down to them by their ancestors. And before long the student will be able to determine the family to which a chrysalis belongs by its shape and colour, or by the position and circumstances in which it was found, though it will

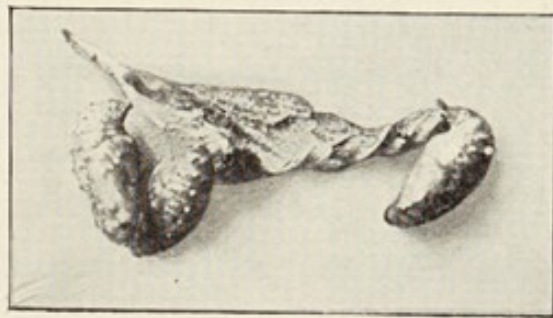
take years of observation before he will in every case be able to denote the actual species. Let us then first consider the process by which the *butterfly* undergoes his change, for he has a method quite peculiar to himself, and one which, with very few exceptions, is not shared



by any kinds of *moths*. The caterpillar of a butterfly has to depend entirely upon its protective appearance during the chrysalis state, as it never resorts to the expedient of burrowing into the earth or of spinning a silken cocoon round itself, but will usually turn into a chrysalis in a perfectly open and exposed condition. As soon as such a caterpillar feels itself ready to undergo the expected change, it searches for a suitable position of real or fancied safety, on a wall or under a leaf or stalk, and then proceeds to spin a small carpet of silk, to which it makes itself fast by its "tail," or, more strictly speaking, its posterior segment (some species also make use of a single thread of silk round the middle to support themselves in an upright posture, while others are content simply to hang head downwards), and it then turns into a chrysalis, and so remains without any covering until it emerges. I will not

here describe this "turning" process—which is perhaps the most marvellous thing that one could witness—as I hope to do so elsewhere.

*Butterfly* caterpillars



GROUP OF FRITILLARY  
CHRYSALIDES HANGING  
FROM A LEAF.

never make use of silk to anything like the extent that those of *moths* do, with the exception of one family, the Skippers, which do spin some sort of rough silken covering before entering upon the chrysalis state. And now it is that the true force of this protective colouring comes into play, for as soon as the caterpillar has finished its metamorphosis and has become a proper chrysalis, it assumes a colour and appearance exactly similar to its surroundings, and thus it is no more easily found than if it had protected itself beneath several inches of earth or within the strongest of cocoons.

One of the most wonderful forms of chrysalis is that of the Orange-tip butterfly. The caterpillar feeds usually on the common charlock or wild mustard, and its chrysalis is the most perfect imitation of the seed-pod of this plant. It is crescentic in shape, both extremities being elongated and pointed, the anterior curved outwards away from the stalk, and the posterior being fastened to the stalk itself; the colouring is pale green or brown, and exactly of the same shade as the seed-pod. Moreover, the chrysalis is also fastened securely on to the stalk of the plant by means of a silken band round the middle, which has the effect of rendering the likeness to the seed-pod the more extraordinary by keeping it in the proper position. Anyone who has ever



noticed one of these peculiar-shaped pods will the better be able to realise how impossible it would be for any casual observer to recognise the chrysalis when in such a situation.

Or, again, we might take the common Large White butterfly, which frequents our gardens, × to the great mortification of the gardener and the destruction of his choicest spring cabbages, although this species seems to be getting much scarcer than it used to be. × When these caterpillars are ready for the great change into the chrysalis state they seem to be particularly partial to the wall



TWO CHRYSALIDES (OPPOSITE THE CROSSES) OF THE ORANGE-TIP BUTTERFLY ON A SPRIG OF WILD MUSTARD.

of a house or garden on which to fasten themselves, and they will often wander a considerable distance in search of one. I have seen a house wall in Scotland literally covered with the chrys-



CHRYSLIDES OF THE  
"SWALLOW-TAIL" BUTTERFLY.

alides of this and the Small White butterfly. When the wall is found, the caterpillars climb up it, and after fastening themselves to a silken carpet, will there change into chrysalides of a yellowish grey colour, sprinkled over with minute black spots, which combine to give them the same general appear-

ance as the wall upon which they have taken up their abode. In this position they will remain, quite heedless of the icy blast of winter; in fact, I have even found one of these chrysalides on a wall with a small icicle attached to it, and yet it emerged successfully the following spring, so impervious is the shell even to considerable degrees of cold.

Another example we might consider is that of the beautiful Swallow-tail butterfly, which fre-



quents the fen districts of Cambridgeshire, where it is still to be found in some abundance, although if the rumours of new draining operations in the fens come to pass we shall probably find that it will follow the example of the gorgeous Large Copper, and gradually fade into obscurity. The caterpillar of the Swallow-tail feeds on fennel and wild carrot, and turns into a chrysalis of a greenish yellow or greyish brown colour, and thus is not easily seen among the yellow or brown stalks of the plants among which it lives.

Again, the royal Purple Emperor deserves a word in this connection, for although in the perfect state he spends most of his time among the highest tree-tops, where he is well out of harm's way, yet in the earlier stages of his existence his home is among the leaves of the humble shallows, on which the eggs are laid, and therefore the



TWO CHRYSALIDES (OPPOSITE THE TWO CROSSES)  
OF THE "PURPLE EMPEROR" BUTTERFLY.

chrysalis—which is naturally a very large one, considering the size of the butterfly—is protectively coloured to resemble a pair of the leaves folded together, being of the same shape and of a similar colour to the underside of the willow leaves.

The chrysalis of the Brimstone butterfly is another very interesting instance. The caterpillar feeds on buckthorn, and turns into a chrysalis of much the same shape as one of the leaves, and a similar colour. I once had a number of these caterpillars, three of which “spun up” at equal distances along the same twig; and when I showed the twig, together with its living leaves and the three chrysalides, to my friends, they found it quite impossible even at the distance of two or three feet to distinguish the leaves from the chrysalides.

Countless, in fact, are the instances I might quote to show how the apparently exposed chrysalis of the butterfly is in reality protected by its very conspicuousness; but it is not possible to dwell upon them all, so I have merely particularised concerning a few of the more remarkable cases, and will now go on to the various methods employed by the caterpillars of *moths*. And here we shall notice at once a fundamental difference, for whereas the butterfly generally depends upon the colour and shape of its chrysalis for protection,



and leaves it quite uncovered and bare, the moth, on the other hand, does nothing of the sort, but devises some means for *hiding* its chrysalis altogether from view, and thus ensuring its protection by putting it out of sight. I will just mention a few of the more common-place methods first, before going on to dwell at length on certain individual devices, which are so extraordinary as well-nigh to pass comprehension.

One of the most usual ways is that employed by the majority of the Hawk-moth caterpillars, and, of course, by a great many other species as well. Such a caterpillar burrows down into the earth, and assumes the chrysalis state underground, in which position it is particularly safe from most of its enemies; and as these chrysalides are generally of a dull brown or black colour, they are not easily noticed if the earth be disturbed. There is a very curious fact about these caterpillars which seems to be of peculiar significance, as showing how their colour will alter to suit a change in their surroundings, as we noticed in the case of the Lappet-moth caterpillar, for as soon as a caterpillar of any of the "burying" kinds is ready for pupation, and therefore ceases eating and wanders about over the ground seeking for a suitable spot to burrow in, from that moment its bright colours begin to fade entirely away,

until it becomes at last a uniform dull yellow or brown, and therefore is not at all conspicuous



CHRYSALIS OF  
A MOTH.

as it wanders about on the brown earth, as it would certainly have been had it kept its more gaudy hues. Now the caterpillars of many species, such as the Poplar and Lime Hawk moths, are

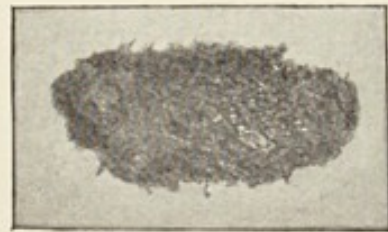
quite content after they have once finished their grave-digging operations, and make not the slightest attempt at a cocoon of any sort in their subterranean cavern. We cannot quite say that "they toil not, neither do they spin," for they are most painstaking and energetic over the burrowing part of it; realising, I suppose, that their chances of danger are very much lessened directly they get safe underground. They burrow down a few inches into the ground at the foot of the tree upon which they have been feeding, and then simply hollow out a little cavern and lie in it motionless until the moment arrives for the change into the chrysalis state. The chrysalis is a dirty, grimy-looking object, and presents the appearance of a thick little bit of dead stick dipped in mud. I have found them in large numbers at Oxford by digging round the roots of the poplars and limes, and can testify from my own experience



how difficult it is to distinguish them from the bits of dead stick that are always to be found lying at the root of a large tree; and anyone not acquainted with their appearance would undoubtedly throw them aside without even stopping to examine them.

There are, however, some kinds of "burrowing" caterpillars that do also enclose themselves in a sort of rough cocoon, which they construct with the help of little bits of earth fastened together with a gluey secretion, and in such a position none but an expert could possibly find them, and the only enemies—leaving mankind out of the question—with which they would have to contend are a few insects and mice and the damp, which latter destroys an enormous number during the chrysalis state. Many of the chrysalides that hide themselves in a subterranean cocoon are themselves of a very bright brown colour; in fact, some of them are so shiny that they look as if they had been rubbed over with a coat of varnish, but as they are hidden from sight in their cocoons they do not run any risk on this account.

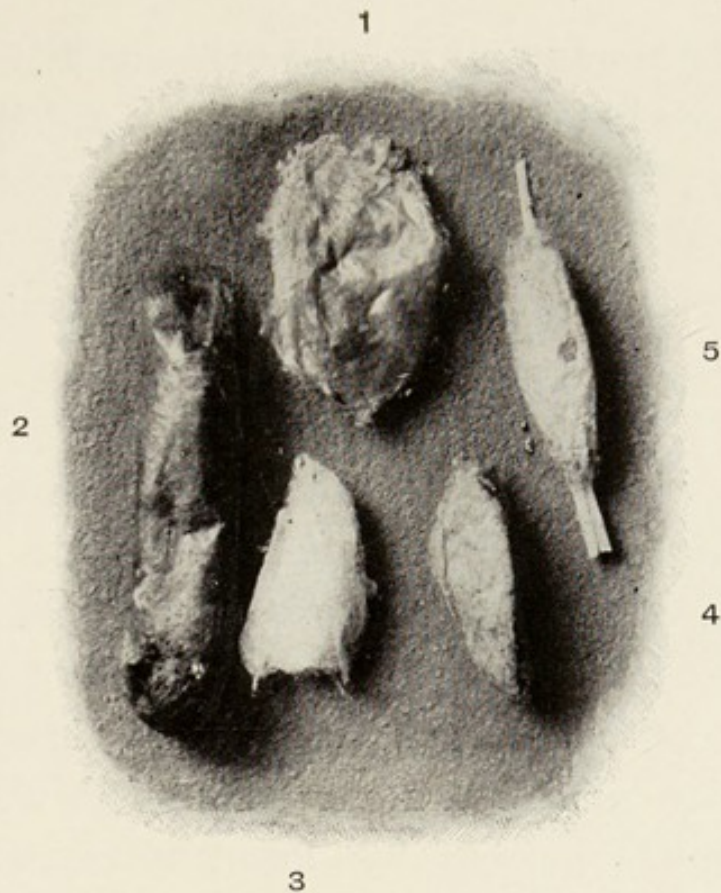
A very large number of species do not burrow into the earth at all, but



COCOON OF BURROWING  
CATERPILLAR.

undergo their transformation above ground, and such kinds almost invariably protect themselves with a covering of some sort, either thick or thin, but silk is the largest component part of it. There are a few notable exceptions to this rule—the “Mocha” family, whose caterpillars fasten themselves up after the manner of a butterfly, and undergo pupation in an equally exposed situation. But these are quite exceptional.





3  
SOME DIFFERENT FORMS OF  
SILK COCOONS.

- |    |                        |                        |
|----|------------------------|------------------------|
| 1. | MADE BY CATERPILLAR OF | LOBSTER MOTH.          |
| 2. | "                      | FOX MOTH.              |
| 3. | "                      | LACKEY MOTH.           |
| 4. | "                      | PEBBLE PROMINENT MOTH. |
| 5. | "                      | DRINKER MOTH.          |

## CHAPTER V.

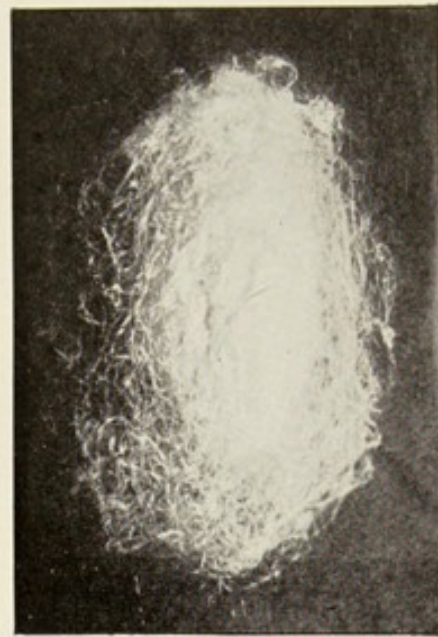
SILK, FROM THE CATERPILLAR'S POINT OF VIEW.

EVERYONE has heard of "silk moths," and there are but few in these enlightened days who are ignorant of the fact that they owe their silk garments to the efforts of a humble caterpillar, from whose hours of toil the beautiful material is

derived. Moreover, the silkworm—as it is erroneously called, for it is not a worm at all—is not the only creature that produces silk, for the caterpillars of most moths produce some sort of silk more or less fine in quality; in fact, some of the Brazilian caterpillars make an even superior quality to that of the common or garden silkworm. Why, then, are not the *best* silk-producing kinds kept for the manufacture of the article? This is a very natural query, and the answer, though curious, is eminently satisfactory. The female moth of the species commonly kept for the production of silk has very imperfect wings, and quite different from her lord and master, whose wings, on the contrary, are very well developed, and therefore she is never tempted to stray far from her own tree—often, in fact, never leaving it during the whole period of her natural life. This characteristic is of vital importance, as, indeed, is obvious; for if, as Mr. Pigott points out, “the female silkworm had perfect wings, and were free, as other ladies of the kind are, to come and go and mate and lay her eggs wherever fancy led her, instead of living and dying content with her own mulberry-tree, silk cultivation on an extensive scale would be impossible, and the thousands employed in the various silk industries would have to look elsewhere for a livelihood,



and a silk dress would be as rare a luxury as Lady Brassey's feather cloak." So we see that the convenient stay-at-home tendencies of this moth render it *par excellence* the most suitable for the purpose of silk cultivation; hence its selection in preference to any other kind.



COCOON OF SILK MOTH.

