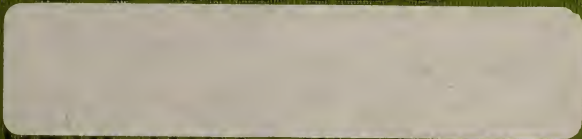


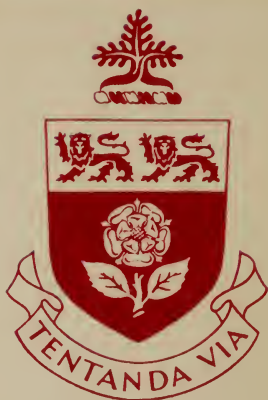
BRITISH
NATURAL HISTORY
STUDIES



W. PERCIVAL WESTELL

F.L.S., M.B.O.U.





THE LIBRARY OF

YORK

UNIVERSITY

Presented by

J.R. Dymond

J.R. Dymond.

Jan. 1928.

HN/4646



3 9007 0289 6866 7

BRITISH
NATURAL HISTORY STUDIES

REPTILES
AMPHIBIANS
FISHES
ETC.

SOME NATURE BOOKS

POPULARLY WRITTEN AND
SCIENTIFICALLY ACCURATE

NATURE'S CURIOSITY SHOP; or, Recreations in
Nature Study

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

FIFTY-TWO NATURE RAMBLES

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

HOW TO STUDY WILD FLOWERS

By GEORGE HENSLAW, F.L.S., F.G.S.

WILD FLOWERS OF THE YEAR

By ANNE PRATT

EVERY BOY'S BOOK OF BRITISH NATURAL
HISTORY

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

THE BOY'S OWN NATURE BOOK

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

EVERY BOY'S BOOK OF GEOLOGY

By ARTHUR E. TRUEMAN, D.Sc. (Lond.), F.G.S.,
and W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

BIRDLAND'S LITTLE PEOPLE

By OLIVER G. PIKE, F.Z.S., F.R.P.S.

BIRDLAND STORIES FOR YOUNG PEOPLE

By OLIVER G. PIKE, F.Z.S., F.R.P.S.

CREATURES OF THE SEA

By FRANK T. BULLEN, F.R.G.S.

RAMBLES WITH NATURE STUDENTS

By MRS. BRIGHTWEN, F.E.S.

NATURE CURIOUS AND BEAUTIFUL

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

POPULAR HANDBOOK TO THE MICROSCOPE

By LEWIS WRIGHT.

BY-PATHS IN NATURE

By FRANK STEVENS.

THROUGH A POCKET LENS

By HENRY SCHERREN, F.Z.S.

POPULAR NATURAL HISTORY OF THE
LOWER ANIMALS

By HENRY SCHERREN, F.Z.S.

PONDS AND ROCK POOLS

By HENRY SCHERREN, F.Z.S.

BRITISH NATURAL HISTORY STUDIES: Reptiles,
Amphibians, Fishes, etc.

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

NATURE PHOTOGRAPHY and Some British Mammals
and Birds

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

LIFE STORIES OF WHALES; Sharks, Seals, Cattle-
fish, Turtles, &c.

By FRANK T. BULLEN, F.R.G.S.

LIFE STORIES OF SOME DEEP-SEA FISH

By FRANK T. BULLEN, F.R.G.S.

SEND FOR THE "R.T.S." LIST OF NATURE BOOKS,
Published at 4 BOUVERIE STREET, LONDON, E.C.4
Of all Booksellers



FIG. 1.—COMMON, GRASS OR RINGED SNAKE.

BRITISH
NATURAL HISTORY
STUDIES

REPTILES, AMPHIBIANS, FISHES, ETC.

BY

W. PERCIVAL WESTELL

F.L.S., M.B.O.U., ETC.

WITH ILLUSTRATIONS AND NOTES
BY THE REV. S. N. SEDGWICK, M.A.

LONDON
THE BOY'S OWN PAPER OFFICE
THE RELIGIOUS TRACT SOCIETY
4, BOUVERIE St., E.C.4

QH

48

W48

Stacie

These Studies are from
"Every Boy's Book of British Natural History"

CONTENTS

	PAGE
LIST OF ILLUSTRATIONS	9
CHAPTER I	
SOME BRITISH REPTILES, AMPHIBIANS, AND FISHES .	11
CHAPTER II	
SOME BRITISH BUTTERFLIES, MOTHS, AND OTHER INSECTS	49
CHAPTER III	
SOME BRITISH WILDFLOWERS, AND TREES	72
CHAPTER IV	
ON THE FARM—MISCELLANEOUS	110
INDEX	117

LIST OF ILLUSTRATIONS

FIG.	PAGE
1. Common, Grass, or Ringed Snake	<i>Frontispiece</i>
1A. Skeleton of a Frog	20
2. Frog Spawn	22
3, 4. Tadpoles	22
5, 6. „ swimming	22
7. Common Frog	28
8. Toad	28
9. Common or Smooth Newt	28
10. Gudgeon	28
11. Roach	28
12. Minnows	40
13. Pike	40
14. Glow-worms (Females)	40
15. The Glow-worm's light	40
16. A dormant Spider in Winter	58
17. Larva and pupa of Heath Fritillary Butterfly	58
18. Garden Spider and nest	58
19. Magpie Moth	60
20. Larvæ of Magpie Moth on perforated metal	60
21. Eggs and Pupa of Magpie Moth	60
22. Mimicry in Nature; Garden Snails hiding amongst Iris	60
23. Edible Snail	60
24. Larvæ of Cockchafer	62
25. Larvæ of Dragon Fly	62
26. Small Garden White Butterflies	62
27. Eyed Hawk Moth on Lily	66
28. Larva of Purple Emperor Butterfly	68
29. British Beetles	68
30. Stag Beetle	68
31. Orange-tip Butterfly, Pupa on stalk	70
32. Orange-tip Butterfly, emerging from pupa	70
33. Orange-tip Butterfly, wings unfolding	70

LIST OF ILLUSTRATIONS

FIG.	PAGE
34. Orange-tip Butterfly, under wings dropping	70
35. Orange-tip Butterfly, leaving the stalk	72
36. Orange-tip Butterfly, ready for flight	72
37. The Crooked Oak tree	72
38. Yew trees	72
39. Wych Elm tree	76
40. Tree in full leaf	76
41. Hybrid Lime tree	78
42. Cuckoo Pint or Wild Arum	78
43. Cuckoo Pint or Wild Arum, showing interior	78
44. Wood Sorrel	82
45. Marsh Marigold	82
46. Primroses	82
47. Wood Anemones	82
48. Wild Roses	88
49. Horse Chestnut showing buds	88
50. Horse Chestnut showing flower	88
51. Horse Chestnut showing fruit and leaves	90
52. Leaves, to show shape and veining	90
53. Beech tree in winter	92
54. Trees planted by nature	92
55. Trees planted by man	96
56. The Mill Pond	96
57. Milking	104
58. Cutting the Hay	104
59. Making the Hayrick	110
60. Foals	110
61. The Favourite Grey Horse	112
62. Wild Horses in the New Forest	112
63. Grazing	112
64. Carting the Hay	112
65. A quiet country scene	112
66. Fine Cattle	114
67. Tortoise walking	114
68. Tortoise mounting his throne	114
69. Tortoise on his throne	114

CHAPTER I

SOME BRITISH REPTILES, AMPHIBIANS AND FISH

IN another volume* we had something to say about some British mammals and birds. Following the list of vertebrates we come naturally to the—

Reptilia (Reptiles).

I. Lizards.

II. Snakes.

Amphibians.

I. Frogs and toads.

II. Newts.

And the last class in the vertebrates is the Pisces (Fishes).

REPTILES

We have, therefore, first to concern ourselves about the reptiles, namely, the lizards and the snakes. As there are only three species of lizards and three species of snakes in the British Isles, our task will not be a lengthy one. For all that, the members of this class are not by any means the

* *Nature Photography and some British Mammals, etc.*

least interesting included in the vertebrates, and the lizards (which come first) are perhaps much better known, and lend themselves more to study than the snakes.

The Common Lizard.—This is the smallest of the three British lizards, and is a handsome little species. It feeds almost entirely on an insect dietary; is a good swimmer; produces its young alive, the egg hatching within its own body, and differing from the sand lizard in this respect. Hence this species is called viviparous, whilst the next species is called oviparous. These are most interesting points which the reader should not lose sight of. Three or four young ones are born—sometimes more—and these are very dark in colour, almost black. The adult lizard is greenish-brown, has black or dark brown longitudinal bands, and a bright orange-yellow belly spotted with black.

The Sand Lizard.—The sand lizard is a much rarer species than its last-named relative. It resorts to the plains, and may be identified from the common lizard by having teeth and smaller scales. It varies a good deal in colour; brown in various shades tinged with green, white on belly, spotted minutely with black. On the back and sides there are rows of white spots which vary in number. The eggs, which number about twelve, are deposited in the sand, where they hatch unassisted by the parents.

The Slow Worm.—It is a thousand pities that this entirely harmless species should have been accorded the name of slow or blind worm, for it is often mistaken for, and killed as, a snake or a worm. As a matter of fact it is neither, it having been proved to be a legless lizard! Boys who get about the countryside should remember this, and impart the information to their fellows. This species is not found in Ireland. It averages, perhaps, ten to a dozen inches in length; it is metallic red or grey on the back, whilst the belly is dirty white or darker. It has a small head and eyes, the tail has small scales, and is about as long as the body. Like the sand lizard this species hibernates, but not for any lengthened period. Snakes cast their skins—called sloughs—and, curious to relate, this lizard does also. Its food consists for the most part of snails and worms. It is, like the common lizard, viviparous. Ten to a dozen young ones are born during the summer, and it is very partial to a manure heap as a breeding-ground.

A curious habit of many lizards is that of leaving their tails behind them when handled, so as to make good their escape; this species also will sometimes do so. When taken in the hand the slow worm evinces its dislike at being handled by biting, but it cannot, by reason of its rudimentary teeth, do much (if any) harm.

The Adder, or Viper.—This is the only poisonous reptile we possess, but unless ‘cornered’ rarely does much harm. Professor Gerald Leighton—our greatest living authority on British serpents—in the course of some very entertaining reptile studies in the *Field Naturalists’ Quarterly* (of which he was the able editor), has told us that he has proved the oft-disputed point as to adders taking to the water and swimming. During one of his adder-hunts Dr. Leighton observed ‘an adder coiled up on a stone some feet from the banks of the river, which it must have reached by swimming.’ Approaching the reptile with great caution, with camera ready for a snap-shot, Dr. Leighton got quite close to it, and was just about to release the shutter when the adder glided off into the stream. The shutter was snapped a second or two afterwards, and we can well imagine the great pleasure it must have afforded when it was found on developing the plate that the head of the reptile was plainly discernible in the water. After witnessing this act on the part of a perfectly wild snake, Dr. Leighton made experiments with living captured adders, and as a result found that they would swim without hesitation across the river, which was some thirty yards wide, and one remained in the water for forty minutes before making any effort to get on shore. On this same reptile-hunt Dr. Leighton obtained a variety

known as the small red viper, which he believes to be quite distinct from the common adder, and which he proposes to call *vipera rubra*, to distinguish it from *vipera berus*, the common adder. We are told that its size, habits, and distribution are entirely different from those of the common species; and, moreover, both sexes are similarly coloured, which is not the case in the common adder. At present, however, it is impossible to state whether this new variety (or species?) breeds with the common adder, and hence the question remains a matter of opinion until further evidence is forthcoming.

It was during the course of this hunt also that Dr. Leighton encountered one of the only two adders he has ever known to attack in the open. He tells us that as a rule they will endeavour to escape, but this particular specimen was disturbed as it was sleeping on a warm bare patch amongst the heather during afternoon. It went straight at the hunter, hissing volubly. I have personally known adders to attack a person, more especially when they have young, but unless they are 'cornered' it is safe to assert that they almost invariably try to escape, and do not show fight.