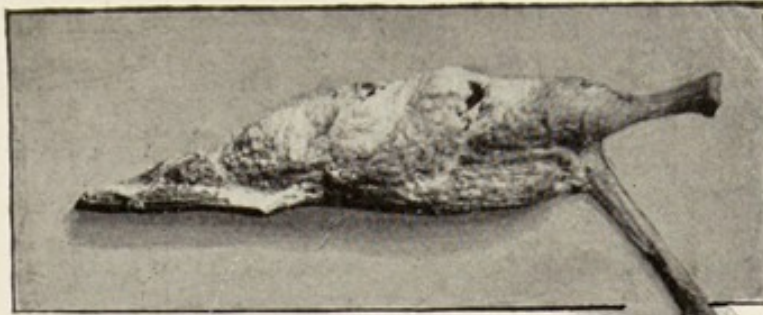
The silk produced by different species naturally varies very much in quality as well as quantity, and in some species it is nothing more than a sort of gluey secretion, which could not by any stretch of the imagination be described as silk. Such material, however, though of no use to mankind, is quite as serviceable to the caterpillar as the finest silk could be—in fact, more so, as it makes a much harder and tougher cocoon than would be the case with mere silk, and caterpillars are not at all particular whether their garments are composed of silk or glue, as long as they answer their purpose. The material used by the caterpillar of our friend the Puss moth is perhaps more gluey than that of any other species, and the



GROUP OF PUSS COCOONS  
ON A PIECE OF BARK.

texture of the cocoon is of a toughness almost incredible. The caterpillar, as I mentioned before, feeds on willow and poplar, and when full-fed it crawls down the trunk until it reaches what it considers a suitable position, and then proceeds to gnaw a hole in the solid wood. Moreover, it does not waste the chips, but mixes them up with its own patent glue, and forms an outer wall round itself with the mixture, which hardens directly, and gradually hides the caterpillar from view. Master Puss then further adds another layer to strengthen the inside, and by the time it is finished it is enclosed within a covering of the most extraordinary toughness and durability, as may be shown by the fact that I have broken a penknife with trying to open one of these cocoons. Moreover, another result of this process—and one which is, to the caterpillar, at any rate, of vital importance—is that such a cocoon is practically





GROUP OF FIVE KITTEN COCOONS  
HUDDLED TOGETHER ON A TWIG.



PUSS COCOON COMPOSED  
OF ELASTIC AND MUSLIN.

invisible, owing to the fact that it is composed of the same bark upon which it is placed; it therefore naturally presents the same appearance, and would readily be mistaken for one of the little humps that grow in abundance upon the tree-trunks. And so complete indeed is this resemblance that even the practised eye would experience considerable difficulty in discovering one of these cocoons.

There is a group of smaller moths containing three British species, which are commonly called

“ Kitten ” moths, from their likeness to the Puss moths, and these caterpillars make precisely the same sort of cocoon as the Puss, except that they are smaller and not so extraordinarily hard, and their cocoons are likewise protected by their bark-like appearance.

There is a very amusing experiment which can be made with Puss-moth caterpillars. If kept in captivity where they cannot use the bark of a tree to assist in the construction of their cocoons, they are usually glad to avail themselves of anything they can get for the purpose ; and if they are placed in a wooden box, they will calmly make use of the sides of the box, and will gnaw out the wood from them to mix with their glue. Moreover, if the sides are not pretty thick, they will bite right through, and so make their escape. Having noticed that the caterpillars would generally use whatever was given to them, I once put one into a box which I had previously covered with several layers of pink paper ; and as the caterpillar had to gnaw through the paper before it could get to the wood, the result of its labours was a beautifully artistic cocoon of a delicate pink shade.

Similarly, another caterpillar was made to manufacture a blue cocoon, and another a black and white one. On another occasion I placed one



in a tin without any material whatever, to see whether it would adapt itself to the circumstances : it wandered about the tin for some time disconsolately in a vain search for some sort of material, and at last gave it up in despair, and made a cocoon in one corner out of its own unaided glue. This cocoon was not, of course, nearly as hard as it would have been if the caterpillar had had a proper supply of wood with which to strengthen it, but all the same it was astonishingly tough. Another caterpillar was kept in a wide-mouthed jam bottle, with some coarse muslin over the top, fastened by an elastic band round the neck of the bottle ; it was inconvenient to put it in anything else, as I was travelling in Scotland at the time ; and as I did not think that the caterpillar would be ready to spin up for some little time, I thought it would not attempt to get out of its comparatively insecure abode. However, Scotch air seemed to suit it, and it had finished eating before I was aware of the fact. Therefore, finding no wood in the bottle, it bit through the muslin and proceeded to forage on its own account, with the result that the next morning I could only find the hole by which the caterpillar had escaped, but not a trace of the caterpillar itself, and though the room was diligently searched it could nowhere be found. I had quite given it up for lost, and

began to take the muslin off the bottle, when I noticed to my surprise that I could not undo the elastic, and closer examination revealed the lost caterpillar snugly ensconced in the groove made by the neck of the bottle, and busily engaged in constructing its cocoon of muslin and elastic, in default of any more serviceable material! Presumably the caterpillar, after escaping through the hole it had made in the muslin, found that it could not climb down the slippery surface of the bottle, but could only walk round and round the overhanging edge of the muslin covering, to which it could cling comfortably, but which did not reach near enough to the ground to enable it to get off; and, doubtless tiring of this unprofitable pursuit, after a time it decided to make the best of a bad job and use what material there was to hand. Anyhow, the result pleased *me* mightily, though it may not have been quite in accordance with the tastes of the poor caterpillar, and I have still got the elastic-muslin cocoon among my curiosities.

I have often been asked how it is possible for the Puss moth, when it is ready to emerge, to succeed in making its way out of so solid a structure as we have seen the cocoon to be; and, indeed, it may well be a matter for surprise, considering the frailty of a moth and the impenetrable





COCOON OF PUSS MOTH ON A PIECE OF WILLOW BARK, SHOWING THE HOLE BY WHICH THE MOTH HAS EMERGED.

nature of the wall surrounding it. "Does it bite its way out?" a lady once asked me. Assuredly not, my dear madam, for the very good reason that a moth has nothing to bite with. If the moth in question still possessed the powerful jaws that it had as a caterpillar, it would be a matter of small difficulty to bite its way even through

that tough material. But its nature has now changed; the jaws which were so useful to the caterpillar would be of little value to the perfect insect, and they have therefore disappeared entirely, and their place has been taken by a delicate proboscis, which is of no avail for any purpose excepting that for which it was made—that of sipping honey from the flowers. How, then, is the imprisoned creature to effect an egress from its dark cell? And how is it to discover the “Open, Sesame” to unlock the gates that enclose it as securely as if they were of wrought steel? But Nature is more than equal to the occasion, and supplies each moth with an efficient latch-key in the form of a little store of fluid, containing powerful dissolving properties, with which the moth is able to melt a hole in the end of its cocoon, and thus effect an exit as easily as if the barrier were nothing more impenetrable than tissue paper!

Enough, for the present, of the Puss moth, though I shall refer to him again when he has reached the perfect state.

Another caterpillar which makes a very ingenious form of cocoon is that of the Emperor moth, and this, indeed, would be difficult to surpass as a marvel of neatness and complexity. The whole cocoon—which is pear-shaped—is composed of a beautiful light brown silk; it is fairly



stiff in texture, most perfectly symmetrical, and contains an opening at the smaller end. Now it is this aperture which is the striking feature of the cocoon, for it is so constructed that, although the emerging moth can push its way *out* without the slightest difficulty, it is quite impossible for anything to push its way *into* the cocoon. The caterpillar effects this object by means of a very simple contrivance, for it protects the opening by constructing a fringe of stiff bristles all round inside. These are directed outwards, and though they are not actually attached at the outward extremities, they converge until they meet in a point. The result of this is that when the moth inside wishes to come out, the bristles part readily at the slightest pressure from within, and thus admit of an easy egress; whereas to anything approaching from the outside their converging points present an impenetrable barrier.

Another caterpillar which makes use of its protective colouring to hide its cocoon is the common Burnet moth. This caterpillar feeds on the various low plants that grow in abundance on any grassy downs, and in such situations is generally to be found in great quantities. When full-fed the caterpillar ascends a blade of grass or the stalk of a plantain, or any similar point of vantage; and here it proceeds to construct longitudinally



GROUP OF BURNET COCOONS  
ON GRASS STEMS.

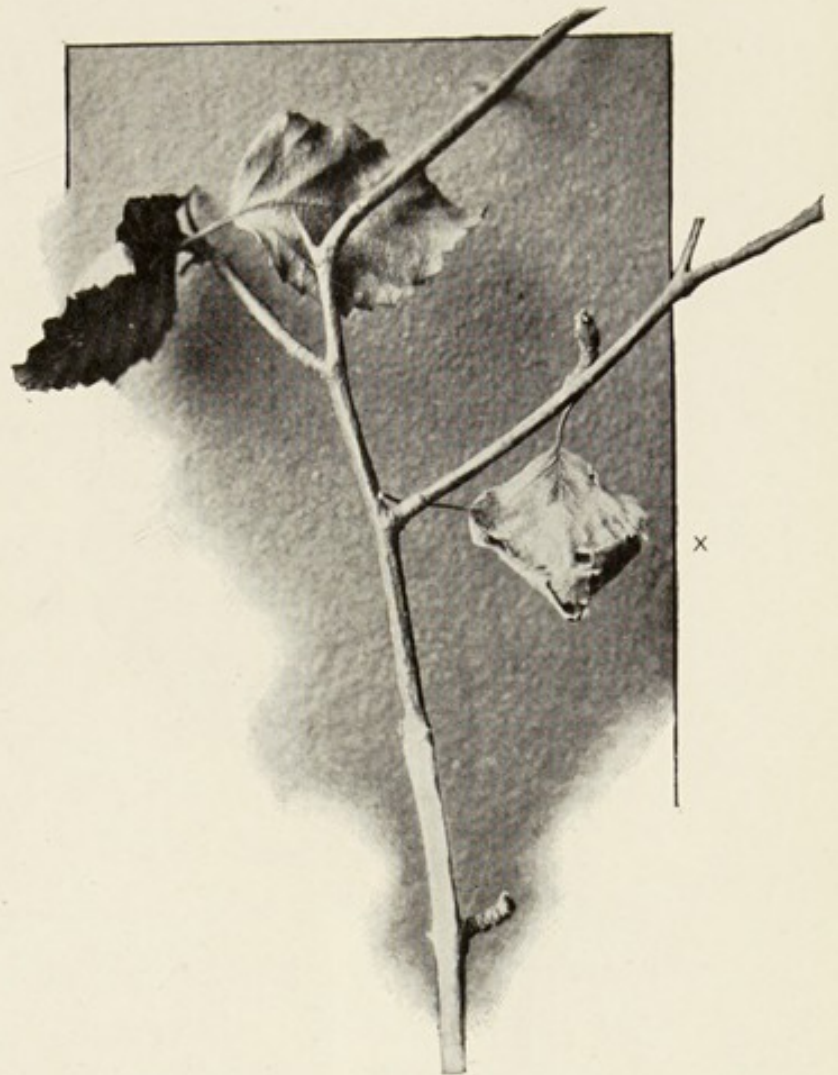
on the stalk a boat-shaped cocoon of a shiny gold or pale straw colour. This cocoon, which is an elegant object, so strikingly resembles one of the many seed-pods of the "Yellow Rattle" which grows in profusion around it, as readily to deceive the passing eye, though a closer examination would at once reveal its identity. It is quite easy to find these cocoons if one walks

*away* from the sun, about an hour or two before sunset, as, the sun being low, the cocoons are then betrayed by the sun shining upon their glistening surfaces, and at this time the grass appears to be sprinkled with flecks of gold and silver.

In June, 1899, I collected these cocoons in large quantities on the downs near Winchester, in the hope of getting some varieties when the



moths emerged, especially as I knew that a beautiful variety was occasionally to be found on these downs. I was not very sanguine of having my hopes fulfilled on this occasion, as a friend of mine had done the same the year before without any luck whatever; in fact, although the species is so common, I felt that



LEAVES FASTENED TOGETHER  
BY CATERPILLAR (OPPOSITE CROSS)

I should be quite satisfied if I were to get one variety out of every thousand cocoons. I therefore went out on several occasions when I had a spare half-hour, and did not rest until I had collected some eight or ten thousand of the cocoons. It was not easy to find them at a great rate until I found out the "dodge" of the sun, but after that I could get about two thousand in every half-hour, as they were very



COCOON OF OAK EGGAR AND  
RECENTLY EMERGED FEMALE MOTH.

plentiful in that part of the downs. Nor were my labours unsuccessful, as I got about forty nice varieties out of the whole lot, some of which were really good ones. The rest of the eight thousand were let out of the window, and very lovely they looked as they flitted about in the garden, like so many crimson gems.

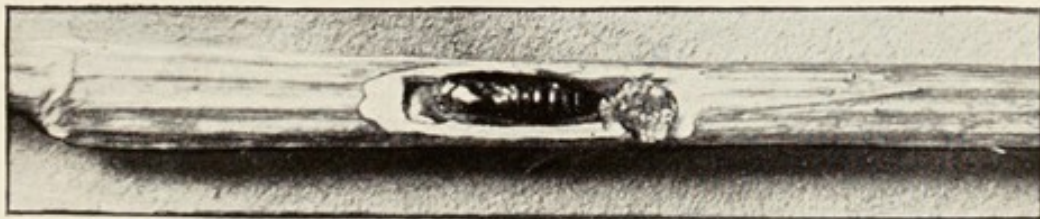
The caterpillars of many species employ the simple device of spinning together the edges of a leaf and making their cocoon inside it, and of course they could not be better protected than they are in such a position as this. When autumn arrives and the leaf falls, the chrysalis lies comfortably inside it until the spring, amply protected against the cold and everything else. Some species even go a step further, and, apparently



thinking that it would be safer to remain upon the tree than to lie upon the surface of the earth, resort to the expedient of fastening the leaf on to its parent stem with threads of silk in such a way that it cannot fall off, so that by this means the chrysalis will remain suspended in a natural hammock during the winter.

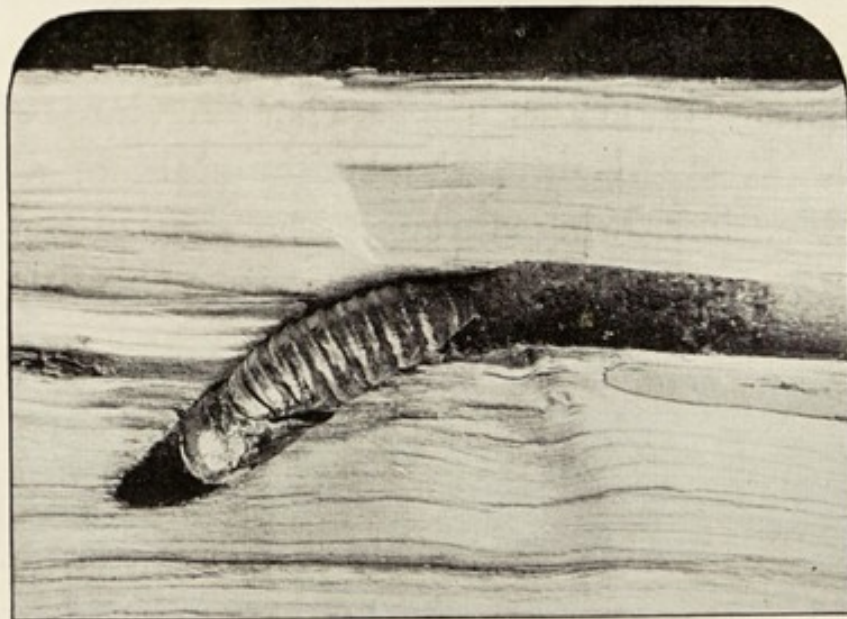
The cocoon of the Oak Eggar is a very beautiful as well as a most serviceable contrivance. It is in shape very much like a roller, but is rounded off at both ends, very compact and hard, and of a dirty brown colour. An exact imitation of this cocoon is that of the Small Eggar, only paler in colour and about one-third the size.

Another species which I must mention is the handsome Alder moth, to which I have already referred in the caterpillar state. When ready to pupate, this caterpillar, in common with some others of its genus, chooses a singular resting-place. It crawls into the hollow stalk of a dead bramble, burrowing through the dry pith; and



CHRYSALIS OF ALDER MOTH INSIDE  
HOLLOW STALK.

when it has got some little way into the stalk, it constructs a wall at both ends of the place it has settled upon, thus shutting itself off from the rest of the world in a snug little retreat. The chrysalis is very well adapted for this mode of pupation, as it is long and slender in shape, and thus runs no risk of being over-cramped in a narrow stalk. Whenever I am fortunate enough to find any of these caterpillars, or of their cousins the beautiful Miller moth, or, in fact, any of the other species belonging to this family, I always supply them with the old cork of a wine-bottle in lieu of a hollow stalk, having previously made a small hole at one end so as to delude the caterpillar into thinking that it is a stalk; and the caterpillars will readily make use of the accommodation



CHRYSALIS OF GOAT MOTH INSIDE BURROW.





EMPTY CHRYSALIS SHELL OF GOAT MOTH.

provided for them, and will burrow into the cork until they get well inside, when they will turn round and fasten up the entrance.

A very curious method is that employed by the Goat-moth caterpillar, to which I have also made previous reference. The caterpillar, which feeds on the solid wood of trees, makes its cocoon out of the chips of wood mixed up with a sort of loose web; the texture is not at all strong, like that of the Puss moth, but it is quite sufficiently so for the purpose, as the cocoon is placed well inside the solid trunk. The chrysalis, however, is furnished on the posterior segments with a number of strong hooks, and a sharp horny protuberance at one end, with which, when it is

ready to emerge, it works itself out of the cocoon, and then wriggles along the passage at the end of which the cocoon is placed, helping itself along by means of the aforesaid hooks—which are pointed backwards, so that the chrysalis cannot slip back again—until it has reached the outer surface of the tree, when the moth on emerging can easily walk out the rest of the way.

Some of these instances which we have considered show an amount of ingenuity which is indeed surprising, but it must not be supposed that all caterpillars resort to such clever artifices. Many species are not nearly so particular about the shape and appearance of their cocoons, but are content with merely enclosing themselves within a simple web of loose material, thickly interspersed with the hairs of the caterpillar—if it belongs to a hairy species—for the caterpillar moults profusely as soon as it begins to construct its cocoon. But whatever the methods employed, and various as are the forms, colours, and sizes of cocoons, they are one and all made with the object of affording protection for the inmates during their defenceless state, and their efforts in this direction are surprisingly successful.



## CHAPTER VI.

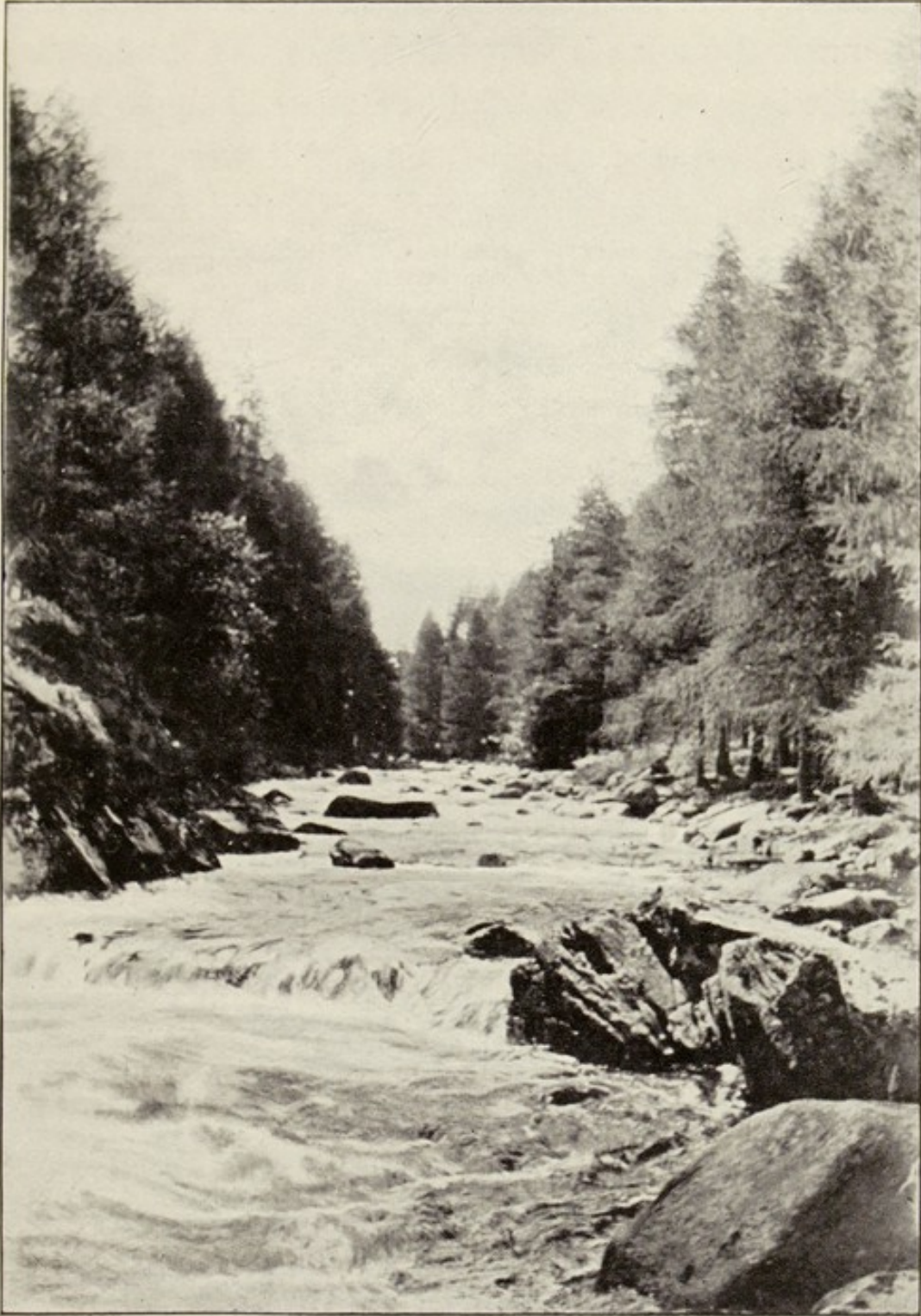
## THE PERFECT STATE.

WE have now come to the final stage in the insect's career. And this is aptly called the "perfect state," for now at last has the humble caterpillar reached his goal and broken the last link that bound him earthwards, and henceforth a life of dreamy pleasure will be his lot. A change which he will welcome after the miserable routine of perpetual leaf-munching, coupled with the continual anxiety of frequent skin-changing, for now he has leisure for loftier pursuits, and may fritter away the sunny hours without a care to trouble him, as he sports with his lady-love among the flowers, now quaffing the nectar which lies hidden in their fragrant blossoms, now hovering above some limpid stream to admire the reflection of those splendid pinions which raise him so high above the abject grub that grovels beneath him.

Seated on a mossy rock, by the edge of a boisterous burn that crashes through one of the loveliest gullies in Scotland, I once watched a beautiful Purple Hairstreak dancing amongst the foam that melted into spray by the violent contact

with a rugged boulder ; and I held my breath as the fragile creature again and again almost dipped its wings into the seething eddies that churned amongst the rocks, and threatened each moment to engulf the tender life that hovered so foolishly over the very brink of destruction. And yet he seemed as safe amid the tumult of waters as on his native oak-tree. I watched him until he tired of his fancy, and, soaring aloft, disappeared over the silvery birches that dipped over the banks and bent their graceful fingers to catch the spray. To think that he, too, had once been a lowly grub ! And yet, does the possession of wings necessarily exempt him from the attacks of his enemies ? Assuredly not. The swallow that darted by a moment since could easily have severed his little thread of life with one swift swoop ; or the speckled trout, that lies hidden under the side of yonder pool, could have quickly snapped him up during one of his wild games of hide-and-seek with the spray. For although the wings of a perfect butterfly will waft him out of reach of many of his enemies, this very power of flight tends to make him more conspicuous than he ever was during his earlier stages. Certainly he is henceforth free from the cruel attacks of the dreaded ichneumon fly, but he has doubtless gained fresh foes to make up for the loss. The pinions of a





THE HOME OF THE PURPLE HAIR-STREAK.

butterfly enable it to outwit countless numbers of its enemies ; but the time comes when it must rest, and it naturally spends a good deal of its time thus, and it is then that it would be most likely to suffer from the attacks of its enemies if it were not protected by its colouring, which is therefore made to harmonise with its immediate surroundings. Now in some species the manner in which this object is effected is far more extraordinary than would appear at first sight. One can easily understand that it is possible for a dull brown butterfly or a dark-coloured moth to be protected by the sombreness of its appearance ; but what about the gaudier species, many of which are bedecked with every colour of the rainbow ? Take the beautiful Elephant Hawk-moth, resplendent in its dress of crimson, and we may ask how such a gorgeous creature can be protected by its colour. Surely it would be the more likely to be exposed to danger from the fact that it is arrayed in bright attire ? But no ; in this case, at any rate, it is its very brilliance that protects it. And let us look for the explanation of this apparent paradox by examining the habits of this insect, and we shall find that the caterpillar feeds upon willow-herb, the flowers of which, as any botanist will know, are bright pink and very conspicuous. Now the solution of the mystery is simple enough,



for it is obvious that the moth, while resting upon the willow-herb, would present the same appearance as one of the brilliant flowers, and the illusion



PRIVET HAWK-MOTH AT REST  
ON TREE-TRUNK.

is strengthened by the fact that the bright crimson surface of the moth's wings is broken up by bars of dull green of the same shade as the stalks and leaves of the plant. And we may notice in this striking instance that the same truth holds good among insects to which I drew attention whilst treating of the larger animals, and which I illustrated by the example of the white sheep amongst green surroundings, which escape notice

from the fact that the eye *expects* to see a number of white boulders, and does not readily grasp the fact that the sheep are not boulders also, and which shows us that it is not at all necessary for the colour of an animal to be the *same* as the colour of its surroundings as long as it *harmonises*. The case of the Elephant Hawk seems to be a particularly suitable instance in support of this theory, for the fact that one would *expect* to see pink among the green leaves of the willow-herb would deter any but a careful observer from making the close examination that would probably be necessary to reveal its identity, and more often than not would deceive such an one also.

A few of the most brilliantly coloured species—such as the Tiger moths—are protected by the fact that they are not at all palatable eating for the birds that prey upon insects, owing to their extremely nauseous flavour. Hence, although a few might suffer from the attacks of inexperienced birds, the majority would escape ; for, as I pointed out in the case of the Currant moth caterpillar, birds soon find out which kinds do not taste nice, and learn to leave them severely alone. A case in point is the Burnet moth, which is very beautifully marked with metallic green and crimson. But these insects are apparently looked upon with disfavour by the feathered tribes, for



although their flight is very sluggish, and they hover about over the flowers in the hottest sunshine, yet their numbers do not seem to get materially diminished, and I certainly have never seen a bird try to eat one, though possibly other naturalists may have occasionally done so.

I have several times caught some and thrown them down for the consideration of a brood of half-grown chickens; but although the usual stampede was made directly one of the insects came within reach, one peck was sufficient, and no attempt was made to eat them. There is a unique deception practised by certain species, which are brilliant in colouring, but are not themselves nauseous in taste, for they imitate another species which is nauseous in taste; so that the birds are completely taken in by this device, and the arch-



EMPEROR MOTH  
AT REST ON  
SPRIG OF HEATHER.

deceivers obtain an undeserved immunity from attack by assuming characteristics which they do not possess. The curious part of it is that it is only the *females* of these species that descend to such a subterfuge. The reason of this distinction is obvious, for whereas the slaughter of a few *males* would extend no further than themselves, and would have comparatively little effect upon the perpetuation of the species, on the other hand each *female* killed represents a whole brood of caterpillars lost if she is caught before she has had time to lay her eggs, which would probably be the case, owing to her conspicuous appearance.

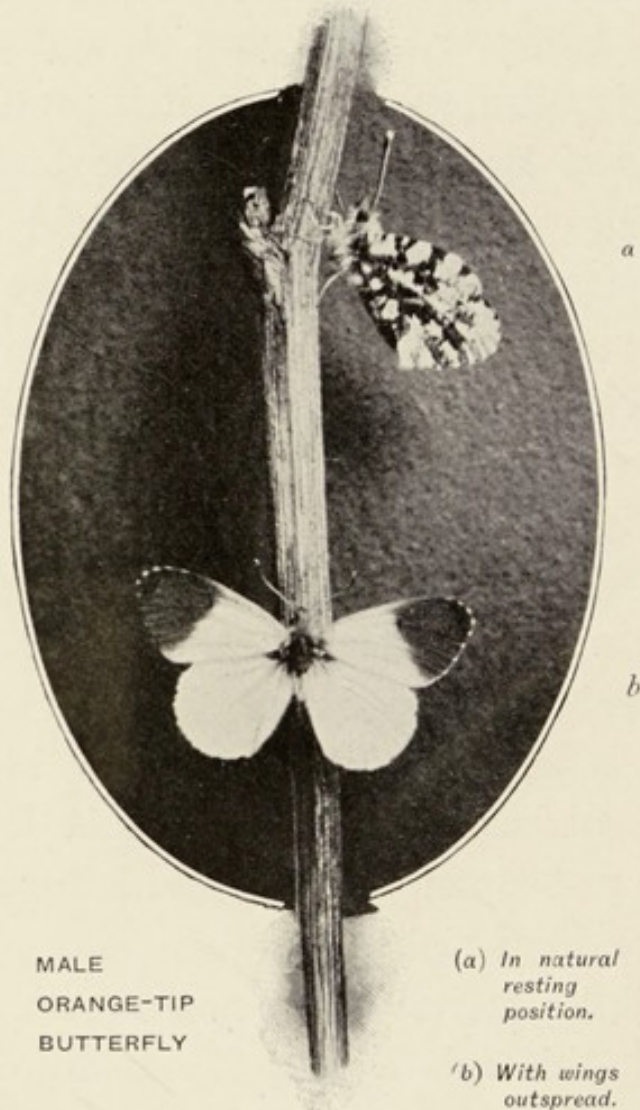
Similarly, in many other species we may notice that a greater degree of protection is afforded to the females than to their mates, by the fact that their colours are much less gaudy, and that consequently they are less easily seen by their numerous foes. If this were not the case such an insect as the beautiful Adonis Blue would probably soon become extinct. I shall never forget the first time that I ever saw one of these radiant butterflies flying about on Beachy Head. I was a small boy at the time, and therefore was doubly impressed with the sight. The colour of this butterfly is ten times more vivid than that of any of the other British blues, and the insect looks



like a veritable jewel floating about among the flowers, and I was so enraptured at the sight that I almost failed to notice the sober-looking little brown butterflies that were flitting about amongst them, and which were the females of the same species. However, brilliant though the male butterfly is when on the wing, it is protected when it is at rest by the fact that the under surface of the wings is not of the same bright hue as the upper surface, but, on the contrary, is of a dull silver-grey, and mottled with various shades of brown. Now the value of this distinction will be at once apparent if we bear in mind that when a butterfly is in a resting position it invariably folds its wings up perpendicularly over its back, with the result that only the under surface is visible, and the upper side, however brilliant it may be, is at this time completely hidden from view. Consequently, whenever this lovely Blue stops to rest upon a clover-head, he apparently disappears from sight.