Adders are especially numerous in the New Forest in Hampshire. For many years there roamed about the forest a snake-catcher, who rejoiced in the name of 'Brusher' Mills. To give

an idea of the number of snakes there found, I may state that the redoubtable 'Brusher,' during the first fourteen years of his snake-catching, caught no less than 3,186 adders!

A great many people have asserted that adders swallow their young in the time of danger. As yet, however, no thoroughly authentic information has been forthcoming, in spite of tempting rewards which have been offered. Many students of these reptiles now agree that this performance is anatomically possible, but at present the matter remains in doubt. If it is hereafter proved to be correct, it is curious to reflect that Dr. Leighton and others who have hunted so many adders in the course of their studies have never as yet witnessed the accomplishment referred to.

Personally I am decidedly of opinion that the adder does do so, as I have unimpeachable evidence from a friend of mine, who is a practical field naturalist and a gentleman who has had ample opportunity of seeing these things, indeed, spent a good deal of his time in looking for them. Let me tell the story in as few words as possible.

Mr. Horace Tuppen, late of Ripe, near Lewes, Sussex, whilst out on his farm some years ago, came across a male adder, which he promptly shot. No sooner had he done so than he observed the female eyeing him very suspiciously, as if she was preparing to attack him. All at once she

opened her capacious mouth widely, and several young adders immediately sprang into it. The fatal moment had now arrived, and my friend fired. The shot took effect, and sixteen young adders at once jumped out of the parent's mouth, one by one, my friend killing each one with the butt end of his gun as they did so.

Such wholesale slaughter was, to say the least, deplorable ; but coming, as this information does, from a gentleman in whom I have the most implicit trust, I cannot but think that this long-disputed act is not only possible but extremely probable. Since writing this I have received further confirmation from another eye-witness and a man on whose word I can absolutely rely.

Now, you boys who reside in the country where adders are found, here is a chance for you to keep your eyes well open and be of some service to scientific research.

The adder has a dark zig-zag line along the back, and a V-shaped patch of black on the crown of its head. In colour it varies very considerably, being found in many shades of brown to black. It casts its slough with regularity, and sometimes not without difficulty, rubbing against a stone or other article, until the old skin is wriggled off. It averages about 18 ins. in length, although much longer examples are often recorded. It sleeps during winter, waking up in the spring-time. The young

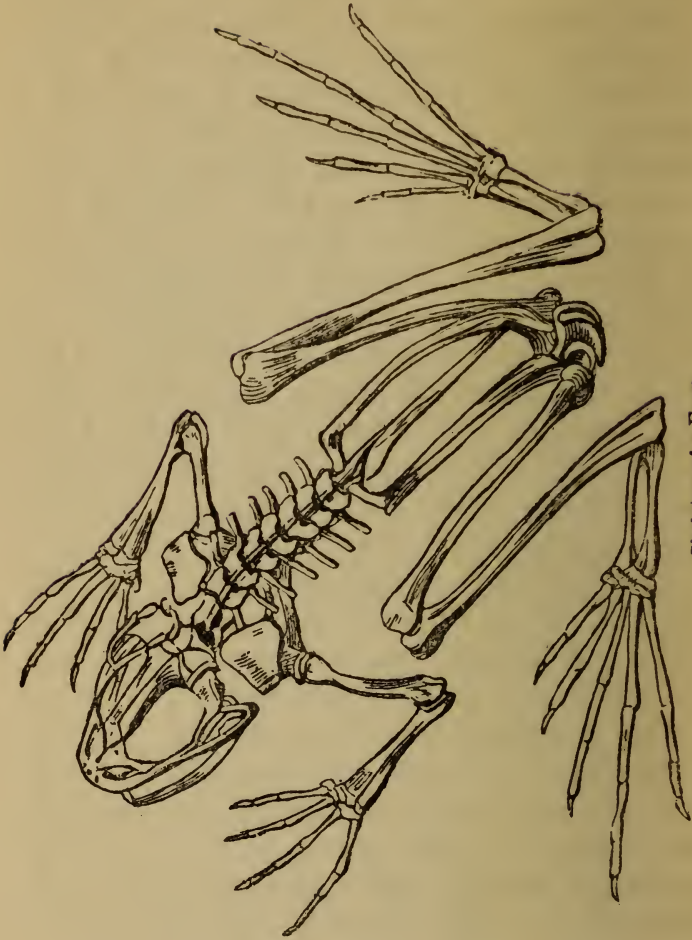
vary in number from fourteen to forty, and these are brought forth in the perfect state. The dietary is made up of mice, lizards, small birds, eggs, and insects. Although the bite of the adder is rarely proved to have fatal results, it is policy to endeavour to avoid being bitten if one finds himself 'cornered.'

The Common, Grass, or Ringed Snake.—Mr. Sedgwick was fortunate enough to secure a very excellent photograph of one of these perfectly harmless reptiles, which is reproduced in Fig. 1. By looking at this photo, you will observe that the V-shaped patch on the head of the adder is not present in this species. You can also discern in the illustration the yellow patch on the side of the head, and some of the dark blotches on the side of the body, the latter being for the most part greenish in coloration. Not only is this our largest snake, but it is also the commonest. The average length appears to be from about 30 to 36 ins., but specimens measuring over 5 ft. have been recorded! The tail, as will be seen in the photograph, tapers off to a point almost, and it is interesting to notice, by comparison, that the tail of the adder is blunt. This snake is very partial to frogs, which are swallowed alive. It also feeds on toads—which are rarely eaten by any wild creature—as well as birds and eggs, mice and newts. I knew of a grass snake which devoured

a nest full of young nightingales, the story of which, being so piteous, I withhold from publication here. It deposits its eggs—which vary in number from perhaps twenty to thirty—in a manure heap, for preference. They are best described as leathery-shelled eggs, and have been known to lie in a manure heap all through the winter, hatching out in the spring. The young of this species are very dark when first hatched, light colour only being present on the collar. It resorts to damp situations, and is very fond of the water. Mr. Charles E. Nipper, of Axbridge, sends me a note of an incident related to him by a friend of his. Mr. Nipper's friend was fly-fishing for trout one summer, and hooked and landed a common grass snake! He is a member of a certain angling association, and weighed in his catch with the fish! I have heard of swallows being hooked whilst persons have been casting their lines, and my grandfather hooked a bat during one of his fishing excursions, but this is the only instance I have heard of a snake being caught with rod and line. Dr. Leighton mentions that a prominent characteristic of this snake is 'its habit of emitting a powerful and unpleasant odour when disturbed. . . . The odour is the product of two glands placed just within the anal orifice.'

The Smooth Snake.—This species, the remaining British reptile on our list, is quite the

AMPHIBIANS



Skeleton of a Frog.

rarest of the six species included. It is reddish-brown, and has a double row of black spots. It differs from the last-mentioned species in producing its young alive—being viviparous—but in a similar manner emits an unpleasant secretion. It appears to feed on lizards for the most part. Dr. Leighton remarks, in his *British Serpents*, that a great deal has yet to be learned respecting the dietary of snakes, more especially that of the young. Here is ample scope for the young reptile-student to acquire knowledge, and be of some service in recording information upon this much neglected matter.

AMPHIBIANS

Whereas there are only six species included in the class *Reptilia*, which was last under review, the amphibians, divided up into these two orders—

I. Frogs and Toads,

II. Newts,

number but one more. In the British Isles we are poorly off indeed as regards reptiles and amphibians, the list including thirteen species only. To deal with the frogs and toads—

The Common Frog.—Perhaps of all the vertebrates, the common frog is one of the best known, at any rate, by casual, if not close,

acquaintance. And next to the lizards and snakes, perhaps no creatures are regarded with so much repulsiveness as frogs and toads, but for what adequate reasons it is difficult to understand. Both species are absolutely harmless, and the stupid reports which are circulated as to these animals 'spitting' may be written down in the wise words of Mr. Aflalo as 'pure fiction.'

The life-history of the frog is one of the most wonderful and interesting of any British animal. Early in the spring the spawn is deposited in masses in ponds, and may be observed at that season floating on the surface. In the course of a few weeks the second stage is reached in the life-history, the young—which are called tadpoles—then being hatched. It is wonderful to reflect for a moment upon the fact that during its early life—that is, whilst a tadpole—the frog breathes by means of gills; but as the tadpole stage is left behind, the tail is gradually lost, the mouth, which is beak-like at first, loses this latter form, and, by a wonderful process of evolution, the young tadpole develops into the perfect frog, as illustrated in Figs. 2-7, and breathes by the means of lungs! Our photographs reveal the frog spawn (Fig. 2), some young tadpoles (Fig. 3), recently emerged from the jelly-like ova, and Fig. 4 shows them in a more advanced form. Notice the tail at this early stage, and also note that as the frog

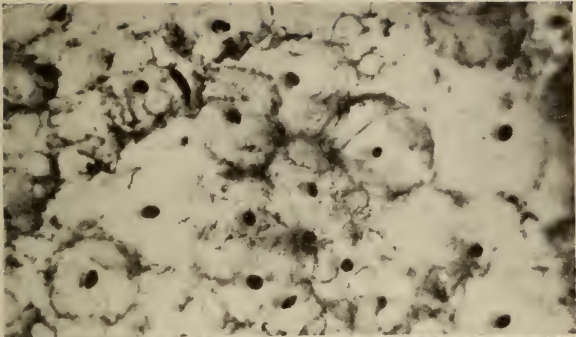


FIG. 2.—FROG SPAWN.
FIGS. 3 AND 4.—TADPOLES.

develops, this appendage is entirely lost. Not only whilst in the tadpole stage is this interesting amphibian an expert swimmer, for the adult frog is a splendid example to boys as to the correct manner of striking out when learning to swim, its strokes being easy and beautifully measured. Our photographer has pictured for us a frog in the water (Fig. 5), showing a frog at the base of the aquarium, and Fig. 6 portrays same in a different attitude. This latter picture nicely reveals the long hind legs, the fore-legs, and the webbed toes. Successful as Mr. Sedgwick has been in securing these four excellent frog-life photos with that ingenious home-made camera which he has told you in his own two chapters how to make and use yourself, he has been still more successful, I think, in his further study of the frog on land. Notice the capacious mouth, and the exceedingly prominent eyes. Not only can the frog see what is in front of it, but it is also able to glance sideways. It feeds on insects found in the water and on land, and the tongue, which has a viscid secretion upon it, is used to advantage in the capture of insects. I have occasionally in my wanderings come across whole armies of young frogs on their migration-march. Apparently these little creatures had only just left their watery home, and were *en masse* seeking pastures new. Not hundreds, but thousands of little frogs, not

much more than a quarter of an inch long, have I met migrating in this way, and have seen a country road so densely populated by them as to make it quite impossible to walk without treading upon them! The female is the larger of the two. The colour is brownish, with or without spots.

The Edible Frog.—This species—the edible, or eatable frog—is rare in our country. It has been introduced, and in some parts seems to be increasing. The distinctions between this and the common species may be shortly stated thus: There are black markings and white lines on the back, the hind toes are completely webbed; it is greenish in colour. On the sides of the head are what are called ‘vocal sacs,’ by the aid of which the croaking is produced, and this more during the breeding season than at any other time.

The Toad.—Perhaps this species is regarded even with more hatred than the frog, and although I will admit its leathery, warty-like skin and clumsy build, awkward and ungainly habits, may be somewhat repulsive to those people who only view their own species (*Homo sapiens*, ‘man the wise’) as possessing intelligence, the stories which one hears as to harm perpetrated are quite untrue. It feeds on insects, and although it is true that as a means of defence it is able to emit a somewhat irritant

secretion from the pores of its skin, it does little (if any) harm to anybody. Indeed, the frogs and toads may be justly regarded as being quite as useful in ridding the land of insects as insect-eating or insectivorous birds. Mr. Sedgwick has given us a splendid snapshot of one of these animals (see Fig. 8). The wart-like skin, prominent nose, eye, swelling over same, and limbs, are all admirably depicted in this photograph. You will notice, too, the shortness of the hind legs as compared with those of the frog. The toad catches insects by means of its tongue with great adroitness and cleverness, and this organ is furnished with a sticky substance like that of the frog. It breeds in a similar manner to its near relative, but the tadpoles are darker in colour, and it does not resort to water to the same extent. It is brown above, with black markings; white below, spotted with black. Similar to the adder, it casts its skin—or slough—and has been known not only to cast it, but to swallow it!