And it is interesting to notice that in accordance with this rule a butterfly is always marked in a protective manner on the *underside*, however bright and conspicuous it may be above. The beautiful Peacock butterfly is nearly black underneath, and of a very similar shade is the gaudy little Tortoiseshell; but perhaps the most striking

instance of all is the Green Hair-streak. The favourite habitat of this butterfly is among the low bushes of hazel and bramble which abound in the open places that are to be found in all large



MALE  
ORANGE-TIP  
BUTTERFLY

(a) *In natural  
resting  
position.*

(b) *With wings  
outspread.*

woods. The upper surface of this little butterfly is of a uniform brown colour, but the underside is of a vivid green, from which fact the butterfly gets its name. Thus, when the insect stops to



rest upon one of the green leaves of the hazel or bramble, and folds its wings so that the green under-surface alone is visible, it is only after the



ORANGE-TIP BUTTERFLIES RESTING ON  
HEMLOCK FLOWERS.

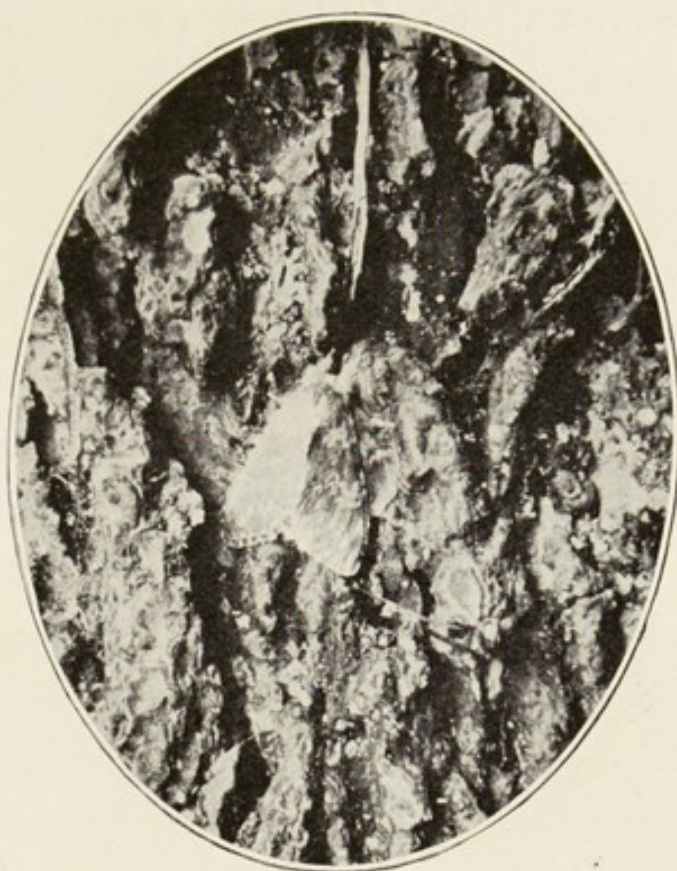
closest scrutiny that it is possible to detect its presence. Many a time have I followed one of these butterflies to the bush upon which it has settled, and on approaching to within two feet

it has still been some moments before I have been able to distinguish it from the leaves.

Another very good example is that of the Orange-tip butterfly. The male is very conspicuous from the bright orange tips to its upper wings ; but the female, for better protection, is entirely without these orange markings, and is therefore hardly distinguishable when on the wing from one of the common White butterflies. Moreover, the undersides of the wings in both sexes are beautifully marbled with green and white ; and when the insect is at rest among the similarly coloured flowers of the hemlock, which it appears to prefer to any other flower, it is rendered practically invisible, more especially so from the fact that the butterfly slips its upper wings down inside the lower ones, so that only the marbled green and white surface of the under wings is uppermost.

Now *moths*, on the contrary, do not rest in the same position as that adopted by butterflies, but either spread their wings straight out or else fold them down closely against the body in various postures ; and in the latter case the lower wings are usually hidden beneath the upper ones. Consequently, it is the upper wings that have to have the protective markings ; and so we may notice that many moths have very brilliant under-wings,

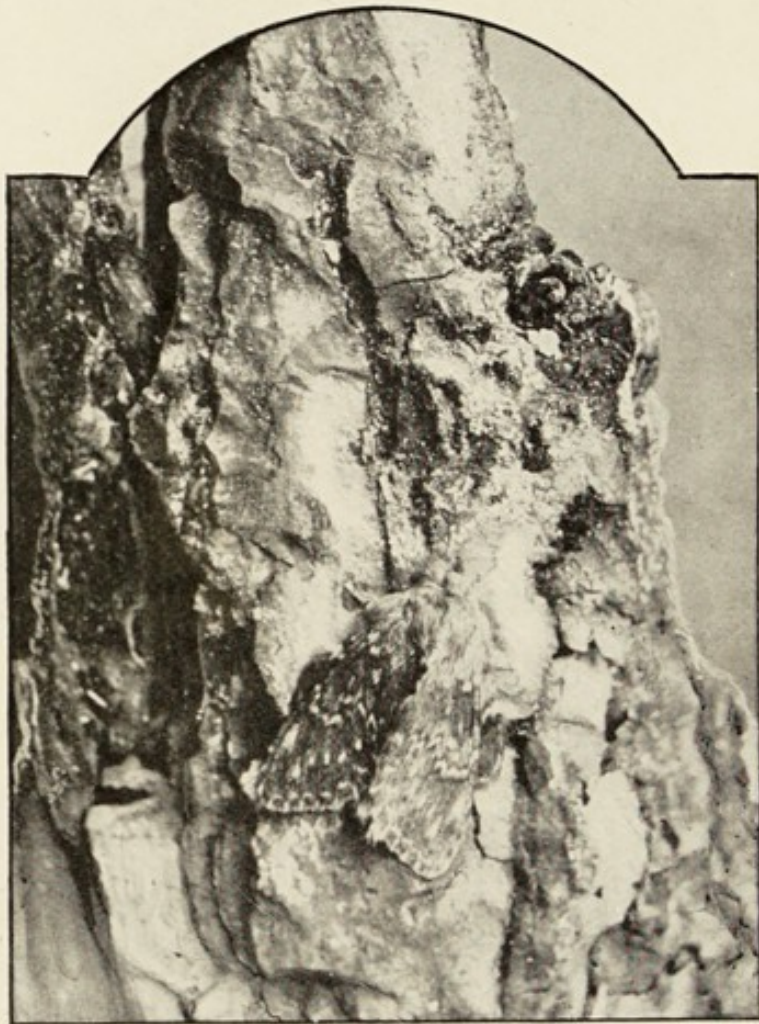




LOBSTER MOTH AT REST ON  
TREE TRUNK

but are not the more exposed to danger from this fact, because although the under-wings are very conspicuous when the moth is flying, yet they do not betray the moth when it is at rest. A good example of this class is the Red Under-wing moth and its cousins, the Light and the Dark Crimson Under-wings. These moths are very large, and they have, as their names denote, very bright red or crimson under-wings, which, when the insect is flying, are extremely conspicuous. The upper wings, however, are of a soft, greyish colour,

marbled with various shades of brown, and when the moth is at rest upon a dark tree-trunk, with only the dark upper wings exposed to view, it would readily escape notice altogether.



ANOTHER LOBSTER MOTH.



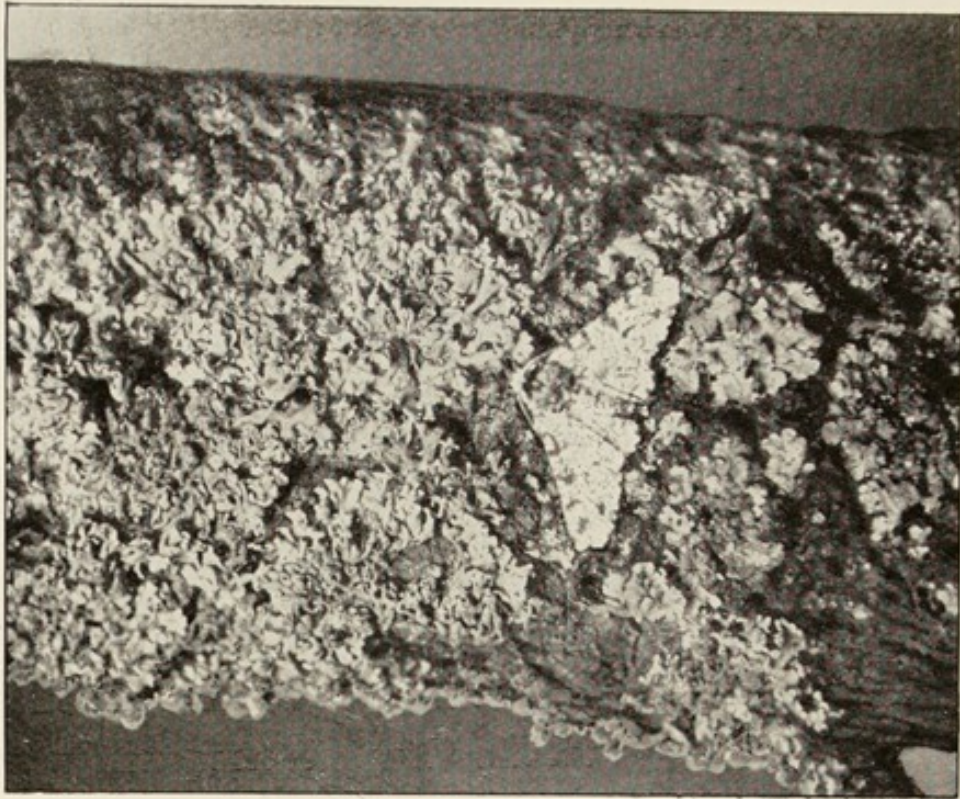
## CHAPTER VII.

## SOME MOTHING ADVENTURES.

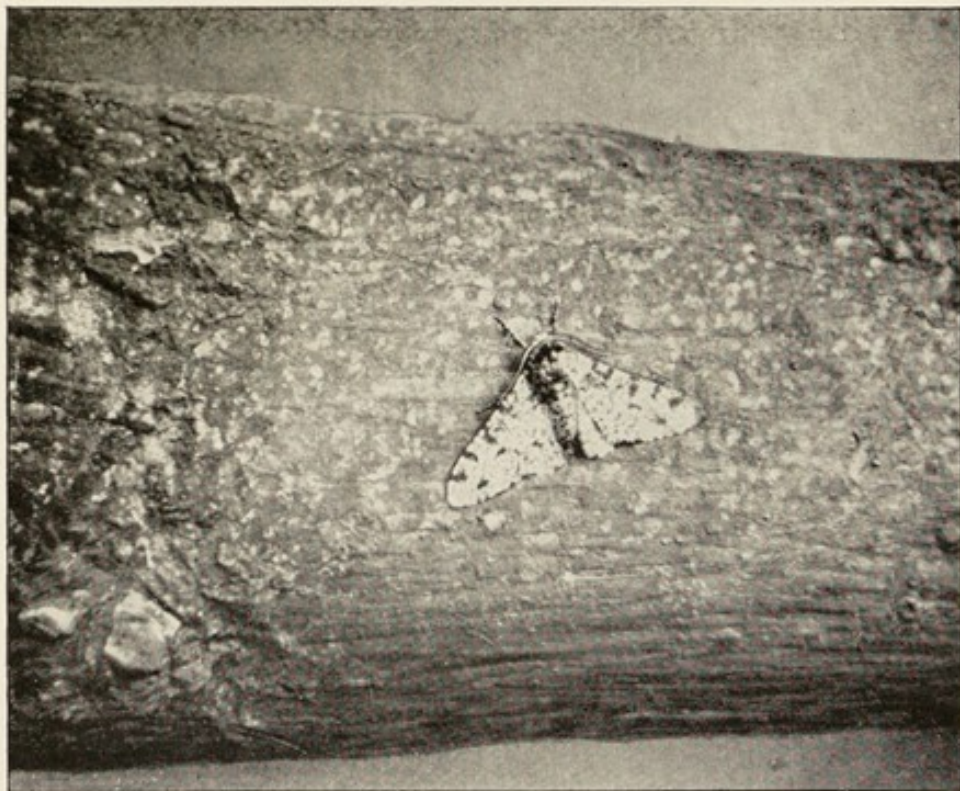
AN important point in this protective colouring is that the insects are evidently thoroughly aware of their resemblance to various natural objects, just as we noticed was the case among the larger branches of the animal kingdom. Consequently their instinct leads them to take every advantage of this protection, and to make use of it at every possible opportunity. And thus we find that a moth or butterfly will choose a resting-place as much as possible in accordance with its own colouring, a grey one preferring a stone wall or a lichen-covered tree-trunk, whereas a brown moth will make choice of a darker object. The knowledge of this habit is very useful to the entomologist, and his eye from long experience will soon become quite accustomed to pick out at once a moth at rest, which would perhaps be invisible to the unpractised eye.

A particularly beautiful example of this principle is that afforded by the case of the Pearl-bordered Fritillary butterfly. This insect frequents the open glades in woods, and is usually on the wing





PEPPERED MOTH AT REST ON TREE-TRUNK  
COVERED WITH LICHEN.



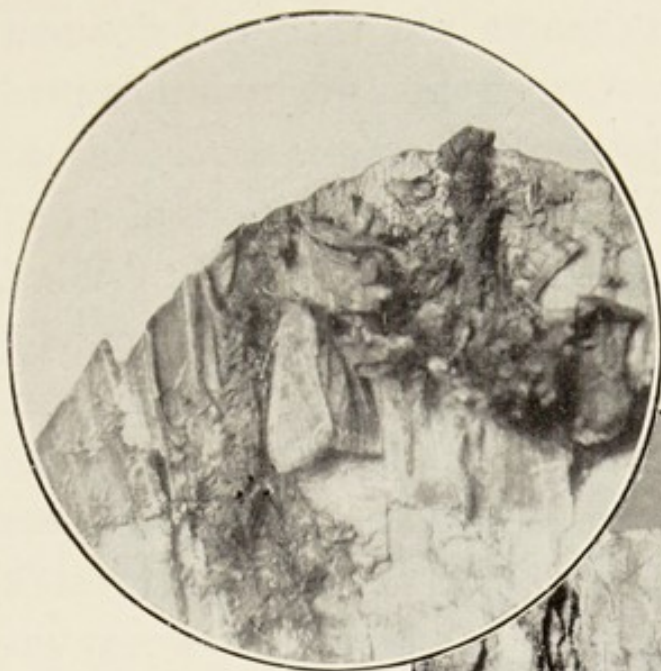
THE SAME ON BARE TREE-TRUNK.



about the time when the bracken fronds have shot up to the height of a foot or more above the ground, but have not yet begun to unfold the soft fluffy buds with which the stalks are crowned. These buds, as every botanist is aware, are delicately mottled with different shades of yellow and brown, and have a tendency to curl downwards. The butterfly in question is equally aware of the fact, and neither does it escape her notice that the prevailing tints of the bracken buds are precisely the same as those of the undersides of her own wings. What, then, is more natural than that, when she feels inclined to take a rest, she should take advantage of this similarity in colouring, and settle upon one of the bracken buds? I well remember noticing this peculiarity in a striking manner during my first year as an undergraduate at Oxford. Many of my spare afternoons were spent in Bagley Woods, that "happy hunting-ground" of naturalists, which are situated some five miles from the city, and extend over an area of hundreds of acres. Some of the loveliest spots I have ever seen are to be found in this wild retreat. The lover of Nature, leaving behind him for a while the noisy din and busy turmoil of the great town, may revel in the calm seclusion of this delicious spot; and as he wends his way down a leafy path leading into one of the

glades with which the wood abounds, a sight meets his eyes which roots him spellbound to the spot. Before him is outspread the richest canopy of bluebells and pink campions, over which are hovering in wildest profusion a marvellous array of living jewels of every colour of the rainbow, whilst the ceaseless hum of a myriad bees is broken only by the rich, mellow tones of scores of nightingales, or the shrill song of the tiny wrens chasing each other among the hazel bushes. And as he drinks in the sweet, mossy fragrance that hangs upon the air and mingles with the perfume of the bluebells, he may feel that here indeed is a place where "the wicked cease from troubling, and the weary are at rest." Now amongst the carpet of flowers arise a number of tall bracken stems, surmounted by the brown-tipped buds which I mentioned above. And should a threatening rain-cloud obscure the sunshine, in an instant all the gay little Fritillaries which a moment since were flitting happily amid the flowers have disappeared completely from view. When this phenomenon was first brought to my notice, my curiosity was stimulated to discover their place of retreat; and in order to effect this object I kept my eyes fixed upon a straggler which was still flitting in an undecided manner over a campion. Suddenly it also disappeared, and on approaching the spot I





A DARK MOTH  
RESTING ON A  
TREE-TRUNK.



A LIGHT MOTH  
RESTING ON A  
TREE-TRUNK.

found the butterfly resting beneath the bud of a tall bracken frond which stood hard by; and a subsequent search among the flowers revealed one or more of the butterflies perched upon nearly every bracken bud. Then, when the cloud has passed, as if by the stroke of a magic wand, the bluebells are again ablaze with the radiant gems which the sun has once more called to life.

But alas! the chances are that the dreamer in this fair spot will soon be rudely interrupted by a harsh voice which proceeds from a velveteened form wearing a grin and an expression of great ferocity, and which demands savagely, "What business have you got in there?" Thus cruelly are his happy illusions dispelled, and, torn from the seventh heaven of bliss, he is compelled to beat a hasty and ignominious retreat from these fair realms of loveliness, and once again to seek the dry, dusty road. Such, indeed, was my experience on the first occasion that I ventured within the sacred precincts. Argument was of no avail, though I assured the irate keeper that he could not accuse me of disturbing the pheasants, as there were none to disturb. This only had the effect of making him more angry, so I tried a different tack, and appealed to his sympathies: how would *he* have liked to be turned out just as he was beginning to enjoy himself, and after having come all the way from Oxford too? This argument he treated with the contempt that it doubtless deserved, so I played my last card and informed him that I was in reality doing an immense amount of good to the estate by taking away the caterpillars which would later on eat up the leaves of the trees—(N.B.—This fact is only too true, for by the end of a dry July some parts of



the wood present the appearance of having been visited by a flight of locusts)—and, as confirmation of my protest, I produced from my pocket several pill-boxes full of caterpillars which I had collected on my way into the wood. This last shot he could not answer, so he ignored it; and growling out that he “’ad horders to turn out everyone he found in the wood,” he very considerately escorted me in person as far as the road. No sooner, however, had I seen his stalwart form disappear in an opposite direction than the remembrance of the paradise within overcame every other consideration, and I was speedily back again amongst the butterflies. I had tasted the sweets, and was not going to be outdone by a mere keeper! I could, of course, have descended so low as to make use of the expedient—suggested by a friend the next day—known as the “silver key,” and doubtless the velveteened aggressor would then have been more inclined to tolerate my presence in the wood; but I considered that such a practice would neither be good for the morals of the keeper nor yet—which was a more important consideration—for my pocket, which would inevitably have found itself exposed to a constant drain every time I visited the wood in future.

On subsequent expeditions I decided that discretion was the better part of valour, and resolved

to deny the members of this fraternity the opportunity of exercising their authority upon *me*, at any rate, by keeping at a respectful distance from them. In the pursuit of this object I have had many exciting adventures, and narrow escapes of being discovered, having had on more than one occasion to stand motionless behind a tree while the keeper walked by on the other side, and I gradually edged round the trunk as he passed beyond me. Moreover, in this position I was myself as well protected by the "natural colouring" of my garments as the Fritillary upon the bracken buds, by a pair of weather-stained flannel trousers and a still more disreputable green blazer, which must certainly have harmonised excellently with the mossy trunk behind which I was concealed. On one occasion I had a most singular escape, which indeed was so remarkable that it can only be considered in the light of a most unaccountable piece of luck. In one part of the wood there is a narrow gorge with a stream running through it, from which the banks slope gradually upwards on either side. Near one of these banks I discovered the habitat of a much-prized caterpillar, and on this particular afternoon I was down on my knees busily engaged in boxing one of the specimens when I was suddenly startled by hearing a heavy tread just behind me. I looked anxiously



around, and espied my quondam assailant Mr. Velveteens, gun in hand, cautiously approaching in my direction. Although I was quite in the open, he evidently had not seen me, as his eyes were intently fixed upon a tree on the opposite side of the stream, from which was issuing the harsh cry of a jay. I kept perfectly still, hoping that he would soon move on; but, to my horror, he actually sat down on the ground when he had got to within a dozen yards of



THE GIANT OAK BEAUTY AT REST AMONGST LICHEN.



me, with his back in my direction, and apparently engrossed in his occupation of watching the bird opposite. Accordingly I hastily put the caterpillar in a box and popped it in my pocket, and raising myself gradually from my knees to a crouching position, I endeavoured to steal away, inch by inch, as noiselessly as possible, the while conjecturing what the keeper would probably do if he should catch me trespassing a second time. I owe a debt of gratitude to that jay for remaining in the tree so long, and thus attracting the man's attention away from myself, as it was a very tedious proceeding to get out of earshot unperceived. Fortunately, however, the circumstances were favourable to my project, for, it being an open part of the wood, the ground was comparatively free from dry twigs, the snapping of which would inevitably have betrayed me. Step by step I drew further away, anon furtively glancing round at the unconscious figure of the keeper, whose gaze was still rivetted upon his quarry, until at length I reached a welcome bush, behind which I crouched a moment, and then rapidly betook myself out of danger. Scarcely had I got well out of sight when I heard the report of a gun, which told me only too surely that my deliverer had probably perished as a punishment for its



crimes, imaginary or otherwise. Not long after I had got out into the road upon my way back to Oxford I chanced to meet the keeper again, who eyed me suspiciously. I could not resist the temptation of asking him whether he had "killed that jay," and the expression of mute astonishment with which he regarded me was delicious. And I chuckled to myself as I thought how blissfully unconscious he was that there had been a spectator of the little tragedy in which he and the jay had been the principal actors.

On another occasion I had an adventure the recollection of which has given me and my Oxford friends many a hearty laugh. In the course of my wanderings in Bagley Woods on a hot afternoon in June, after traversing an open part of the wood, I approached a clump of high bushes, on the opposite side of which I suddenly espied the figure of a man, who was apparently watching me. Visions of keepers floated before me, and I proceeded to dodge round the bushes, when to my surprise I noticed that the figure began to do the same, being evidently equally desirous of avoiding me. After this insane game of hide-and-seek had been kept up for some moments, I caught a glimpse of a butterfly-net in the hand of the figure, and the truth flashed upon me that here was a fellow "bug-hunter," and that we had each been

mistaking the other for one of the dreaded keepers. Explanations ensued. The "keeper" turned out to be a venerable Don—not unknown in Oxford scientific circles—who, like myself, was spending an afternoon in the pursuit of his hobby, and both of us, thoroughly appreciating the humour of the situation, sat down under a bush and laughed so long and heartily that we must have run a considerable risk of attracting a veritable keeper.

The wooden palings that are often to be seen round parks afford a very favourite resting-place for many moths, and one of these proved a happy hunting-ground for myself when I was at Oxford. It was my custom to pass this strip of palings every morning on my way to the river for my early bathe; and as the position was particularly favourable, and I always went before six o'clock, when the sun would not be hot enough to disturb the moths that had alighted on the palings during the night, the consequence was that hardly a morning passed without my finding something worth keeping. I got so accustomed, after a while, to detecting the presence of any moths on the paling, that I soon found it quite unnecessary to abate the pace of my walk (or rather run, as it usually was on a frosty morning), but by keeping my eyes fixed on the paling a little in advance of myself I was fairly sure not to miss anything.





PUSS MOTH AT REST.

Now there was a certain enthusiastic gentleman living in Oxford, to whom I was introduced during the first summer after I had discovered the palings in question; and our conversation, as was natural, very soon assumed an entomological turn. Presently my new acquaintance, to my inward amusement, happened to mention my pet palings, remarking that he could not understand how it was that he "could not find a single moth worth keeping on them this summer," although he had met with great success in previous years. On my asking him what time of day he made his visit to the railings, he replied, "Every morning, directly after breakfast"; and as he was a classical tutor I knew that this would mean a



PORTRAIT OF A  
"BUG-HUNTER."

much earlier hour than that of the average under-graduate. Thereupon I felt that I must enlighten him, although I doubted whether he would be particularly pleased at the intelligence, but I thought it would be too cruel to let him continue to waste his time in a fruitless search.

The worthy Don was much disgusted to learn that it was I who had stolen a march upon him. However, he relinquished his morning search from that day forward, and used to ask me from time to time, with a twinkle in his eye, what day I was leaving Oxford, so that he might know when he could begin to "search the palings at a rational hour" with some hope of success.

The infatuation displayed by moths for a bright light is proverbial, and is accountable for the sight — not uncommon in the outskirts of towns — of frantic figures armed with green nets,



careering wildly round the street-lamps during the dark hours of the night in the pursuit of some coveted rarity. Moreover, I must admit the soft impeachment, that I have myself belonged to this fraternity, which the passers-by evidently look upon as "harmless lunatics," and the pursuit of this hobby has often led me into adventures both amusing and otherwise. When at Oxford it was my custom to make a nightly tour of the lamps along a particular road in search of plunder, and the experiences of one such occasion are indelibly fixed upon my memory. On that memorable night I chanced to be seated upon the cross-bar at the top of a favourite lamp-post, and was so intent upon securing a prize that had found its way into the interior of the lamp that I did not at first notice the rapid tramp of heavy footsteps, coupled with the furious panting as of some uncouth monster, which was bearing down upon me, and which finally came to a stop beneath the very lamp to which I was clinging, while a stentorian voice commanded me in awful tones to "come down from that there lamp." Somewhat startled at the suddenness of the assault, for which I was totally unprepared, I looked down and discovered the infuriated form of a large "bobby"—and Oxford bobbies are not, as a rule, noted for their slight figures. The present

specimen was puffing and blowing under the lamp-post, having evidently borne down upon me at a great pace for fear I should escape; but, as I was well out of his reach, he could not attempt to get me down forcibly, so the poor creature had to be content with wildly gesticulating and roaring at the bottom. I therefore waited until I had secured my prize, treating the bobby as quite beneath consideration, in two senses; and then, plucking up what little courage I had left, I quietly descended from my lofty perch into the jaws of the lion. The latter animal, perceiving that I manifested no desire to beat an unduly rapid retreat, and presuming that I was perhaps not a criminal after all, calmed down considerably, though he still demanded fiercely to know what I "wanted with that there lamp, which wasn't no business of mine." I informed him that I was catching moths, whereupon he looked incredulous, and remarked that he had "heard that story before." (I must explain that it is by no means an uncommon amusement for undergraduates, returning late at night to their colleges in an excited condition after some convivial meeting, to climb up the lamp-posts in secluded spots, with the object of putting out the light; and very probably it is a favourite excuse, if they should be caught in the act by the bobbies, who are always



on the look-out for such skylarkers, that they were catching moths.) However, I was naturally nettled by the bobby's want of discrimination in ascribing such motives to my innocent proceedings ; and under the influence of his incredulous grin I fired up a bit, at the same time producing my killing-bottle, and showing him the moth which I had just captured. The bobby's huge countenance gradually relaxed, and the transformation it underwent as the truth dawned upon him was positively ludicrous ; the stalwart "limb of the law" became abject in his apologies as he murmured softly, "I beg your pardon, sir ; I thought you was trying to put the lamps out." One evening, not long afterwards, as I was walking up to my rooms after "Hall" dinner, I encountered my quondam assailant, who was just going off duty, tramping along the stone pavement till the walls re-echoed with his elephantine tread. Acting on the impulse of the moment, I asked him to come in and have a cup of coffee and a smoke, forgetting for the instant that I had asked two or three friends to come in after dinner for a while before beginning the evening's work. The bobby, after consulting his watch, consented, adding that he "mustn't stay long, as the missus would be expecting him." On the way up to my rooms I remembered that I had asked some friends in,

and that they would probably be there before me. Accordingly, on our arrival, I gave the door a loud knock, and, keeping myself in the background, ushered the bobby in alone, to the great consternation of my friends, who had arrived, and were already helping themselves in true Oxford fashion to my cigarettes. As the bobby entered, remarking in his deep, sonorous tone, "Good evening, gen'lemen," the effect was truly magnificent, which I watched, unseen, through the crack of the open door, hugging myself with suppressed laughter. One of the men, recovering first from his astonishment, enquired waggishly of the strange intruder "whom he had come for," while another turned the tables on me by remarking that "the gentleman had not come in yet." I then appeared from my hiding-place, and the monster was duly introduced to the others, who had all heard the story of my lamp-post adventure (which, it is needless to say, they had immensely appreciated, and, in recounting it again to other mutual friends, had exaggerated it not a little, so that the versions that eventually came round again to my ears were so garnished that it was difficult to recognise the original). Five minutes more saw the bobby duly ensconced in one of the luxurious armchairs for which Oxford and Cambridge are famous, and provided with



coffee and cigarettes *ad lib.*, recounting to a most appreciative audience some of the tales of his experiences in the "good old days" of Town and Gown rows. We examined the various points of his equipment. I tried on the handcuffs, and when I was unable to get them off again the bobby jocularly remarked that "now he could run me in for climbing them lamp-posts." Altogether we spent a pleasant half-hour, and at last our sturdy guest, after having protested for the third time that "the missus would be wondering where he was," was permitted to take his departure, though not before he had consumed I should be sorry to say how much coffee and cigarettes, and having afforded us in return a good deal of entertainment.

On another occasion, however, I had a less fortunate encounter, when I was engaged on my usual voyage of discovery round the gas-lamps along a quiet road on the outskirts of the town. The evening was very hot, and I had, therefore, omitted to take with me the "cap and gown" which is the regulation attire for every undergraduate who may desire to wander abroad after dusk.

In connection with this rule, I must mention an old story, for the benefit of those who have not heard it, which, though quite irrelevant to the subject, is nevertheless rather amusing. There is

a story on record of an undergraduate who, on being caught by the proctor one summer's night without his academical attire, ingenuously enquired of that worthy whether he would kindly inform him what the rule was. The proctor—who, by the way, is an official appointed by the University authorities to look after the morals of the students and to exact severe penalties for any breach of the rules—replied, evidently much irritated at this pretence of ignorance, “I think you must be well aware, sir, that the University statutes enact that academical attire shall be worn by all junior members of the University after dusk.” “Well, sir,” responded the youth, unabashed, “do you call this dusk?” On the proctor replying that he certainly did, considering that it was past nine o'clock, “Then, sir,” replied his victim triumphantly, “if it is now dusk, it cannot be after dusk.”