The Natterjack.—The remaining toad on our list is the natterjack, which is rarer than the last-named species. It may be identified by a light line on the centre of the back, which has resulted in the name of ‘Golden Back’ being accorded to it in some localities in the country. It is more active than the last mentioned, the hind toes are not webbed so much, and the hind leg is shorter. In other respects it mostly resembles the common

toad, although this species is stated to feed on mice as well as insects.

The second and remaining order, the newts, need not detain us at any length. There are three species only, and the first on our list is—

The Common or Smooth Newt.—Newts are found on land for the most part, resorting to water only for breeding purposes. The spawn is placed amongst the leaves of aquatic plants; the young commence their life as tadpoles, like the frogs and toads. It is interesting to notice, too, that during the breeding season the male newt acquires a crest which may, or may not, be one of the attractions of courtship, much in the same manner as the sheath which envelops the beak of the puffin at nesting time attracts for him a female partner in life. The common or smooth newt is a handsome species, being green or brown in colour, much spotted; it is yellow underneath, spotted with black. The male is red under the flattened tail with lines and markings of a bluish hue, whereas the female is yellow and without the markings. The male, as stated, grows a frill or crest along the back during the breeding season, which may be plainly seen in the photograph of the largest newt in Fig. 9. The female also possesses a frill, but this is smaller. In the summer it casts its slough. Length, $3\frac{1}{2}$ ins.

The Palmated Newt.—This is the smallest of the three British newts ; it is darkly spotted on the body, and speckled with black on the head. The crest is edged with black ; in the breeding season the toes of the male are webbed, and there is a curious filament on the tail. Length, 3 ins.

The Great Water Newt.—This is our largest species, being 5 ins. in length. It is black above, yellow underneath, spotted with black. The male has a prominent crest during the breeding season, and a light band is present on the tail. It may be distinguished by the warts on the skin and the pores on head and body. In its habits it resembles the two other species, and all three feed on a dietary which is made up for the most part of the tadpoles of the frog !

PISCES (FISHES)

Of the two hundred (about) species of British fish—that is, fresh and salt water inhabitants—it is quite impossible, in the limited space at my disposal, to give a description of more than one-tenth of the number, and even then those resorting to the sea must be altogether eliminated. We, therefore, must confine our attention to a few of the commoner species of British fresh-water fish, of which there are about fifty species. Before coming to these, however, it should be stated that fish are

divided up into a great many orders and sub-orders ; but fish being difficult to study—howbeit their life and habits are none the less interesting—the young reader need not be troubled here with scientific terminology or problems of classification.

Fish, as will be noted from the list of vertebrates set out in the opening pages devoted to some British mammals, is the last class included in the vertebrates. Although living entirely in the water, fishes have an inside skeleton, and breathe by means of gills which act as lungs. It is as necessary for a fish to inhale air as it is for land animals, including man, and air is chiefly made up of two indispensable gases, called oxygen and nitrogen. A certain quantity of this air is found in a natural condition in water, such as a river, lake, pond, sea, etc. As many boys will perhaps have noticed, fishes are generally seen facing upstream, so that the water may penetrate into the mouth when opened, and thus give to the fish oxygen, a necessary and life-giving gas. This is necessary for the purpose of purifying the blood and supporting life.

The water passing into the mouth in this way is not swallowed, as might be supposed, but passes through the gills and out at the two slits at the side, called gill-covers. The gills themselves are usually red in colour. Most boys on lifting up the gill-covers have at some time or other noticed these



FIG. 8.—TOAD.

FIG. 9.—COMMON OR SMOOTH NEWT.

beautiful organs—the gills—consisting as they do of fringed or feathered membranes. When the angler catches a fish and puts it on the ground or in his fish-basket it generally dies, although some species—eels, for instance—live quite a long time out of water. Why does it die? Because when taken out of its natural element—water—the gills dry up, the fish cannot take in oxygen *which is not mixed with water*, and it dies of suffocation. Fishes (as also amphibians and batrachians) are known as cold-blooded animals. A fish taken from the water is cold to the touch. Why? Because the gills only absorb a small quantity of oxygen; as a result there is not much ‘oxidation’ or ‘combustion’ in the tissues, and a small amount of heat only is generated.

Being cold-blooded the fish does not need any special protection from cold. In some species there are no scales, a thick skin replacing same; but generally speaking scales are present. These are composed of a horny substance, and may be compared to the nails on the reader’s fingers and toes. They are beautifully arranged, much in the same manner as the feathers of a bird, namely, they overlap. Thus water cannot penetrate between them, and the scales being flexible, the fish is able to bend its body quite easily. Could the young reader suggest any improvement in the shape of fish? Is not the typical ‘spindle-like’ form of

body perfect, to enable them to glide through the water with ease, elegance and rapidity ?

The fish swims mostly by the aid of its tail, whilst the fins may be called the steering-gear. Human beings have four limbs, and in a corresponding manner so has a fish in its four fins, mostly present in pairs. The fins of a fish may shortly be stated to be as under—

1. Pectoral fins, on right and left sides of the breast.
2. Pelvic fins, underneath the body.
3. Dorsal fins, on the back.
4. Anal fin, underneath body near tail.
5. Caudal fin, namely, the tail.

Inside these wonderfully interesting animals is an air- or swimming-bladder, which is a most essential and useful organ. By means of it, fish are enabled to float to the surface of the water or to sink below. How does a fish rise to the surface? The answer is, air is lighter than water ; when a fish wishes to proceed to the surface, the swimming-bladder is puffed out or filled with air until the body is lighter than an equal proportion of water, and this enables it to ascend. Indeed, as Mr. Aflalo points out, the air-bladder is a sort of internal gas-bag inflated with a preponderance of nitrogen. But what happens when a fish is at the surface and wishes to descend? Then, the air in the bladder is let out. By what means? By the aid of certain muscles ;

and as the fish then becomes heavier than water, it is enabled to sink lower. It is most interesting to relate that some species of fish who entirely resort to the bottom of deep water do not possess a swimming-bladder; but although most species who resort to the surface do have this wonderful organ, there are some rapid surface-swimmers who do not! Here is an interesting object-lesson to reflect upon, gleaned direct from Nature's ever-open and wondrous book.

Fish lay an enormous number of eggs, for the reason that these are preyed upon by other fish, birds, mammals, etc., besides which the nature of the surroundings in which they are deposited makes it necessary for an allowance to be made for waste, etc.

I hope now that you appreciate a few points in connection with the wonderful life-history of a fish more than you have done previously, and will not in future look solely upon these interesting creatures as objects only for catching with a rod and line. Our sketch so far has had to be considerably curtailed, and is quite elementary, but I hope I have written sufficient to induce you to pursue this study further with pleasure and profit.

The Metamorphosis of a Fish.—Before proceeding to shortly summarize a few of the salient features of about twenty of our commonest fresh-water fish, I propose to tell you exactly how a fish

is hatched, and follow the same right on until it is twelve months old, or a yearling. And for this purpose we will take

The Common Trout, that really beautiful British fish with which almost every boy in the country is by sight acquainted.

British fish are, with very few exceptions, hatched out from eggs, or ova, called spawn. In the case of the exceptions the young are brought forth alive. A great many eggs are laid in various situations, sometimes at the bed of a stream, on the leaves of aquatic plants, etc. It is curious to notice that whilst some species of fish, like the salmon, ascend the rivers at 'spawning' time, there are other species, the eel for example, which act in an entirely different manner and descend to the sea! When the eggs are laid, the parent fish—unlike birds and mammals—take little heed of them, leaving them to be hatched by means of the warmth of the water. These eggs are much relished by various species of fish, as also by birds and reptiles. In the case of the common trout the spawn is deposited during the autumn in a small depression in sand. This serves as the 'nest,' and is made by the trout by the aid of its tail. The eggs are then covered over with gravel; there they remain during winter, being hatched in the following spring. When first laid the ova is yellowish in colour, with a prominent spot of red yolk. The egg is about

the size of a pea. After a month or two a considerable change may be seen ; the bright yellow colour has almost entirely disappeared, being replaced by dull pinkish-yellow, the red yolk cannot be seen, but small specks can just be discerned. These are the eyes ! A little later, the ova does not seem to have undergone much further change, but the eyes are more distinctly visible.

Just as the ova is hatching, the eyes become especially prominent, and the young fish can almost be seen coiled up in the egg. At last this bursts, the tail usually coming out first. This is important, as if the head is first protruded the little wanderer stands a poor chance of escape from its numerous enemies, they being on the watch for it, and if the tail is not out, the little fish cannot make good its escape from them ! When it does emerge, it is a curious-looking little creature. It is then called an alevin, by which name nearly all young fishes are called at this interesting stage in their life-history. The eyes are very prominent ; there is a bag under the belly, which contains the red yolk of the egg, and on this the young fish exists during the first few weeks of its life. The tail can just be observed, but the mouth has yet to develop.

After about seven or eight weeks from the date of hatching the little trout has made great progress, and looks a perfectly well-formed fish. The

fins, tail, mouth, and beautifully moulded body are object-lessons in fish-life; it is about an inch in length, and now commences to search for food on its own account. At this stage the young are called fry.

When twelve months old the minute but perfect little creature last described has indeed developed into a fine fish, being quite 3 ins. in length. The head, gill-covers, fins, and tail are all beautifully perfect, and the yearling trout is well spotted on the sides of its back as well as on the large dorsal fin. The young fish—providing it secures abundant food, for trout have voracious appetites—grows very quickly. It has been known to reach an age of more than thirty years. It feeds on worms, slugs, fresh-water shrimps, and snails, as well as flies.

The adult trout is yellowish in colour, but the coloration is affected by the nature of the water inhabited. The back and upper parts, as in the yearling, are spotted with black and bright red; it is silvery-white or yellow underneath, and the fins are light brown. I have known trout to attain a weight of 9 lbs. Such, shortly stated, is the early life-history of one of the most beautiful species of fish which lives in British waters.

I will now proceed to give a short account of a few of our commoner British fresh-water fishes, and the first on our list is the voracious perch,

The Perch.—This fish is one of the commonest fresh-water species, and mostly goes about in companies. It may easily be identified by the very prickly, or spinous, dorsal fin, and by the black bands on the body. The general colour is bronze or green on back and sides, whitish below; red fins. Mr. Aflalo states that it is not restricted to fresh water, for he has caught large perch in the Baltic Sea.

The perch always reminds me of the greenfinch amongst birds, because it is a most voracious feeder. Anglers will appreciate this statement to the full, for when once a perch-hole is found, and the fish are on the feed, sport rages fast and furious. Contrary to the experience of most writers, I have frequently caught perch after pricking and losing them, and, indeed, having lost several hooks, have eventually landed the self-same fish with the hooks in it! It feeds on small fish, young water-birds, water-voles, insects, etc. It spawns among reeds in May. It attains a weight of 7 or 8 lbs., but a perch weighing 3 or 4 lbs. is often regarded by the angler as a specimen to be stuffed and mounted in a glass case for him to gaze upon in after days as 'a thing of beauty and a joy for ever.' I have caught several over 3½ lbs. It is stated that anglers have noticed that female perch are rarely caught, and that male fish are in a great majority.

The marine form of perch is the bass, which,

although chiefly found in the sea, also resorts to brackish and fresh water.

The Pope or Ruff.—This species might be mistaken for a small perch, but it is not nearly so well distributed. I have caught large numbers, however, in the Bridgewater Canal, in Hertfordshire. It may be identified by possessing one dorsal fin instead of two; the bands in the perch are missing, this species being spotted. It spawns early in spring, and is of somewhat inactive habits.