Now on hot evenings one is glad to dispense with any superfluous garments, especially in a relaxing place like Oxford; and, moreover, “academical costume” is inclined to become rather irksome, especially when climbing lamp-posts. Therefore I generally went out without mine, as my beat lay along roads which the proctor did not usually traverse in the course of his nightly prowling. But on this particular evening, as luck



would have it, he chanced to come along my road at the very same time when I was busily engaged with my pursuit, and his wary eye soon espied me, with the result that, after the usual polite formalities of bowing and raising of hats, followed by tender enquiries on the part of the proctor as to whether I was a "member of the University," and the manifestation of great anxiety to become acquainted with my "name and college," I was enjoined to call upon him at nine o'clock the following morning. At the appointed hour, on my arrival at the private sanctum of that dignitary, he demanded an explanation of my nocturnal escapade; and although I pleaded that I was only catching moths, and put it to him whether he himself would like to be encumbered with a cap and gown whilst climbing a lamp-post: although I drew his attention to the fact that it was the first time that I had ever had to appear before the proctor, and on his remarking that that excuse did not hold good after a man's first term--which was supposed to be quite time enough for him to find out the University rules—I protested that "Surely it is all the more creditable to have been nearly three years without being reported," yet it was all of no avail. The proctor laughed at this latter argument, and sentenced me to a fine of five shillings and sixpence,

adding that he was "very sorry, and would have liked to let me off, but the rule was," etc. etc. However, by way of concession, he gave me permission to go out in future without my cap and gown when I wanted to climb lamp-posts if I sent a "note round to the proctor's to inform him of my intention." I discovered subsequently from a mutual friend to whom the proctor had related the occurrence that the worthy official happened himself to be a keen naturalist, and had been greatly amused at the incident.

A few years later, when I was at Winchester, I regularly investigated certain street-lamps every night, and had a most interesting and interested companion on my rounds in the shape of a sleek yellow and white cat. This animal appeared every night with surprising regularity, and waited for me outside the gate, eagerly expectant, in anticipation of the fat, juicy beetles which she knew would fall to her share. Moreover, if I failed to keep her supplied, which sometimes was the case in the excitement of a capture which, in my eyes at any rate, was far more important, she would endeavour to attract my attention with a loud mew. Neither did she give me any peace until I had made amends for my shortcomings by throwing her down one of the cockchafers which were swarming round the lamp. She would



then play with it for a few moments, after which it disappeared with an ominous crunch, and there was a clamour for more of the dainty morsels.

We were speaking of the natural instinct which leads moths to settle upon some object which bears a protective resemblance to themselves, when I was led away into some Oxford reminiscences.

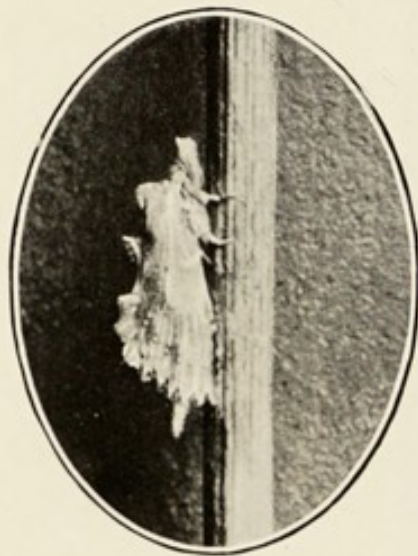


SMALL MOTH AT REST  
ON GRASS-STEM.

## CHAPTER VIII.

## THE HYPOCRITICAL BUTTERFLY.

NOW some butterflies and moths are not content with a mere resemblance to their surroundings, but must "go one better," and mimic some



PALE PROMINENT MOTH.

particular natural object, just as we noticed was the case with some of the caterpillars. My readers will remember that I mentioned the remarkable caterpillar of the Alder moth, and showed how when young it imitated a bird-dropping so exactly as to defy detection, and there is a no less remark-

able moth that does precisely the same. I refer to the Chinese Character, a little moth which only measures about three-quarters of an inch from tip to tip of its wings, which latter are of a pearly white colour, with some brown markings of a very curious shape, and these wings the moth closes in a peculiar manner when it settles upon a leaf. When



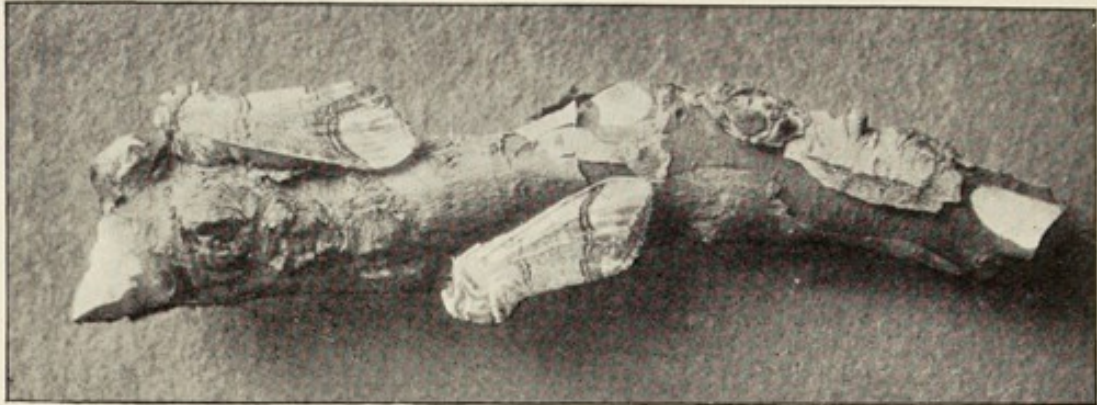
in this position, although resting quite openly upon a hawthorn hedge, the deception is so complete that I have frequently almost passed one by, but on a closer examination have discovered that



CHINESE  
CHARACTER  
MOTH AT REST  
WITH WINGS  
CLOSED.

what I had at first taken to be merely a mark left by a passing bird was in reality one of these pretty little moths.

Another moth, the Buff-tip, which is equally wonderful in its own way, imitates a piece of stick, by folding its wings down close to its side in such a manner that the outer edges may slightly overlap and fit together so as to produce a rounded surface with no joining visible; and whereas the general ground-colour of the wings is of a silvery grey, the tips are adorned with a large circular blotch of a pale buff colour—from which the moth gets its name; and the head and thorax (or shoulders) being of the same colour, the two ends thus bear a strong resemblance to the ends of a piece of stick which has been broken or cut off short.



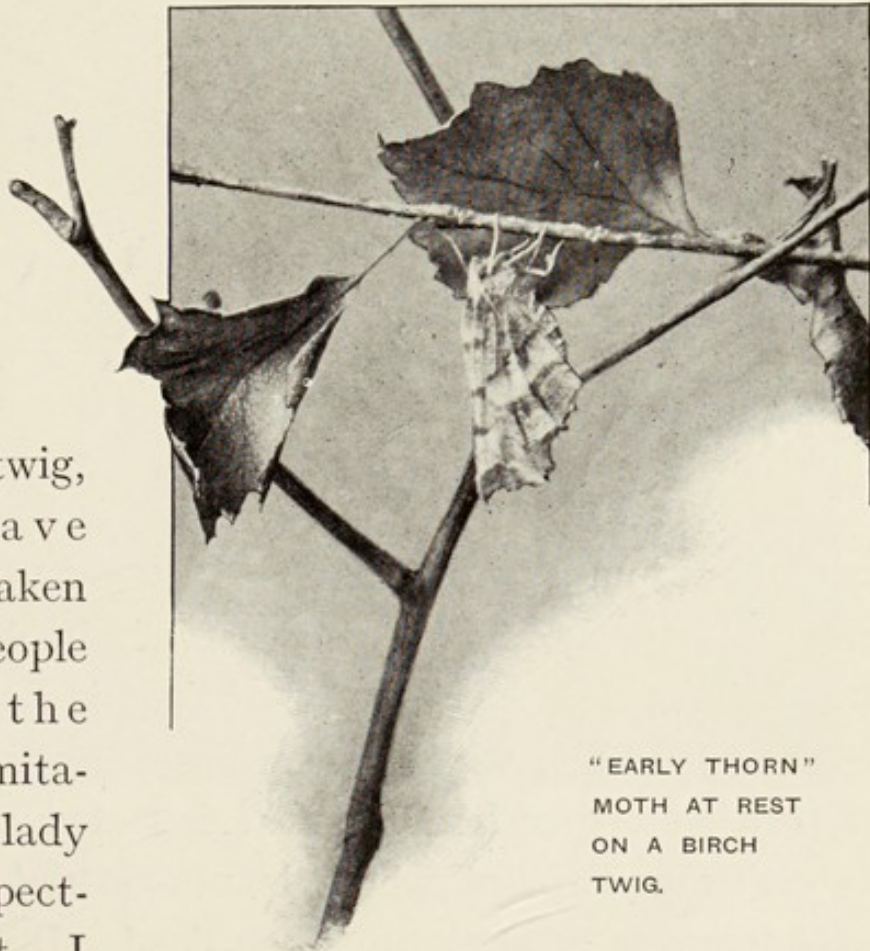
TWO BUFF-TIP MOTHS AT REST ON  
AN ELM-TWIG.

A great many brown and yellow moths imitate various kinds of dead leaves with remarkable effect. And although I am dealing as far as possible only with British species, as being more easily within the reach of our own observation, I must just make reference to a beautiful butterfly found in North India, as it is quite the most perfect example of the leaf imitators. This particular insect is commonly known as the Dead-leaf butterfly, and is of considerable size, being some three inches across the wings, which are dull bluish-brown above, with a broad, bright, orange band across the middle of the upper wings. The under-surface, however, is mottled with different shades of brown and grey, having a dark line running across their whole extent, from the tip of the fore-wings to the end of the lobe on the hind-wings. This line represents the mid-rib of the leaf, the lobes on the hind-wings being long and thin to



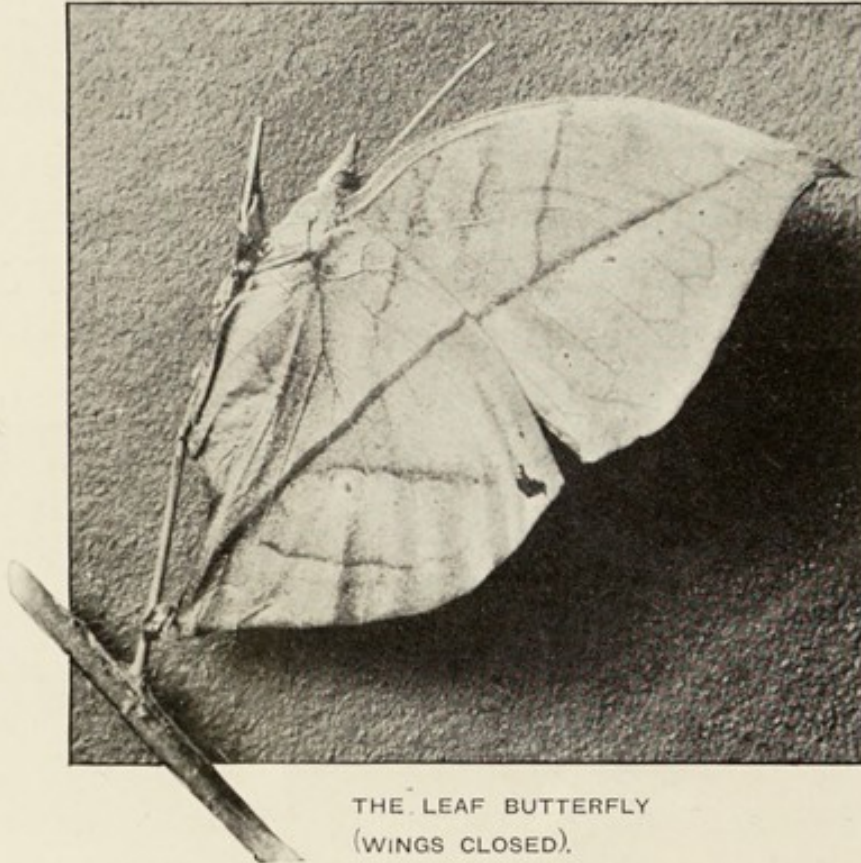
imitate the leaf-stalks, and the whole butterfly is shaped and lined in such a manner as to increase the deception. When the insect is at rest upon a twig with its wings closed, the brilliant markings of the upper surface being entirely hidden from view, and only the leaf-like under-surface visible, the effect is truly extraordinary. There is a case of these butterflies mounted with leaves in the Natural History Museum at South Kensington, and the butterflies and leaves can hardly be distinguished from each other. I have several of

t h e m  
also in  
my own  
possession,  
which  
I have  
mounted  
on a twig,  
and have  
often taken  
in people  
with the  
clever imitation,  
one lady  
who suspected  
that I



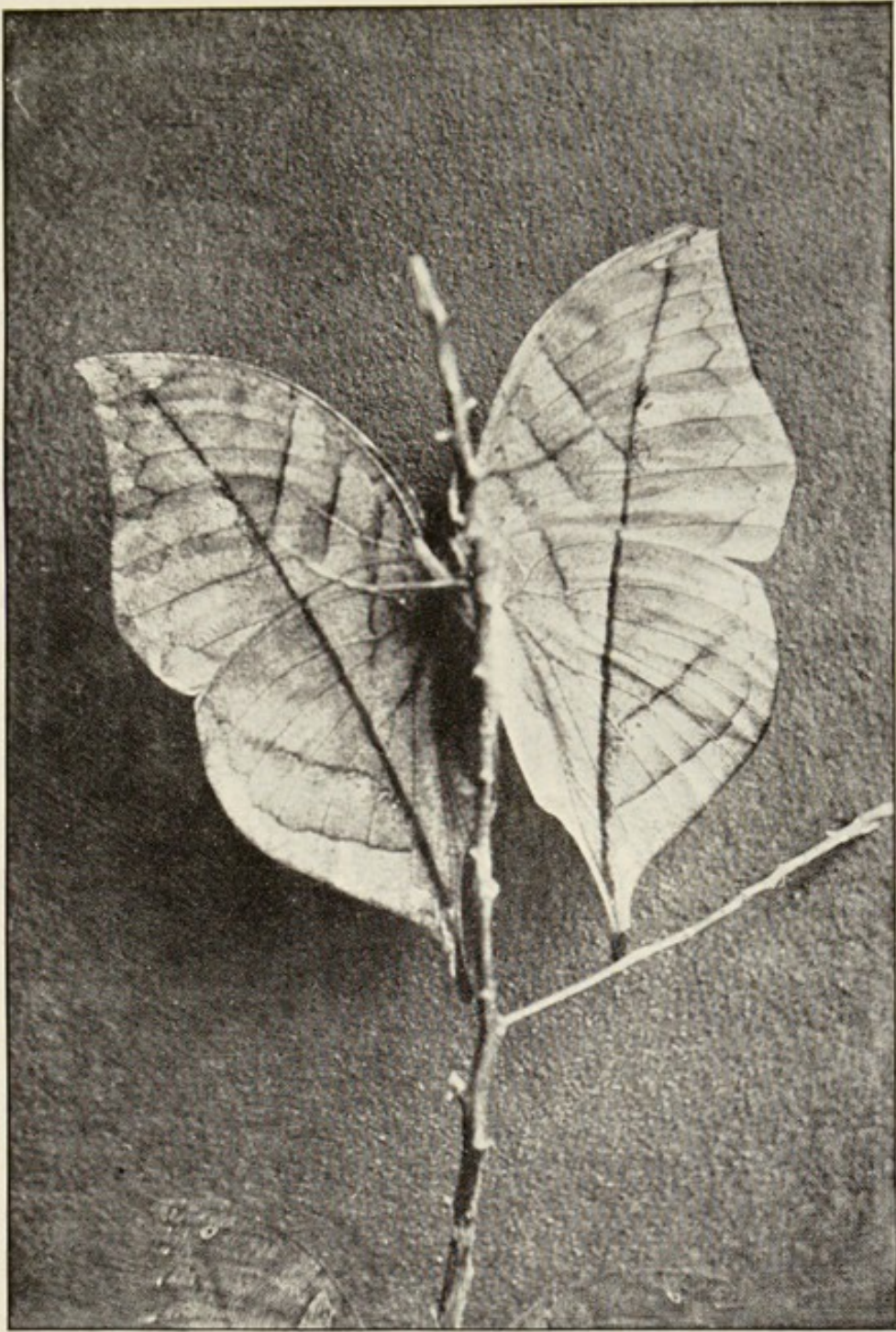
"EARLY THORN"  
MOTH AT REST  
ON A BIRCH  
TWIG.

was trying to deceive her when I presented the twig for her inspection, even going so far as to assert that she was not "going to be taken in with *bay-leaves* stuck on a plum twig!"