The Miller's Thumb.—What boy living in the country does not know this little fish? It resorts to clear streams for the most part, and has a habit of resting underneath stones. And what boy has not often experienced difficulty in catching with the hand this curious little fresh-water inhabitant? It darts out from underneath a stone and at once takes refuge under a neighbouring one, and it needs a keen and practised eye to follow the little creature in all its movements. It is greenish above, lighter on the sides and belly, with black vertical bands. It is a prickly fish, and it is stated that the spines on the head are often the means of causing the death of various water-birds which feed upon it. The dietary is mostly made up of larvæ.

The Common or Three-Spined Stickleback.—This is our commonest stickleback, and is known to every British boy. It is grey and golden in

colour, has three or four spines in the dorsal fin, and in place of scales has bony plates. Instead of depositing eggs upon the bare mud or gravel, like the trout already described, sticklebacks cleverly construct a nest in a similar manner to birds. In the spring the male puts on his best attire, having patches of red on the body; and what British boy has not filled himself with pride when he has caught a 'soldier' to put in his aquarium? Remember in future that these 'soldiers' are the males. He is a 'soldier' in action, as well as appearance, for he jealously guards—sentinel-like—his nest until the young are safely got away from the family nursery!

The Ten-Spined Stickleback.—Rarer than the last named, the ten-spined species resorts to salt as well as fresh water. The bony plates are not present, and the general colour is greenish-brown, spotted with black; silvery on belly and sides. The male in the breeding season, unlike his near relative the common stickleback, assumes a dress of mourning, turning quite black!

The Eel.—The common eel of our fresh waters, particularly where there are muddy bottoms, is really a beautiful species when closely examined. The female is larger than the male, and I once caught two within a few minutes which both measured over 3 ft. in length! These were females, the male measuring barely 20 ins. It is green or

brown above, yellow or white underneath. Eels go to the sea for the purpose of spawning, and it is stated that after doing so they die, as the parent fish have not been observed coming back up the rivers, but only the young, called elvers. These latter, my friend, Mr. Barr, late of Beith, Ayrshire, tells me, climb up the sides of the steep burns in Scotland, and have been known to cross fields of damp grass during their migrations.

The nesting habits of eels are extremely interesting; some build nests, in which the eggs are deposited, other species actually carry their eggs in the *mouth* until hatched. The female of another species carries the eggs embedded in the skin, which at the breeding season becomes soft and spongy, and the eggs are pressed into the skin by the eel lying on them.

The common eel is very tenacious, and will live for a length of time out of water. I have even known eels caught overnight to be very much alive the next day when being prepared for the table. Not only will they live out of water for a long time, but eels which have become frozen have actually been thawed back to life. I have known eels to attain a weight of 6 lbs.

The Carp.—This is a fine old fish, and was introduced into this country over two hundred years ago. My experience leads me to the conclusion that it is found in lakes and ponds more

than in rivers ; but in small ponds where the food supply is not very adequate the fish seems to grow exceedingly slow. The same remark applies to the tench. In other lakes, where there is an abundant food-supply, I know of several fish which have turned the scale at 6 lbs. and 7 lbs., whilst two particular specimens, male and female, which are found in a certain lake in Hertfordshire, and have been netted on several occasions for the purpose of weighing, are stated to weigh over 20 lbs. each. I have seen these two fish many times. A friend informs me he has seen a carp weighing $22\frac{1}{2}$ lbs. In colour, it is between green and bronze, darkish on the upper parts. The fins are reflected with yellow and violet. On either side of the jaw there are two barbels, four in all, the lower being the longest. It is a vegetarian in diet, but will also feed on larvæ. It has large scales ; breeds during summer, and as many as 750,000 eggs have been taken from a specimen turning the scale at 10 lbs. These eggs are small, and green in colour.

The Crucian Carp.—I have only space to mention that this species is found in British fresh waters, and that it does not exceed much more than $1\frac{1}{2}$ lbs. in weight. It does not possess barbels on the jaws ; is greenish in colour above, bronze on sides. The golden carp, more popularly known as the 'goldfish,' is found in some ponds and other

waters in this country. They were introduced from China and Japan. The carp family contains many species of fresh-water fish which we cannot pass by, and the next is

The Barbel.—This species is not found in either Scotland or Ireland, and mostly inhabits streams in the eastern counties of England. There are four prominent barbels on the jaw; it has a long and fleshy snout, a thick upper lip, and in colour is mostly green above and white below. It is a vegetable feeder, but also partakes of small fishes, etc. It attains a weight of 15 lbs., and I know of a specimen which turned the scale at that weight.

The Gudgeon.—This well-known little fish, as most boys know, does not grow to any size, and a specimen of $\frac{1}{4}$ lb. may be regarded as a prize indeed. It is mostly greyish in colour, with dark blotches above. One barbel is present on each side of the jaw (which may be seen in the photograph, Fig. 10), not two on each side, as in the carp and the barbel. It loves running streams, but also resorts to ponds where still water is found. It keeps much to the bottom, and fishermen have to let their baits just skim the bed of the stream, or drag along it, to place their alluring baits (brand-worms gudgeon dearly love) before this fish; but it seems very fastidious in its taste!

The Roach.—Mr. Sedgwick has given us a

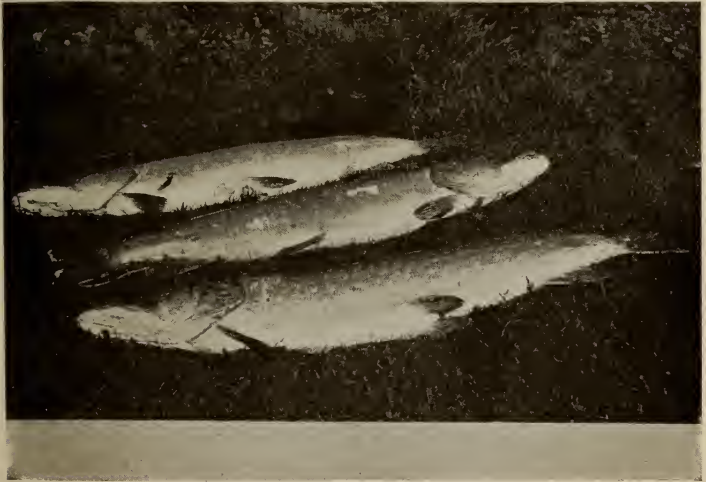
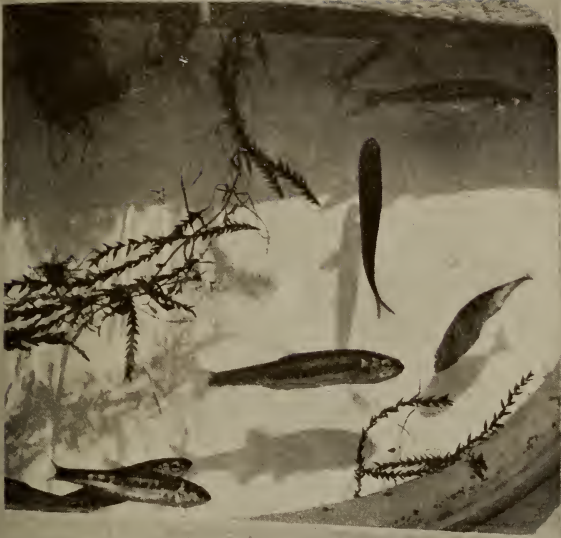


FIG. 12.—MINNOWS.

FIG. 13.—PIKE.

clear picture of one of these fish. Fish-photography has not yet developed to any extent, but the photograph (see Fig. 11) illustrates what can be accomplished even with a home-made camera. This is a very common British fresh-water fish, but is not found in Ireland. A roach in good condition is indeed a fine fish, being dark blue or green above, sides lighter, silver below; lower fins red. It attains about 3 lbs. in weight, but a fish half that size may be regarded as a good specimen, although I have caught several weighing as much as 2 lbs. in private waters, and have seen one which turned the scale at 3 lbs. 6 ozs.! It mostly feeds on insects and molluscs.

The Rudd.—This is a most handsome species, and I have caught them in Hertfordshire weighing over 3 lbs. A fish of that size may, however, be looked upon as the limit weight. It is somewhat similar to the roach in appearance, but is more bronze-coloured; the dorsal fin is closer to the tail, the body is much deeper, and the fins are more reddish in colour. Beyond this, an important and distinguishing feature is the upper lip, which is horny and rigid. That of the roach is not. Insects mostly constitute the dietary. It greedily takes a lobworm and dry bread. I have caught all my rudd with these baits. *In one day*, my father and I caught thirteen dozen rudd at a certain favourite spot in Bedfordshire.

The Chub.—This fish is regarded by the angler as a wary species, and affords much sport when well hooked, being a most difficult fish to land. It has a wide, pinkish-coloured head; the general colour is a dark green back, white below. A chub of 4 lbs. or 5 lbs. is a good fish, but it has been recorded up to 7 lbs. Its food consists of small fishes, frogs, water-voles, and, it is stated, crayfish. They are very fond of boiled graves.

The Dace.—Whereas I have caught roach equally often in streams as well as ponds, I have noticed that the dace has mostly fallen to my rod, or rather the hook at the end of the line, when I have been fishing in a running stream. It does not attain a great weight, and a specimen weighing from $\frac{3}{4}$ lb. to 1 lb. is a good fish; but I knew of one which weighed 1 lb. 4 ozs. It is a long fish, silvery-blue in colour, and has no red, or very little, on the fins. It feeds on vegetable matter and insects, and spawns in May or June.

The Minnow.—This very beautiful little fish is mostly to be observed in shoals or companies, and when looked at in clear running water presents a very attractive appearance. It is dark green in colour, with patches of black; the breast fins have a reddish tinge. It mostly measures 3 or 4 ins. in length, though specimens of 7 ins. have been recorded.

The Tench.—This fish loves the mud, has

very small scales, and is slimy to the touch. I have found it chiefly in old lakes and ponds which have a muddy bottom, and near St. Albans recently a gentleman of my acquaintance caught twenty-seven fish before breakfast, weighing 75 lbs. I know of a catch of tench and bream, caught alternately, in the course of two hours after a storm, weighing over 1 cwt. I caught two within five minutes, a few years ago, which weighed $3\frac{1}{2}$ lbs. each. I have known it attain a weight of $4\frac{1}{4}$ lbs. It has small barbels at corner of mouth, the dorsal fin does not possess spines, and the tail is flattish in shape, not forked. The tench is darkish green in colour, whitish below. It will live for quite a long time out of water, like the eel, and feeds on insects, as well as vegetable matter, and even mud!

The Bream.—This fish is very plentiful in many parts of our country, and on the Norfolk broads I have seen whole boat loads landed by a few rods. It affords little sport, however, as it is not a game fighter by any means. When fishing with a float, and a bream is hooked, the float falls flat on the surface of the water, and does not disappear underneath, as with most fresh-water fish. This is accounted for by the fact that when the bream finds itself hooked it rises to the surface, the line between the hook and the float is temporarily released, and thus the float, having nothing to balance it, falls over. When the float falls you may

be certain the fish is hooked. They grow to a large size, specimens weighing 7 lbs. or more being fairly common. It is a deep, but not lengthy, fish, of a silvery colour, with a red tinge on the fins. In addition to being a poor game fish, it is not much relished for the table.

The bream-flat or white bream is a much smaller species than the foregoing, has much more red on body and fins, and is decidedly rarer than its last-mentioned relative.

The Bleak.—This little fish rarely exceeds 7 ins. in length. It is common in many streams in England, but is missing in Scotland and Ireland. It has a blue back and sides, silver underneath.

The Loach.—The loach may be distinguished by having six barbels on the top jaw. It does not exceed 4 ins. in length, is dark green on back, yellow on sides, grey underneath, with dark brown spots and streaks. Like the miller's thumb, it lurks under stones, but whereas the latter species lives for quite a long time out of water, the loach dies very quickly after removal. It spawns early, March and April being the breeding season. It is very common, and lives on insects, worms, spawn, and sometimes aquatic plants.

The Salmon.—We must not omit to accord a place to this very beautiful fish, although our description of it must be concise. There are several rivers in our country famous for salmon ;

to mention only a few, the Tay, Shannon, Severn, Stour, and Avon. It attains a weight of 60 lbs., but 20 to 40 lbs. is a more common weight. It ascends our rivers from the sea for the purpose of spawning, the eggs being deposited on a gravel heap in the water. It is steel-blue in colour, but when it has been in fresh water some time becomes spotted with reddish, and the blue is not of so brilliant a description.

The trout follows the salmon, but of the former species I have already treated in the life-history sketch on pages 32 to 34.

The Grayling.—Fond of clear running water, this species has many rays on the first dorsal fin, is pale brown in colour, silvery underneath, spotted with black on head and body, and light on fins, the latter having red bands during the spawning season. It attains a weight of about 4 lbs., is solitary in its habits, but a rapid swimmer. There are famous grayling-rivers in the same way as salmon-rivers, and amongst these may be enumerated the Wye, Severn, Teme, Trent, and Yorkshire Ouse.

The Pike.—This well-known species, although the last which I am able to include here, is not by any stretch of the imagination the least interesting. It has been not inaptly called the 'fresh-water shark,' and instances of its shark-like habits might be told at great length. It seems to thrive wherever there is fresh water, and grows to a great weight.

It has been recorded up to 60 lbs. I have seen one 38 lbs. and several over 20 lbs. It is a handsome fish. I have one of 13 lbs. weight before me as I write, the handsomest-marked specimen I ever saw, which fell to my own rod a few years ago. It is a mixture of green and dark brown above, lighter on sides, white below, beautifully marked all over with yellow spots and bands. Its large jaw and conspicuous teeth, as well as the dorsal fin, being very near the tail (the latter is well-forked), are characteristic features. It is a most voracious feeder, and pages might be devoted to this alone. It will prey upon members of its own and other species (pike under about 4 lbs. weight are called 'jack'), and will also seize frogs, water-voles, and water-fowl. Mr. Sedgwick has supplied us with an illustration of three fish which were caught in the river Mole at Leatherhead.

The instances on record of the ravenous and cannibalistic character of the pike are many, and although without doubt many of these stories are very highly polished, I can vouch for the authenticity of the following incident: A friend of mine, a professional animal-stuffer, discovered a very large pike, which must have weighed between 20 and 30 lbs., in a small but deep pool of water, into which the fish had become stranded owing to the drought, the bed of the river being merely at that time a succession of small deep pools. This monster

was observed swimming about with another pike in its mouth weighing at least 7 or 8 lbs., and although my friend almost dragged the large fish out of the pool by means of a hooked stick, it refused to loose its hold of the other pike. After vainly endeavouring to land the fish in this manner, my friend quietly pulled it to the surface of the pool, and dealt it a by no means gentle blow on the head, whereupon the monster made a dart and slid over the dry bed of the river into the much larger pool beyond, and thence on into the river near the mill-head, where the water was continuous. Thus the prize was lost. The extraordinary part of this story is that the pike did not, during all these manœuvres, release its hold of the fish it had in its mouth. A few days after this occurrence the miller asked my friend whether he would believe him if he said that he had seen a pike at the mill-head which must have turned the scale at considerably over 20 lbs. !

I close with an account sent to me recently by an esteemed correspondent as to a fishing excursion in Somersetshire (on which angling bout, by the way, two rods were jointly responsible for nearly 1 cwt. of fish). My correspondent says that he was very much interested in a pike which rose to the surface of the water after the swallows, as they dipped along the pool in their graceful and fairy-like flight ! I have known the pike to do many

things; to seize ducks, moorhens, rats, fishing floats, etc., but I have never previously heard of the wary and cunning monsters deliberately snatching at birds flying across the surface of the water.

CHAPTER II

SOME BRITISH BUTTERFLIES, MOTHS, OTHER INSECTS, ETC.

THIS chapter on Insects, etcetera, must perforce come within the statute of limitations, for the reason that it is quite impossible in one short chapter to deal in any way exhaustively with the whole of the inhabitants of the British insect-world, to say nothing of the etcetera. The same remarks apply to Chapter III, devoted to wild flowers and trees. As a matter of fact these two chapters, II and III, are really Nature-photograph chapters rather than natural history; and this being so, it will be my aim simply to write up short notes on the subjects Mr. Sedgwick has so admirably depicted for us. When it is stated that there are nearly one quarter of a million species of insects known to science, the task of writing up a complete history of even British insects will be seen to be impossible here. Some insects are so

minute that 4000 of them are only equal to a grain of sand ; with these we cannot possibly concern ourselves. In Great Britain alone we have between 3000 and 4000 species of beetles, and in the world there are more than 700 species of earth-worms ! These latter are not insects, but belong to what are called *Vermes*. Before treating of the subjects illustrated, it will be useful for the reader to know how insects are divided into orders, and what an insect is. Insects, then, are usually divided into nine orders, thus—

1. Beetles.
2. Grasshoppers and crickets.
3. Dragon flies, etc.
4. Bees, wasps, ants, etc.
5. Butterflies and moths.
6. Plant lice, etc.
7. Flies, gnats, midges, etc.
8. Fleas.
9. Lice, etc.

Now, what constitutes an insect ?

For an answer in simple, understandable language I direct your attention to the following excellent extract from the handbook written by Mr. Walford Gardiner, which accompanies the wonderful 'A. L.' Natural History Cabinets.¹ To these marvellous life-histories of insects, frogs, fish, etc., I specially direct your attention, for they are most

¹ Messrs. E. J. Arnold and Son, Ltd., Educational Publishers.

interesting, useful, and of great educational value. Mr. Gardiner writes :—

‘All insects have jointed bodies and limbs, but no backbone. Their outer covering is a kind of horny skin called ‘*chi'-tin*,’¹ and this takes the place both of a skeleton and a skin, for it forms a protection to the interior organs, and also a support to them.

‘A true insect has all the three parts—a *cap'-ut* or *head*, a *tho'-rax* or *chest*, and an *ab-do'-men* or *belly*—distinct from one another, as if the body were *cut* (or divided) into these three parts. These divisions usually consist of a number of rings ; one ring generally forming the head, three the thorax, and from nine to sixteen the abdomen.

‘A perfect insect has usually three pairs of legs, and these are all jointed on to the thorax, one pair to each ring. The feet of some insects have claws, and some have a kind of pad by which they can walk with the back downwards, as the house-fly. The feet of others are adapted for digging (especially several kinds of beetles, as the scavenger-beetle), and others for swimming (as the water-beetle).

‘Usually an insect has two pairs of wings, but one pair may be wanting ; these are also attached to the thorax above the legs. All insects breathe by means of air tubes, called *trach-e'-æ*,² which

¹ Greek *chi'-ton* = a tunic or outer dress. (Pronounce *ch* as *k*).

² Latin, *tra-che'-a*, plural *trac-he'-æ* = the windpipe, from Greek

open along the sides of the abdomen by little mouths, called *spi'-ra-cles*.¹ These tubes spread from the sides of the abdomen all over the interior of the body. Insects have no lungs.

'All insects have two very delicate organs of touch, growing out of the head, called, *an-ten'-næ*² or *feelers*, which are very full of joints and nerves; these are not legs. It is thought by some learned men that the antennæ contain the organs of hearing, smell, and touch. The antennæ of different insects have many and varied forms.

'As insects feed on various kinds of food, some living on animal and others on vegetable substances, while others suck juices, there are great differences in the shape of their mouths. In some the mouth is formed for gnawing (as beetles and cockroaches), or for cutting and tearing (as the paper-making wasps), and some only for sucking (as butterflies, moths, and bees).

'Insects which live by sucking, take in their food through a kind of tube, called a *pro-bos'-cis*³ or *trunk*, which runs out from the lower lip. It varies

trachys = rough. The trachea is in Greek properly *tracheia artēria* = the 'rough artery,' because of the rings of gristle which strengthen it.

¹ *Spi'-ra-cle*, Latin *spi-rac'-u-lum* = an air hole, from *spi'-rā'-ro* = to breathe. They are often called *stig'-ma-ta*, plural of Latin *stig'-ma* = a mark, as a pin-prick; these little mouths are very small indeed.

² Latin, *an-ten'-na*, plural *an-ten-næ* = a horn or feeler.

³ *Pro-bos'-cis*, from Greek *pro-bos'-kis* = a front feeder; a trunk.

much in length and shape in different insects. The proboscis is not really a tongue.

'Most insects have two large eyes. These are usually compound, *i.e.*, they consist of a great number of small ones grouped together on the side of the head; there are also often three or more simple eyes between them. The compound eyes of the common fly are each composed of about 4,000 simple ones.

'Most insects, such as butterflies, moths, beetles, flies, bees, wasps, hornets, and ants, are produced from eggs. Many insects take no care of their eggs, but leave them to be hatched by the warmth of the air, etc., but bees, ants, and many others rear their young with great care. The eggs of most insects pass through several changes before they become complete insects; these changes are called *met-a-mor'-pho-se*.¹ This metamorphosis properly consists of four stages—the egg, the larva or grub, next the pupa or chrysalis, and finally the imago or perfect insect. All the insects mentioned above, and many others, undergo these changes from the egg to the winged insect; but others, such as grasshoppers, crickets, dragon-flies, etc., never have the worm-like form, and do not shut themselves up in cocoons.

'Insects inhabit the earth, the air, and the water in all parts of the world, and are very

¹ *Met-a-mor'-pho-sis*, a Greek word meaning 'change of form.'

important creatures. It is probable that they exceed in number all other living creatures taken together. The largest varieties live in very hot countries.

‘They provide food for one another and for a number of very small animals and birds, and several of them are useful in our daily life; such as the cochineal (a kind of bug), which is used in making red ink, and gives us the beautiful colours carmine and crimson lake (the dried bodies of the female being used for these purposes); the honey bee, which produces honey and wax; and the silk-worm, from the cocoon of which silk is obtained. But, above all, many insects assist in fertilizing flowers, and so cause a crop of seeds and fruits.’

To those who would pursue the study of entomology further, I commend—together with systematic work in the fields—the *Natural History Specimens*, etc., published by Messrs. Arnold and Son, Ltd., Leeds, and in doing this I write from an educational standpoint.

I propose now to vary the mode of insertion of the following subjects, so as to give variety. The reader can easily follow the class to which they belong by referring to the table of orders set out at the beginning of this chapter.

The Glow-Worm.—This really interesting,

insect is not, as its English name indicates, a worm, but is really a beetle. The photograph with which Mr. Sedgwick has supplied us shows four females, from which the reader will gain a good idea of the general appearance of this remarkable insect. It is about half an inch in length, has a soft body, and is dull black in colour. The male, however, differs in appearance from the female, having wings and wing-covers, the female being incapable of flight. The most remarkable fact in connection with the glow-worm is the bright light which the female gives off. I have seen whole hedge-bottoms lit up by this curious light on a warm summer's evening. It is pale-green in colour, and, curious to relate, the insect possesses the power of extinguishing or kindling the radiance it bears! This light is stated to be a signal to the flying male as to the whereabouts of his mate, glow-worms being night-insects. Sometimes, however, the male bears two luminous spots. These are much fainter than in the female. This light is often referred to by the poets, and among the many beautiful lines which have been written, I always appreciate the following reference which Shelley makes to it in his 'Ode to the Skylark'—

'Like a glow-worm golden in a dell of dew,
Scattering unbeholden its ærial hue
Among the flowers and grass which screen it from the view.'