Some of our British moths also imitate dead leaves, but in a different manner from the wonderful Indian butterfly, for in the case of the butterfly the whole visible surface of the wings is *flat*, owing to the posture in which butterflies are accustomed to rest, and therefore the leaf imitated must be chosen from a plant whose leaves do not exhibit a tendency to crumple up when dead. But *moths*,





THE LEAF BUTTERFLY  
(WINGS OUTSPREAD).



"DEAD LEAF" BUTTERFLY  
WITH TWO LEAVES.

because of their very different method of folding their wings, imitate a *crumpled* dead leaf which is just about to fall from the parent stem. One of such species is our old friend the Lappet moth, whose caterpillars have already received our attention. This

species feeds upon hawthorn or plum and various other trees; and the perfect insect, which is of a russet brown colour, is streaked all over at regular intervals with darker vein-like markings to represent the ribs of the leaf. Moreover, it has a unique manner of folding its wings, so that the under-wing protrudes and gives the impression of another leaf, the edges of all the wings being deeply scalloped after the fashion of many kinds of leaves. In this position the moth hangs from the underside of a twig, and bears a perfect resemblance to a group of three or four dead leaves, the deception being considerably increased by the presence of a long "nose" or "beak"



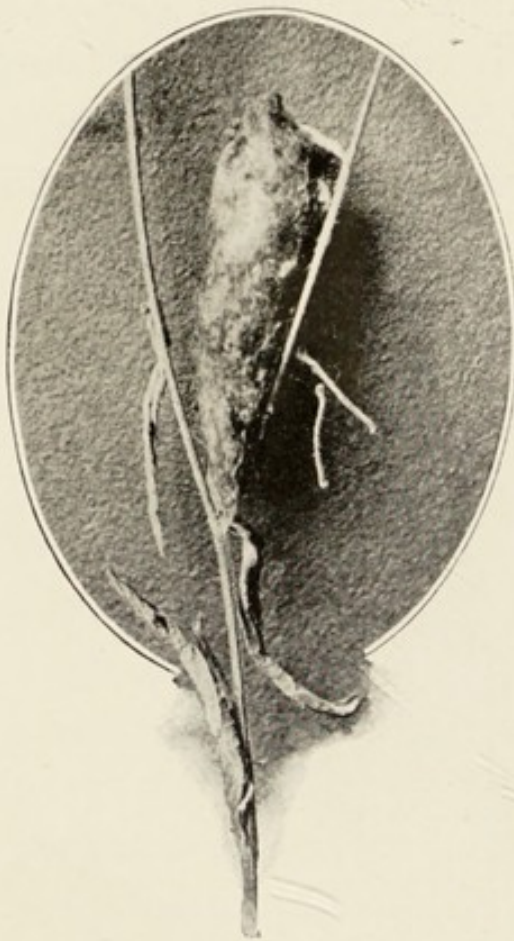
of a darker colour, in imitation of the stalk. It is, indeed, quite impossible to realise adequately the extent of this natural "fraud" unless one can actually see for oneself the living moth hanging from the twig, for the appearance of the moth, when it is stretched out in a glass case, does not give any idea of the creature in a natural state. The deception was first brought to my notice in a striking manner. I had a dozen of the caterpillars sent to me one spring, and I put them on a branch of a tree in the garden, enclosing them in a muslin bag so that they could not make their escape—a process which is called "sleeving" and is very common among naturalists, as it saves the trouble of having constantly to supply the



LAPPET MOTH HANGING  
FROM A TWIG

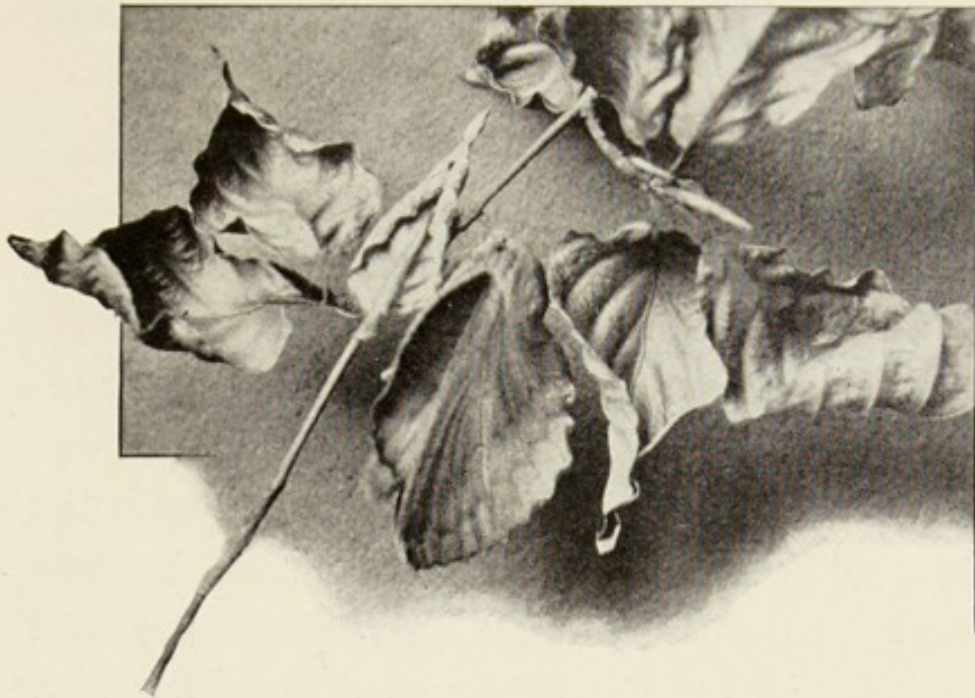
caterpillars with fresh food—and there I left them on my return to Oxford for the summer term. When I again came home at the beginning of the Long Vacation, I at once proceeded to the garden to examine my various treasures, and to take out the cocoons and chrysalides which I expected to find in the place of the caterpillars and eggs which I had put in before I went away. I took off this particular muslin bag, and there were the cocoons, sure enough—the whole dozen of them, great

things three or four inches long. On detaching them from the twig, I noticed that four of them were of very light weight; and a closer examination showed that the moths had emerged from them already—probably the unusually warm weather that season had brought them out sooner than I had expected. But, strange to say, I could not discover the actual moths anywhere, at which I



COCOON OF LAPPET MOTH.





LAPPET MOTH AT REST AMONG  
DEAD LEAVES.

was much surprised, as I knew that they are large insects, and could not possibly have made their escape from the bag. I noticed, however, several bunches of dead leaves amongst the green ones; but as they were not large enough for so conspicuous a moth to lie concealed within them, I did not at first examine them. But it suddenly struck me that the presence of *dead* leaves was rather unusual at that time of the year, for it was then only the end of June; so I looked closer, with the view of ascertaining what could have killed the leaves. No sooner had I done so than I discovered that the four "bunches" of leaves were in reality my missing moths, which were

hanging from the twig in their accustomed posture !

The above example gives us the answer to one of the best of Nature's silent riddles, for, indeed, anyone who was not in the "know" would, like myself at first, have looked upon the brown objects as mere leaves, and given them no further consideration. No one who has not actually seen one of these moths in its natural position can form the remotest idea of its marvellous structure, or how admirable is the deception which it affords ; and anyone who is, on the other hand, familiar with the life-history of the insect will bear me out when I affirm that, so far from exaggerating its description, I am in reality far under-rating it, for the very good reason that mere words are wholly inadequate to do it justice. And this is merely one instance out of the many that show how the student of Nature will find fresh objects of interest and wonder at every turn, and that it is for him alone that the things that appear to others the most inanimate become endued with life, for Nature loves to lift her veil to the earnest seeker after knowledge in a way which she will not do for mere callous observers, who have to be content with just an occasional glimpse at the wonders beneath it.

Another moth that protects itself by the "dead-



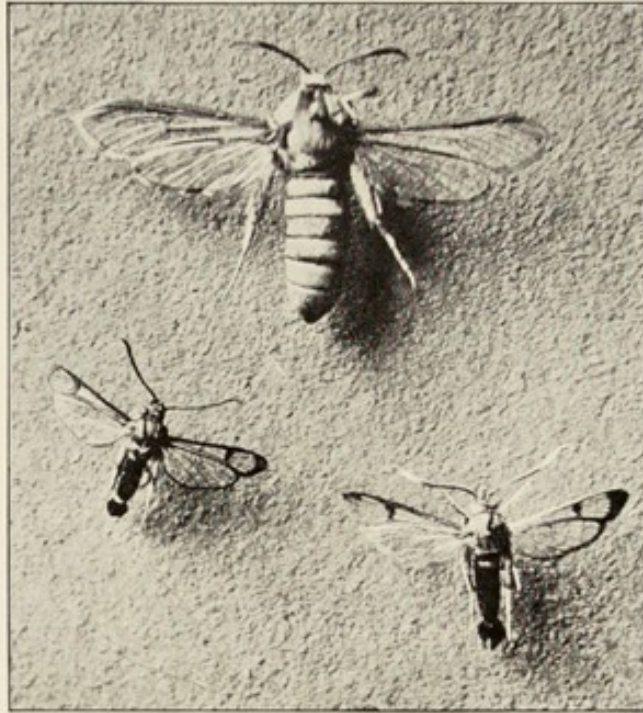
leaf trick" is the Scorched Wing moth, whose varied shades of colour make it one of the most singularly beautiful of our British species. It has the habit of resting on the trunk of an oak-tree or the side of a rustic paling, where it looks just like a fallen leaf that has got caught in a crevice of the bark, or is clinging to some projection. Again, we might mention the Lilac Beauty, or, in fact, any of the

Thorn-moths, to which family this lovely insect belongs, for they all fold their wings in a variety of curious postures, so as the better to resemble the dead leaves among which they are resting. But it would take too long to enumerate the many species which resort to this ingenious device; so we will now pass on to another method.

There is a singular family of moths called the



TWO "LARGE THORN" MOTHS  
AT REST ON AN ELM TWIG.

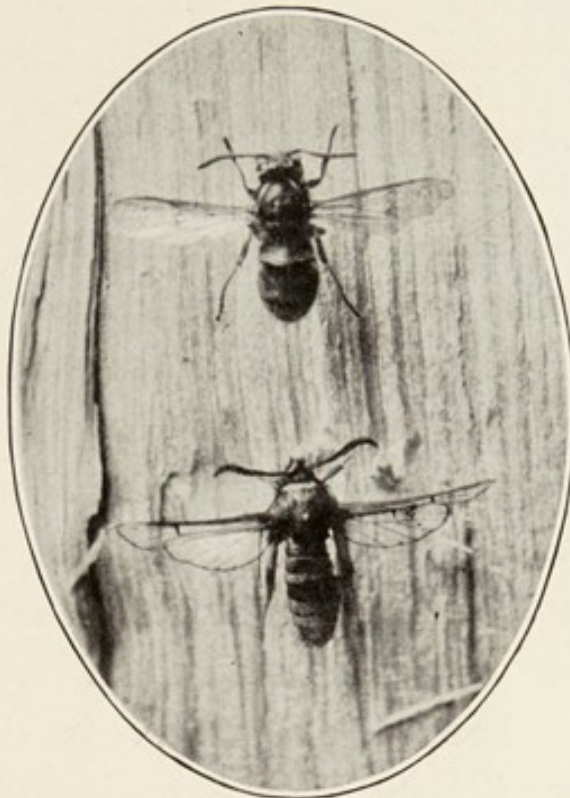


SOME OF THE "CLEARWING" MOTHS  
WHICH IMITATE FLIES.

Clearwings, which mimic various kinds of wasps, hornets, and flies ; some of them, indeed, apparently profiting by their own experience as caterpillars, and realising what an excellent protection is afforded to the ichneumon fly by its ferocious appearance, have even gone to the length of imitating this insect, so that any member of this genus must present to other insects the appearance of a formidable enemy instead of that of the harmless moth which it really is. One of the largest species—the lower figure in the illustration (p. 273)—is an extremely good imitation of a wasp. This insect has transparent wings, very similar in texture to



those of the wasp tribe, as, indeed, have all the members of this family, from which characteristic they derive their name of "Clearwing," and it is about the same size as a hornet, with a body of the same



WASP AND CLEARWING MOTH  
WHICH IMITATES IT.

bright yellow colour striped with bars of a darker hue; and any uninitiated person would not be easily disposed to believe that such a creature could possibly be a *moth*. I have often noticed, when showing my collection to non-scientific friends, that as soon as we come to the Clearwing drawer the almost invariable exclamation is, "Oh! do you collect wasps and flies too?" What could

be a better testimony to the efficiency of such a deception? Another such species is the beautiful Bee-hawk moth, which does not belong to the Clearwing family, although its transparent wings are so similar. This moth mimics a bumble-bee in a very effective way. The sight of one of these exquisite creatures hovering over the flower of a bugle or bluebell is one never to be forgotten. Moreover, it must not be forgotten that I am leaving human beings altogether out of the list of enemies, because, as I have said before, man is an entirely unnatural enemy, against whom no means of protection are proof. I mention this here because a sceptic might object that such a means of protection, as imitation of a wasp, would very sensibly *decrease* instead of *increasing* the Clearwing's chances of safety, inasmuch as it would be manifestly absurd to imitate an insect like the hornet or wasp when the natural tendency among mankind is to slay such an insect immediately. But such a means of protection would undoubtedly be most effectual against members of the feathered and insect tribes, which would constitute by far the greater majority of its enemies.





TWO WINGLESS FEMALES

## CHAPTER IX.

### WINGLESS FEMALES.

THERE is one other class of moths to which I must refer before concluding, as it provides one of the most extraordinary among natural phenomena. There are certain moths whose females are what are called "wingless," by which term is meant that whereas the males of such species are provided with wings as ample as those of any others,



TWO WINGLESS FEMALES AMONGST  
THEIR PROTECTIVE SURROUNDINGS.