Some time ago now I happened to be along

the countryside late at night, and the whole hedge-row in one particular spot was lit up by the curious luminous light to which I have referred. I captured one of the female insects with little difficulty, and transferred it to a matchbox. Reaching home tired after a hard day's rambling, I took the matchbox into my bedroom, making sure before I retired for the night that the glow-worm had not escaped. The insect was quite safe. In the morning, however, it had made good its escape. A careful search failed to find the little roamer. The next evening my wife chanced to be in the garden after dark, and was there attracted by the light of what was undoubtedly the glow-worm I had captured the previous day! My bedroom being in the front of the house and the garden in the rear, the insect had had to travel a considerable distance. It has often puzzled me whether it made its way to ground *viâ* the window and either crawled or dropped to the ground, or whether it adopted the more orthodox manner of descending *viâ* the staircase!

The larvæ do not reach the perfect state until they are twelve months old. They mostly feed upon snails.

Glow-Worms' Light.—Writing of the curious photograph reproduced here as Fig. 54, Mr. Sedgwick says:—

' This photograph was taken by the glow-worms

themselves. All that I had to do was to place them on a sensitive plate in my dark room, and let them walk about on it themselves. Their light recorded itself on the plate as they moved, and this picture is the result.

‘The illustration shows in some cases the three large “lamps” and the two smaller ones, carried by these insects.

‘In the picture of the glow-worms themselves, note that one of them is lying on her back, shamming to be dead. It is a point worth remembering that many insects escape their enemies by this artful resort.’

The Peacock Butterfly.—This very handsome and common species is known to almost every boy living in the country. The larva is spiny; it is velvety-black in colour, minutely dotted with white. The pupa varies in colour from brownish to bright yellow, and is profusely sprinkled with purplish-brown dots. The eggs are deposited on the common nettle in April and May; they hatch off in about fourteen days.

The imago (the perfect butterfly) is distinguished by the scarlet on the fore-wings, browner near the hind-margin. The hind-wings are scarlet only in the centre; the rest brown. On each wing is an eye-spot from which this butterfly derives its name, and on the margin of the fore-wings there are two black patches which can best be described

as half-crescents. There are about seventy species of British butterflies, but several of these are very rare.

The Garden Spider.—A whole volume might be devoted to the inhabitants of spider-land. The pity of it is that our space is so limited and that so much ignorance still exists—both in country and town—as to the spider's place in the economy of Nature. There are nearly 550 species known to science; and these, with the exception of eight, all have eight eyes, the remaining eight having six only. The spider is unable to eat, as its jaws are employed in holding its prey, and its means of sustenance is carried on by suction. The reader will probably be surprised to learn that the spider's ears are in its legs! As regards the garden spider, this is really a most beautiful insect, being reddish-brown with a cross of white spots on the back. Our first spider-photograph illustrates one jealously guarding its nest and eggs to be seen on a leaf. When the young spiders are hatched—and I have counted over three hundred in one mass—they are most interesting little creatures, being golden in colour with a spot of black. As they hang suspended from a web and then adroitly climb up same like so many acrobats, they are most captivating to watch, looking just like a living necklet of small yellow and black beads. When disturbed thus, the sagacious little creatures all crowd together,



FIG. 16. —A DORMANT SPIDER IN WINTER.

FIG. 17.—LARVA AND PUPA OF HEATH FRITILLARY BUTTERFLY.



FIG. 18.—GARDEN SPIDER AND NEST.

evidently being strong believers in the fact that 'union is strength.'

The spider's web, the wonderful and delicate construction of it, and the manner in which spiders act as aeronauts, has doubtless been noticed with interest and wonder by every country lad. During winter, the garden spider is dormant for the most part, and Fig. 16 reveals one in this condition taken at the winter season. Spiders belong to the order Arachnida, and differ from insects by the absence of a distinct head and feelers. The spider, therefore, is not an insect, but comes under the heading of "etcetera."

Mimicry in Nature.—Many instances might be given of mimicry or protective-coloration in Nature, the means adopted by various kinds of wild creatures to protect themselves from enemies. Space forbids more than two illustrations being given here. Our first photograph (Fig. 20) shows nine larvæ or caterpillars of the magpie moth. These are white, with black transverse spots on the back, and an orange-yellow stripe on the sides, with black spots above and below. It will be observed on studying this photograph how the cut-up body of the caterpillar protects it on the piece of metal which it has selected as a resting-place. Looked at not a great distance away, these larvæ would scarcely be seen. Our second illustration of protective-coloration (Fig. 22) is afforded by

some snails hiding amongst the curious rhizomes of iris in the garden. On careful inspection of the photograph it is difficult for even a practised eye to tell straight away how many snails are depicted in hiding.

The Magpie Moth.—Coming immediately after the larvæ of this moth figured in our short mimicry-paragraph on page 219, it is interesting to notice the illustration of the eggs, pupa and perfect moth of this species. With the larvæ added, we have here (Figs. 19–21) a pictorial representation of the four stages in a butterfly's or moth's life; first, the egg, second the larva, third the pupa, fourth the perfect insect; an interesting life-study indeed. The larva has already been described, and it only remains for me to state that it feeds on gooseberry, sloe, currant, etc., and that the moth has white wings, with transverse rows of large black spots partly running into one another, and between which are two orange bands, one near the base and the other beyond the middle; the hind-wings are also white, with a row of black spots on the hind margin and across the middle; there are also one or more solitary spots closer to the base but more of an orange colour.

The Edible Snail.—The 'etcetera' allows us to include this interesting species in this chapter. This is not the common garden snail, but the edible

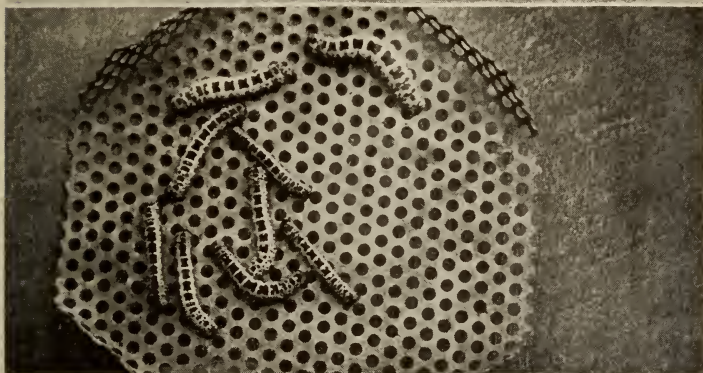
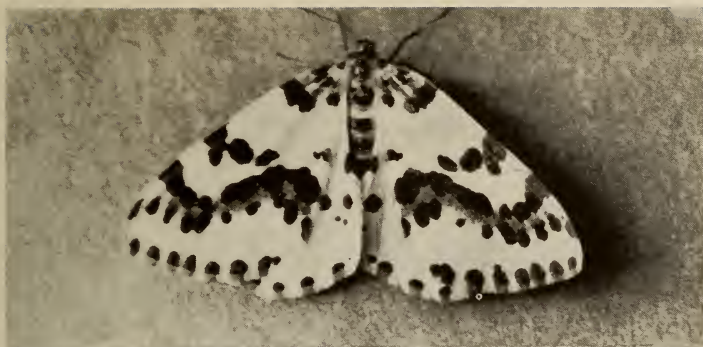


FIG. 19.—MAGPIE MOTH.

FIG. 20.—LARVÆ OF MAGPIE MOTH ON PERFORATED METAL.

FIG. 21.—EGGS AND PUPA OF MAGPIE MOTH.



FIG. 22.—MIMICRY IN NATURE, SNAILS HIDING AMONG IRIS.



FIG. 23.—EDIBLE SNAIL.

snail, which was a favourite article of food with the ancient Romans, and is still largely eaten on the Continent, hence its popular name of edible or eatable snail. It is found in many districts in England, but is not nearly so common as the garden species. Snails belong to the genus *Helix*, and lay their eggs in batches under the ground. The female actually prepares a sort of slanting gallery to deposit the eggs in; these latter are white, round, and semi-transparent. The eggs hatch in about a fortnight, and the shell at first is thin and transparent. When cold weather approaches, snails have the habit of exuding a slimy matter which hardens, thus closing the entrance to the shells and protecting the owner—who is snugly tucked up inside his house, which when in motion he carries about with him on his back—from the cold. At this winter season they congregate together for the purpose of hibernating.

The Dragon Fly.—These beautiful, highly-coloured insects are erroneously considered to be harmful to human beings, but all British boys—and men and women, too—would do well to remember that dragon flies, or horse-stingers, as they are often called, are absolutely harmless and do not sting, for the simple reason that they possess no sting wherewith to do so! The larvæ figured in our illustration (Fig. 25) are interesting, because not only does the photograph illustrate the larvæ

themselves, but also shows how wonderfully they assimilate to their surroundings, appearing like small pieces of aquatic herbage. The eggs being laid under water, the larva, when hatched, passes the first stage of its existence in the water. The larva is a voracious feeder, like the larvæ of most insects, and the reader may have noticed during his wanderings by the water-side the curious caterpillar, or larva, plying about amongst the weeds searching for food. After a time the larva finds its way to the surface, and may be found later in the pupa or chrysalis state adhering to some tall reed or grass near water. The perfect insect is a lovely creature, being brilliantly coloured; it has a peculiar flight, and has been described as 'the eagle of insects,' owing to its predatory character. Mr. Sedgwick tells us that—

'The dragon-fly larvæ are some of the most ferocious of the water-insects, second only to the "water-scorpion." Failing to get any other food, they will attack one another. They are interesting creatures in captivity, and will readily attack smaller larvæ, tadpoles and worms.

'Whilst I was photographing those pictured in the illustration, a tremendous fight took place, and the one hanging on the weed conquered his enemy and sucked him dry. This accounts for the tragic transparency of number two!'

The Small Garden White Butterfly.—It will



FIG. 24.—LARVÆ OF COCKCHAFER.

FIG. 25.—LARVÆ OF DRAGON FLY.



FIG. 26.—SMALL GARDEN WHITE BUTTERFLIES.

be readily agreed, I think, that the study which our photographer has given us of small garden white butterflies (Fig. 26) is a very charming one. The beautiful white wings and black spots upon same are admirably thrown up by the selected dark background. This is one of our commonest British butterflies, and the larvæ (the caterpillars) feed very largely upon, and do considerable damage to, cabbages. It is very similar in the adult state to its larger relative known as the large garden-white. It may be observed on the wing, not only when it is a nice sunshiny day, but when the weather is dull. It is on the wing early and late, and will be known by sight to almost every British boy. The larvæ are green in colour, with a yellow stripe along the middle of the back, and when full-grown are about $1\frac{1}{2}$ ins. in length. The male and female are marked the same on the under surface, but the female may be distinguished by having on the upper surface a second black spot on the forewings, and a club-shaped mark along the hind margin.

The Cockchafer.—Most boys living in the country have doubtless noticed this interesting chafer flying about during the summer, and have no doubt often been struck in the face as it winged its way through the air, buzzing all the time. It has been stated many times that this insect makes its first appearance when the hawthorn is in leaf,

and there seems much truth in the statement. The female deposits her eggs in the ground early in June, and towards the end of the same summer the young larvæ or grubs appear. They at once commence feeding on the roots of grass, wheat, etc., and have voracious appetites. They feed ravenously, and this appears to be their only occupation for two or three years, their appetites increasing with their size. When full-grown the larva is nearly 2 ins. long, and our illustration (Fig. 24) clearly shows several of them. The head and legs are covered with a brownish shell, otherwise the grubs are soft and grey. They are much sought after by birds when ploughing takes place, and I have known the common house sparrow, as well as the nightjar, to feed very largely on the perfect insect. In about three years the grub assumes the pupa state, and the following spring emerges a perfect beetle. This latter is well known, having a brown, hairy thorax, tail turned inwards, white triangular spots on abdomen, prominent projecting antennæ. Even the adult chafer is a big eater, and is often very destructive to foliage.

The Convolvulus Hawk Moth.—Not long since I had several specimens of this very beautiful moth brought to me, and in connection with one particular specimen a curious story was unfolded. The proud captor of the convolvulus hawk moth—for such it proved to be—related to me how he

saw in the gloaming hour a strange form flying round his room, and then making—as he thought—a dart for him, thrusting out its ‘sting’ as it did so! At times he thought it was a huge bat, then a bird, but finally he succeeded in knocking what he called the ‘uncanny creature’ down, and then found it was a large moth! It was brought to me in a battered condition, and proved to be—as already hinted—a specimen of the convolvulus hawk moth. The ‘sting’ part of the story is distinctly interesting, and goes to show the great ignorance which still prevails in country districts on matters pertaining to natural history. What was taken for the so-called ‘sting’ was of course in reality the proboscis, which is longer in this insect than in any other European species. This moth is not nearly so brilliantly coloured as many of the hawk moths are, being dark grey on fore wings, pale grey on hind wings, with four bands of black. The abdomen is banded with black and flesh colour, the latter edged in front with whitish. It expands from about 4 to 5 ins. The larva feeds on the small bindweed, wild balsam, and other wild plants.

The Eyed Hawk Moth.—Another beautiful hawk moth which was brought to me for identification—also much damaged owing to careless handling—proved to be the eyed hawk moth. This is a very handsome insect, the black ‘eye’ surrounded by a ring of blue showing up beautifully on the

rose colour of the hind wings, on which the 'eyes' are situated. This species is not nearly so large as the convolvulus hawk moth, measuring $2\frac{1}{2}$ to $3\frac{1}{2}$ ins. in expanse. The larva feeds on willow, apple, etc. These eyed hawk moths are found in many parts of Europe and Asia, but in North America they are especially numerous, and Mr. Kirby states that no less than four genera are represented there.

Our photograph (Fig. 27) shows one of these eyed hawk moths on a lily flower, drinking up the sweet nectar; indeed drinking to such an extent that it has become stupefied.

There are about seventeen species of British hawk moths, and the very curious death's head moth is the only one which can utter any sound.

The Purple Emperor Butterfly.—The photograph of the larva of this very beautiful butterfly (Fig. 28) is interesting, as illustrating not only the larva of this species, but as another addition to our photographs which reveal protective coloration. As will be observed, it is quite slug-like in appearance, and possesses horns. It is bright green above, and bluish-green below, and on each side there are seven stripes of yellow, with pink edges. The veins or stripes, and the 'graining' on the back exactly correspond to the veins and roughness of the leaves of the willow, on which it feeds.

The male purple emperor is a most handsome butterfly, and is well named. He is gaudier than



FIG. 27.—EYED HAWK MOTH ON LILY.

the empress, having a beautiful purple sheen, which the female entirely lacks. The ground-colour is smoky-brown above, fringed with white. A white band extends from the centre of the fore-wings to near the inner margin of the hind-wings, and there are several spots of white near the tips of the fore-wings. There is a reddish mark near the tip of the hind-wings, and others at what is called the 'anal angle,' near which is a spot of black encircled with red and a little blue in the centre. The colour of the under-surface is even more beautiful than the upper, contrary to many, if not most, butterflies. This under-surface is much lighter than the upper; the white markings are the same, but on each side of the white stripe on the hind-wings there is a band of rich dark brown, and three white patches on the costal margin of the fore wings. On the hind margin of the hind-wings it is pinkish-white, there is the same eye-spot as on the upper surface, only smaller, and the centre is a more attractive blue. Finally, there is a much larger eye-spot on the under-surface of the fore-wings, which is black in colour, circled with orange, with the centre blue.

The eggs are laid on the willow (commonly called palm), or goat-willow, and other trees. These hatch off in about twelve days.

This beautiful insect has been described by Mr. W. J. Lucas as 'the monarch of the butterfly

tribe,' and 'adopts as his throne the topmost branch of an oak, where he sits aloft in the sunshine, occasionally sailing away almost out of sight, doing battle with his peers, the monarchs of the neighbouring oaks, and returning, as a rule, to the identical spray from whence he started.'

The Earthworm.—Although we have no illustration of this common and well-known creature, the following notes may be read with interest. A correspondent writes:—

'I have been a wanderer in the woods and fields ever since I was quite a boy, and am fairly familiar with Nature, but recently I saw something which I have never noticed before, and which greatly interested me.

'I was watching for rats by the side of a small river, when suddenly I became conscious of a slight noise near my feet—a noise like the snapping of small roots. I looked down, and saw that a mole was working its way just underneath the turf. I watched the movement for a minute, and then, to my surprise, I saw three large worms *bolt* (I have never seen worms move so quickly) from the ground about three inches in front of where the mole was working.

'The interesting point to me is that a creature like the worm should have knowledge of the coming of its enemy.'

As my correspondent remarks, it does seem



FIG. 28.--LARVA OF PURPLE EMPEROR BUTTERFLY.



FIG. 29.---BRITISH BEETLES.



FIG. 30.—STAG BEETLE.

incredible that what one often hears described as 'a mere worm' should possess powers of reason and sense; but that it has these faculties I have more often proved than I care to remember, having had a most intimate acquaintance with their adroitness and cleverness during my night prowls after the wary creatures to fill my bait-tin for the purpose of plying the piscatorial 'art' on the eagerly anticipated morrow. When I have been thus engaged—of course, it is generally known that earthworms come to the surface at night and lie out, especially on damp or rainy nights—I have noted with interest that if a frontal attack is made upon the worm, he will, with lightning rapidity, dart into his hole in the ground again; but, should you attack the worm from behind by digging into the ground, he will crawl out of his hole and make haste to escape. Why? Because in all probability he mistakes the digging for a mole, which latter consumes earthworms in large numbers. Undoubtedly earthworms do a great deal of good in stirring the soil and making it porous, and in other ways help to scour the land; but too many worms may not be altogether beneficial.

The Orange-tip Butterfly.—What British boy is there living in the country, who has not during early summer watched the fascinating flight of these very beautiful butterflies along some sunlit hedgerow, admiring its exquisite orange-tipped

wings? This is the male, the female lacking this distinctive and beautiful coloration. It has a very short sojourn in the perfect state, only being on the wing a few brief weeks, and is rarely seen after mid-June.

The series of six photographs which illustrate the closing pages of this chapter are most interesting and are almost self-explanatory.

Fig. 31 represents the pupa or chrysalis on the stalk. This pupa is somewhat like a half-moon in shape, being very much pointed at either end. It is dull green above and brownish-pink below.

The larva is full fed about the commencement of July, and then turns into the pupa state, and remains thus on the stem of the food-plant until early the following spring.

It then (Fig. 32) commences to emerge, slowly but surely, and by looking at each succeeding photograph, so ingeniously taken by Mr. Sedgwick, you will be better able to follow its life-history than through any written description.

Fig. 33 reveals the wings unfolding, and Fig. 34 the under wings dropping and the young butterfly more considerably spotted.

Fig. 35 shows the orange-tip taking its first journey as a butterfly; it will be observed that it has left the stalk on which it has resided for so many months, and has taken up its position on an adjoining piece of herbage.



ORANGE-TIP BUTTERFLY.

FIG. 31.—PUPA ON STALK.

FIG. 32.—EMERGING FROM PUPA, FIRST STAGE.



ORANGE-TIP BUTTERFLY.

FIG. 33.—WINGS UNFOLDING.

FIG. 34 —UNDER WINGS DROPPING.

Lastly comes Fig. 36, revealing the perfect butterfly ready for flight, a fitting conclusion to our brief chapter upon a chosen few of the industrious and interesting inhabitants of the insect-world.

CHAPTER III

SOME BRITISH WILD FLOWERS AND TREES

IT is quite impossible in this popular work to in any way completely cover the very fascinating and interesting branch of Nature-study called botany. I propose, therefore, in the first place to very concisely state how plants are classified, secondly, to briefly mention some of the salient structural parts of a plant—and more particularly the flower—and explain what is meant by pollination and fertilization, and thirdly to conclude in as few words as possible as to how cross-fertilization is effected and seeds distributed. After which, I shall take the subjects which Mr. Sedgwick has illustrated and shortly dilate upon and explain them.

To take our first, how plants are classified.

CLASSIFICATION OF PLANTS

The members of the Vegetable Kingdom are divided into five *Groups*, viz.—



ORANGE-TIP BUTTERFLY.

FIG. 35.—LEAVING THE STALK.

FIG. 36.—READY FOR FLIGHT.



FIG. 37.—THE CROOKED OAK TREE.



FIG. 38.—YEW TREES.

1. **Thallophytes**, comprising seaweeds, moulds, mildews, rusts, etc.

2. **Bryophytes or Muscineæ**, including liverworts and mosses.

3. **Pteridophytes**, comprising ferns, horsetails, and others.

4. **Gymnospermæ**, containing firs and pines.

5. **Angiospermæ**, containing the great majority of flowering plants.

We want to give you a brief outline of how the flowering plants are divided into smaller sections, in order that they may be easily identified. First, then, the Angiosperms are arranged in two main classes—

I. **Dicotyledons.**

II. **Monocotyledons.**

Dicotyledons have the following characters:—

1. The seedling has two cotyledons or seed-leaves.

2. In the foliage leaves the veins generally form a network.

3. A cross-section of the stem exhibits annual rings of growth.

4. The parts of the flowers occur in fours, fives, or their multiples.

Monocotyledons are characterized by—

1. The seedling has but one seed-leaf.

2. The veins of the foliage leaves run parallel.

74 SOME BRITISH WILD FLOWERS

3. No annual rings are evident in a transverse section.

4. The parts of the flowers are in threes or their multiples.

The *Dicotyledons* are divided into four *Sub-Classes*, according to the structure and arrangement of the parts of the flower—

1. *Thalamifloræ*.

Petals free ; stamens springing from beneath the pistil (*hypogynous*).

2. *Calycifloræ*.

Petals free ; stamens inserted on the ovary (*epigynous*), or around it (*perigynous*).

3. *Corollifloræ* or *Gamopetalæ*.

Petals united ; stamens usually growing on the petals (*epipetalous*).

4. *Incompletæ*.

Sepals, petals, or both, absent ; stamens and pistils usually in separate flowers.

The *Monocotyledons* are divided into—

1. *Petaloidæ*.

Perianth usually coloured ; flowers usually 2-sexual.

2. *Nudifloræ*.

Perianth wanting, or consisting of bristles or small scales.

Each of the *Sub-Classes* is divided into *Natural Orders* or *Families*, the members having a broad resemblance in structure, *e.g.* *Ranunculacææ* or

buttercup family, *Rosaceæ* or rose family. The Natural Order is sub-divided into small sections resembling each other in a few structural details, each section being known as a *Genus* (*pl. Genera*). The resemblance is so close that the individuals may be supposed to have sprung from a common ancestor. The members of the Genus will exhibit certain variations common to one or more, and are then marked off as a *Species*. Finer distinctions than these are sometimes recognized by considering an individual as a *Variety*. This somewhat complicated arrangement may be better understood if we take an example, thus—

- Group. Angiospermæ.
 - Class. Dicotyledons.
 - Sub-class. Thalamifloræ.
 - Natural Order. Violaceæ.
 - Genus. *Viola*.
 - Species. *tricolor*.
 - Variety. *arvensis*.
- | | |
|---|----------------------------------------------------------------------------------|
| } | <p><i>Viola tricolor</i>.</p> <p>v. <i>arvensis</i>.</p> <p>The Field Pansy.</p> |
|---|----------------------------------------------------------------------------------|

The scientific name of every plant consists of two words (usually Latin), a substantive and an adjective, the first denoting the Genus, and the second the Species. These scientific names are known to all botanists throughout the world, but the common names are often purely local, often misleading, and unintelligible to people of different countries, or even different districts.

PLANT STRUCTURE AND POLLINATION

A flowering plant is composed of the following parts: root, stem, branches, leaves, flowers, and fruit.