Nature seems to have forgotten to provide the females with any means of flight whatever, although one would think that they would need them even more than their mates. In some of such species the miserable female is absolutely devoid of the least pretence of wings ; while others have to be content with wretched, dragged apologies, which are only a parody on the handsome pinions possessed by the more fortunate sex, and are not of the slightest service for purposes of

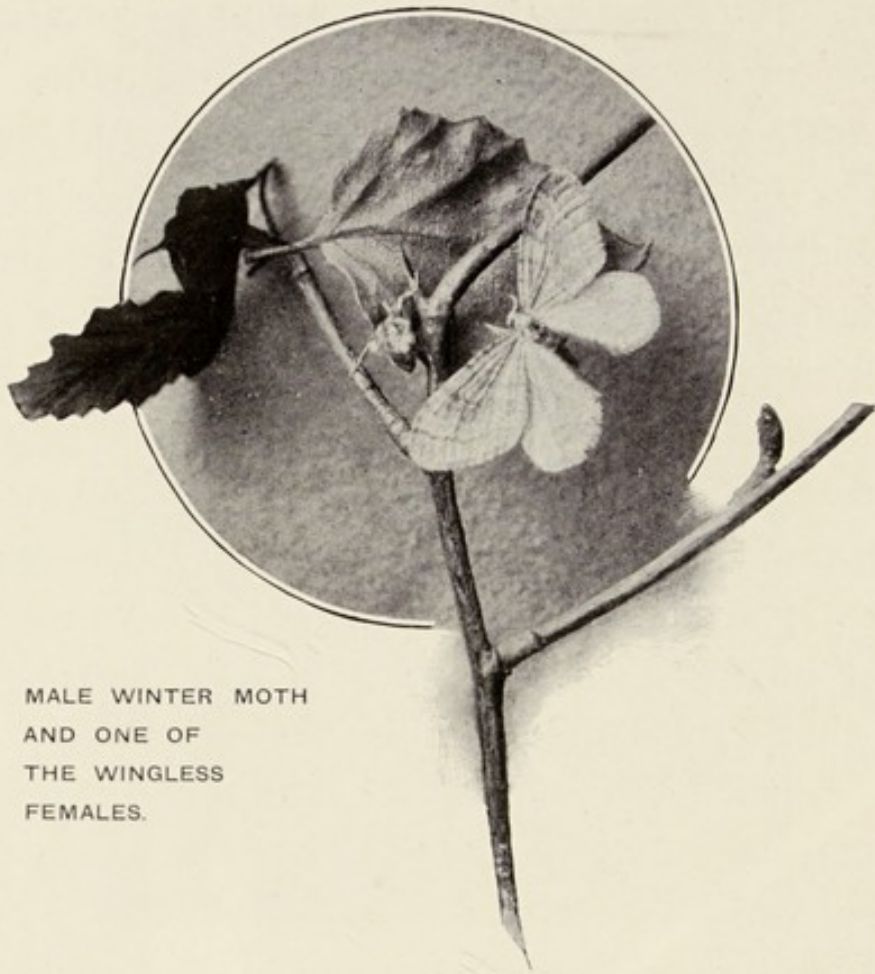


flight. But for all that, her means of protection are as perfect as any moth could wish for. Let us consider a particular case—and we could hardly take a better instance than that of the pretty and highly interesting little moth called the Common Vapourer. The female of this species has a very small head and thorax and little spider-like legs, but an abnormally large, fat body of a greyish-brown colour. When the insect comes out of the chrysalis it crawls on to the outside of the cocoon, where it remains for the rest of its natural life, laying its eggs all over it; and in spite of the fact that its body is so huge and unwieldy, it is nevertheless scarcely visible, because it is the same colour as the cocoon upon which it is resting.

Other species have females which bear such a striking superficial resemblance to a spider lying in wait for its prey, that it is easy to understand how this moth can secure for itself the same degree of immunity from attack as if it were in reality a spider, which,



TWO WINGLESS  
FEMALES AND  
SPIDER.



MALE WINTER MOTH  
AND ONE OF  
THE WINGLESS  
FEMALES.

though not by any means complete, is considerably more than would otherwise fall to its share. The wingless females of such species are the most uncanny-looking objects, and about as unlike a moth as any moth could be. They have little spider-like legs, and their fat little bodies are mottled and marked in imitation of the colouring of their native tree-trunks.

There is a curious habit peculiar to the females of one of these species which is worthy of mention. The caterpillars of the Winter moth infest the



apple-trees in the orchards of Kent and Sussex, and are most destructive; and the farmers, discovering that the female moth has no wings, have resorted to the expedient of smearing the lower part of the trunks with lime, with the object of killing the females as they ascend the trunks after emerging from the chrysalis (which is buried at the roots of the tree), and before they have had time to lay their eggs in the tree. But my lady Winter moth is not so easily thwarted; she is quite equal to the emergency, and persuades her lord and master to carry her up through the air and deposit her safely in the branches out of reach of the cruel lime. The truth of this statement has been abundantly verified by other naturalists besides myself, who have detected the moths in the very act of accomplishing their design by means of this clever ruse.

It may have occurred to some of my readers that such helpless creatures as these wingless females might experience considerable difficulty in finding mates, but Nature has not allowed the deficiency of wings to remain unsupplied, and therefore, according to her universal rule, has made it up in another way. If these helpless creatures cannot go to find their mates, the husbands must come to find them; and Nature has effected her object by endowing the wingless females with a wonderful

power of attraction, and the males with abnormally developed powers of scent. It is true that this power is possessed by certain species whose females have got just as good wings as their mates (*e.g.* the Oak Eggar, the Emperor moth, and some other kinds); but I only mention them parenthetically, as we are at present dealing with those species that are unfurnished with wings. Now by means of this strange power the female is enabled to attract the males from enormous distances; and anyone who desires evidence of this has only to try the experiment for himself, and he will indeed be surprised at the result. The Vapourer moth is perhaps the most satisfactory for the purpose, as it is very common, and therefore easy to get hold of, and, moreover, it flies in the daytime. If one of these freshly emerged females be placed in a box with a perforated lid, and then deposited in the garden or at an open window, it will be noticed that before long several little brown moths will be fluttering round and round the box in their frantic attempts to get at the siren within; and so engrossed are they with their occupation that they may be easily captured with the hand—in fact, they appear to be almost oblivious of human presence. These little brown moths are the male Vapourers, which have scented out the presence of the female at a distance, and hurried off with





GROUP OF "VAPOURER" MOTHS.

the intention of courting the fair charmer. I call to mind a curious instance of the blind devotion evinced by the male insect towards the object of his affections. One afternoon in March I had been collecting specimens of the Small Brindled Beauty moth—what a mouthful of a name!—which could be found resting on the tree-trunks in Bagley Woods, near Oxford, and I was returning to college about dusk with several of the wingless females of that species enclosed in chip-boxes in my pocket. Presently, what was my surprise to find an enterprising male circling around me, and at length actually endeavouring to force his way into my pocket, in order to get to the imprisoned females within. I thought at first that it must be one of my captures that had escaped, as I had a number of the males in another pocket; but on examining the chip-boxes I found that they were all secure. By the time the moth appeared I had got some way off from their habitat, so that he must have followed from some distance. This was by no means a unique experience of mine, as I know of other naturalists who have met with similar cases with the females of other species.

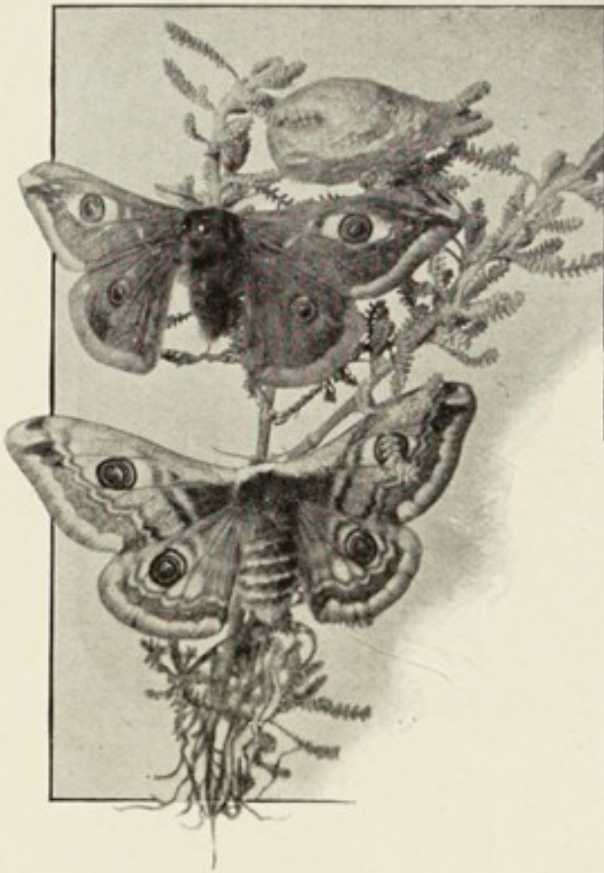
So we see that these wingless females are not so much to be pitied, after all. Indeed, they are really much better off than many of their relations





BRINDLED BEAUTY MOTH AT REST  
ON TREE-TRUNK.

who are provided with a full complement of wings. It is worthy of notice that in those species which have this power of attraction in a very marked degree the males have the "antennæ," as they are called, and which signifies the little "horns" which stick out in front, very strongly "pectinated" or "feathered," while in the females they are small and comparatively insignificant. Moreover, in some species, such as the Emperor and Vapourer moths, the antennæ present the appearance of huge feathers. This fact can easily be accounted for by the explanation that the antennæ of a moth are used as organs of scent, and hence



EMPEROR MOTHS AND COCOON.

in those species whose females are wingless the antennæ of the males are abnormally developed, in order to enable them to ascertain the presence of the females at a distance, while the female—which, of course, does not require them—has to be content with comparatively small and insignificant antennæ. This seems a very natural inference to anyone who has ever watched the curious manner in which the male quivers and shakes his huge antennæ about when he is searching for his mate.

We will now leave the subject of the wingless females, and, before concluding, I will just give a few details of one of the experiments I have made recently with the object of ascertaining the extent to which the characteristics of a species will alter according as they are placed among



fresh surroundings, in order that their protective appearance may be able to conform to their new conditions. I first obtained a large batch of the eggs of the Large Chocolate-tip moth, the caterpillars of which will feed readily on various species of poplar or willow. Accordingly, I made selection of the darkest poplar I could find, and the lightest and most silvery willow; and, dividing the eggs, I put half upon each. During two successive generations I kept them carefully distinct, after which time I was rewarded with results which far exceeded my expectations; for whereas the specimens which



a

CHOCOLATE-TIP MOTHS AT REST ON A TWIG.

(a) Two shown on a large scale.

had fed upon the poplar were uniformly dark and dingy in appearance, those which had been confined to the sallow were much paler and quite silvery, and some of them being even almost white, in conformance with the light undersides of the sallow leaves.

With these instances I will ask my readers to be content; there are many more to which I have made no reference whatever, partly because space would not permit, but in a greater measure because words would be wholly inadequate to describe them, and to point out wherein lies the protective nature of their adaptation to their surroundings. Such must be ranked among those natural phenomena which must be *seen* to be understood; they are the riddles which Nature will not answer by proxy, but desires the investigator to come and look for himself, that he may understand more fully the perfection of her designs.

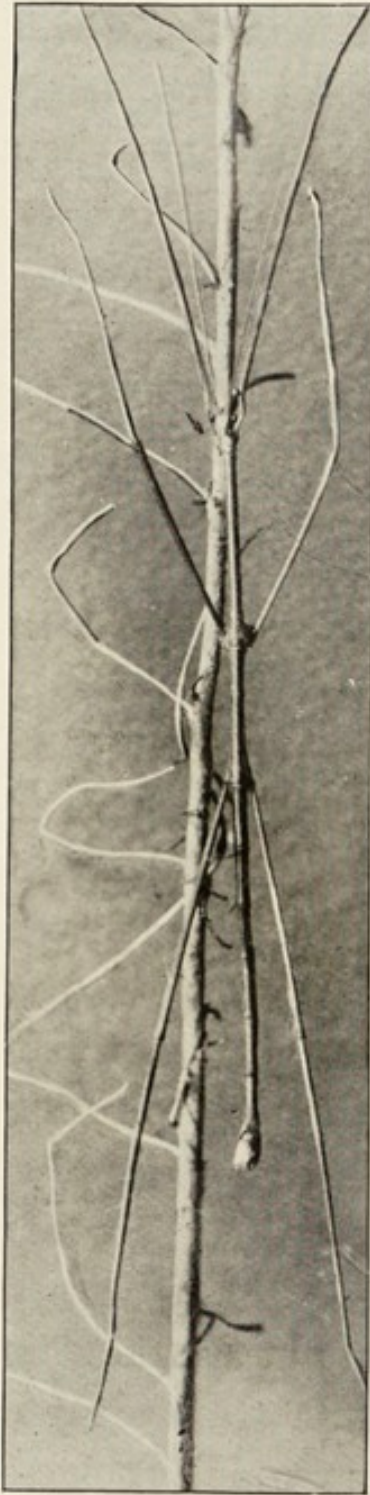
\* \* \* \* \*

Now it was not my intention in this work to deal at all with the many other classes of lower animal life, but only with that class which is known scientifically as "Lepidoptera," comprising all the butterflies and moths; although the study of other branches would reveal instances of protective means quite as effective—and often more so—as



those which we have considered in these pages. I will therefore not do more than just mention casually such creatures as the dragon-fly, which, though quite devoid of any sort of sting, has a habit of curling its tail-end up and down in a threatening manner, in order to give the impression that it has got a sting, from which it derives the name of "Horse-stinger," given to it by the rustics in many parts of the country. And if we were to search further afield amongst tropical insects, we should find the protective forces intensified in order to guard against the more numerous enemies, as in the case of the South American "Leaf Insects" and the famous "Stick Insects," as they are called. These creatures are quite indistinguishable from bits of leaf or stick; and, moreover, one species indigenous to the Pacific Islands even has the additional power of squirting a poisonous fluid to the distance of five or six feet. And I will just quote a few lines from Sir John Lubbock's "Ants, Bees, and Wasps," in which he mentions two particularly interesting instances described by the naturalist Belt: "He (Belt) once saw a Harvestman (Phalangium—which is a species of spider and therefore, of course, not a true "insect" at all) standing in the midst of an army of ants with the greatest circumspection and coolness, lifting its long legs one after the other. Sometimes

as many as five out of the eight legs would



THE STICK INSECT.

be in the air at once, but it always found three or four spots free from ants, on which it could safely place its feet. On another occasion Belt observed a green, leaf-like locust, which remained perfectly still, allowing the ants to run over it, which they did, but seem to have been quite deceived by its appearance and immobility, apparently taking it for a leaf." There is another insect, one of the leaf-like species, which lives in Ceylon, and is to be found among the coffee-shrubs. This creature even goes so far as to imitate the leaves when they begin to change colour; thus, when the coffee-shrubs were infested during one season with a peculiar disease which brought out ugly blotches on all the leaves,



these leaf-insects were equal to the occasion, and immediately proceeded to develop similar spots on themselves !

\* \* \* \* \*

Throughout this volume I have endeavoured to answer one of Nature's riddles to the satisfaction of my readers, and the attempt, although but very incomplete, has at any rate shown us that the keynote of all animal life is a ceaseless struggle for existence, which is largely influenced by the wonderful methods with which Nature has enabled her creatures to maintain that struggle successfully, by providing them with adequate means for their defence—some with weapons either offensive or merely defensive, and others with that wonderful protective colouring which has especially been the subject of my theme. I have dwelt more particularly upon this latter means, not so much because it affords in itself, through its very simplicity, a greater degree of security than any other method, not so much because it is a subject that through its intense interest must necessarily appeal to the popular fancy, but because of its own intrinsic merit—because it opens up a vista of research of so vast an area and so productive a nature that the student cannot fail to find himself repaid a hundredfold—nay, rather a thousandfold

—for the time and energy he bestows upon it ; and, moreover, because it is a study so full of interest, at the same time so inexhaustible, and yet withal so fascinating, as positively to enthrall the would-be investigator of its wonders, for it holds before our astonished vision wonders of which we never dreamed ; it shows us wild Nature in an aspect hitherto unknown ; it affords us a deeper insight into the secret workings of that exquisite Creation of which we ourselves are, after all, but infinitesimal units ; and finally it cannot fail to impress us with an overwhelming sense of the “ eternal fitness of things.”



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