1. *The Root*.—The chief functions of the root are—

1. To anchor the plant in the soil.

2. To absorb from the soil by means of minute hairs, inorganic food substances in solution.

3. To act as a store-house of reserve food which will enable the plant to produce flowers and seeds during the next season.

2. *The Stem* supports the branches which carry the flowers and leaves, and also acts as a conductor of the food in solution from root to leaf.

3. *The Branches* enable the plant to expose leaf-surface to the air; and they also bear flowers and fruit.

4. *The Leaves* absorb from the air the carbon-dioxide necessary for the assimilation of the inorganic substances taken from the soil; they also act as an organ of transpiration, allowing the evaporation of much of the water, and the consequent thickening of the sap.

5. *The Flowers* are the fruit and seed producers.

6. *The Fruit* is, strictly speaking, the ripened ovary, but other parts of the flower often take part



FIG. 39.—WYCH ELM TREE.



FIG. 40.—TREE IN FULL LEAF.

in its formation. It contains the seed which is necessary for the perpetuation of the species.

We will now study a typical flower, and take the parts in order, commencing from the outside. It is taken for granted that the flower is produced on a stalk. You will first observe a whorl of green leaves, which, when the flower was in bud, entirely enveloped the essential organs. This whorl of leaves is called the *calyx*, and is made up of separate floral leaves called *sepals*. The use of the calyx is generally to protect the flower when it is in bud. The calyx may drop off when the flower expands, as in poppy and blackthorn, or last till the flower fades, which is the most usual, or it may persist after the ripening of the fruit, as in the strawberry and dog rose. Passing inwards, another whorl is reached, made up of coloured leaves called *petals*, the whole being known as the *corolla*. The function of the petals is partly to protect the essential organs of the flower and partly, by their usually brilliant colours, to provide attraction for insect visitors, as we shall see later. Other attractions for insects are provided in the form of honey-glands or *nectaries* secreting a sweet fluid called nectar, which justly compensates the insect for its visit. The perfume of flowers also acts as an insect guide to the hidden feast. The word *perianth* embraces the calyx and corolla, and is generally used in describing such plants as the lily, daffodil,

snowdrop, and many others, where the calyx and corolla are not easily distinguished.

The next whorl of the flower consists of *stamens*, which are the male organs. As a general rule the stamen is divided into a slender stalk or *filament*, and a rounded pollen-box called an *anther*. Occasionally the anthers have no filament, but are seated directly upon the part of the flower from which they grow.

Immediately in the centre of the flower may be observed a structure called the *pistil*, which is the female organ, and usually consists of three distinct parts. The lowest part is known as the *ovary*, and contains small eggs or *ovules*, which after fertilization become seeds. Seated upon the ovary may be one or more stalks called *styles*. The top of each style is called a *stigma*, and is often flattened or rounded, and sometimes divided. The function of the stigma is to receive on its usually sticky surface the ripened pollen grains, which, falling from the anthers, germinate by pushing a slender tube down the style into the ovary, where they reach the eggs or ovules. In some plants—for example, the poppy—the stigma is seated directly upon the ovary, and is not borne on a style. The contents of the pollen grain which have followed the end of the tube pass into the egg-cell, and then a wonderful change takes place. The egg changes into a seed containing an *embryo* or young plant.



FIG. 41.—HYBRID LIME-TREE.



FIG. 42.—CUCKOO PINT, OR WILD ARUM.



FIG. 43.—SHOWING INTERIOR.

A change also occurs in the ovary, as it immediately develops into what is known as the seed-vessel. When the seed is mature, the seed-vessel or ripened ovary in various ways liberates the seed for dissemination.

Sometimes a suppression of parts takes place in a flower, and it is quite common to find plants without petals, or those in which the petals are reduced to such small dimensions as to be scarcely noticeable. It often happens that in such cases the calyx becomes coloured and petal-like (*petaloid*), and may be mistaken for petals—for example, the wood-anemone and monkshood—but on closer observation it will be found that it is the outer whorl that is coloured, and must, therefore, be the calyx.

The Inflorescence.—Flowers are arranged on the flowering stem in various ways, and this general arrangement is known as an *inflorescence*. A few may be briefly mentioned.

When the flowers are arranged along the flower-stalk or *peduncle*, springing directly from it without smaller stalks (*pedicels*), they form a *spike*, as in wheat and plantain. If the flowers are given off in something of the same manner, but each is connected to the peduncle by a pedicel, the inflorescence is a *raceme*, as in the currant, foxglove, laburnum, etc. When the main stalk branches, and each branch forms a raceme, we have a panicle,

as in oats, lilac, and privet. The inflorescence of the dandelion and daisy is known as a *capitulum*, in which each *floret* is seated immediately upon a flat *receptacle*, so that you will see that the head of blossom is not a single flower, but an inflorescence, the flowers of which, instead of arising from various parts of the flowering stem, all arise from a horizontal plane. Thus, the flower-head is made up of a number of florets—sometimes more than 150—most of which are perfect flowers.

The whole of the flower-head is surrounded by a structure called an involucre, consisting of whorls of green leaf-like *bracts*, not a calyx, the calyx proper of the dandelion being found at the base of each floret in the form of numerous hairs, being known as a *pappus*. The pappus is conspicuous in groundsel and sowthistle, but is not present in the daisy or marguerite. It may be mentioned that bracts are produced around the calyx, or on the peduncle or pedicel, as in the strawberry, buttercup, and foxglove. When all the pedicels spring from the same point of the peduncle, and bring the flowers to somewhere about the same level, the inflorescence is called an *umbel*, as in the cherry and cowslip. Sometimes the main stalk branches in an umbellate manner, and each branch bears an umbel; this is called a *compound umbel*, and is very common in the carrot family (*Umbelliferæ*). In many plants the

pedicels are produced at different levels, and are of different lengths, thus bringing all the flowers to the same level, and we then have a *corymb*, as in hawthorn and mountain ash. In all the foregoing the oldest flowers are near the base of the peduncle, or on the outside when on a level, and the inflorescence is known as *indefinite*. When the oldest flower is at the top of the stalk, or in the centre when on a level, the inflorescence is *definite*, and there are several variations of this arrangement, but a general name for all is a *cyme*.

HOW PLANTS ARE CROSS-FERTILIZED AND THE SEED DISTRIBUTED

You have already learned what pollination means, and how a flower becomes fertilized, but it is necessary to show how pollen is carried to those flowers which depend for fertilization upon the pollen of other flowers reaching them. The two principal agents engaged in the distribution of pollen are wind and insects. It is thought that wind-fertilization was the earliest form of cross-fertilization (where it was impossible for plants to fertilize themselves), and that the cuckoo-pint was one of the earliest plants to be fertilized by insects.

In many plants the flowers offer no attraction to insects either by means of their colour, or perfume, as they secrete no honey. It is necessary then

that the pollen should be carried by some other agent, and this is the wind. We find also that these flowers produce an abundance of pollen for the purpose of making sure that some of the precious grains shall reach the stigmas, these latter being usually branched or feathery, so as to catch the pollen borne by the wind. Examples of wind-fertilized flowers may be seen in the large family of grasses, and in the catkin bearers, such as the hazel, poplars, and willows.

A curious phenomenon is presented by the pollen from the grasses just when it is at its zenith and there is a strong wind blowing. The pollen rises in vast clouds, as of smoke, and we are thankful we are behind the wind, so as to escape the cloud, and perchance an attack of hay-fever! To the unobservant the pollen-laden air would be dust or smoke, but to the rambler along the countryside, who cultivates the useful habit of observation, this is not so, and the curious phenomenon is duly chronicled in the note-book. On a recent occasion I observed this pollen distribution from a field of bents; the anthers had apparently just burst, the wind sprang up and carried along the pollen on its bosom, thus affording an excellent example of Nature's wonderfully thought-out agency for the distribution of pollen by the aid of the wind.

You will have already learned that the colour and scent of, and honey secreted in, flowers attract



FIG. 44.—WOOD SORREL.



FIG. 45.—MARSH MARIGOLD.

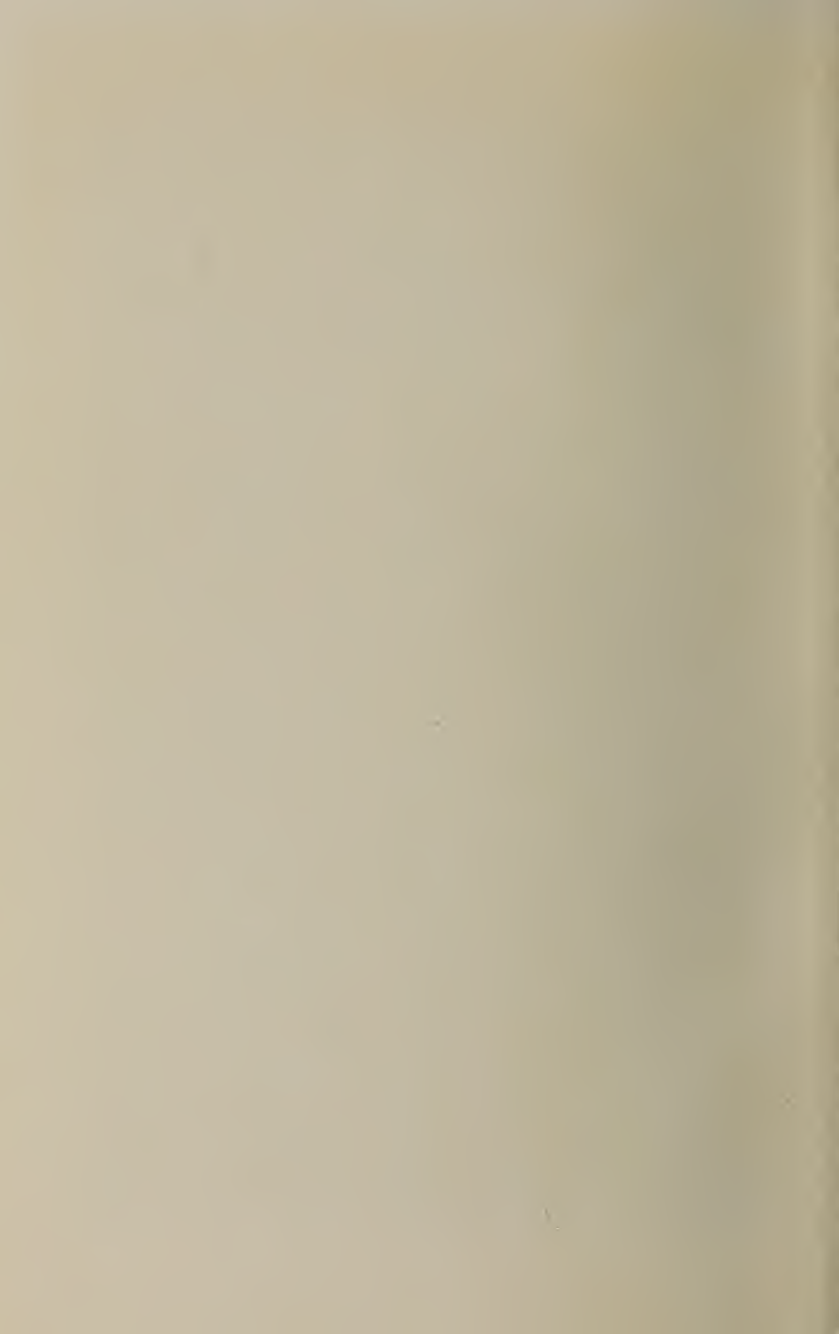




FIG. 46.—PRIMROSES.
FIG. 47.—WOOD ANEMONES.

insects. The form of flower is usually adapted to the particular insect which visits it. In some cases the *corolla* forms itself into a tube opening on one side only, the lower petals forming a platform on which the insect must alight, therefore it comes into contact with the *stamens* that guard the entrance and also the *stigma*; for examples, the snapdragon and the dead nettles. In other cases the flowers have a long tube, and depend entirely upon an insect with a proboscis long enough to reach the honey at the base. These flowers, in order to protect themselves against the visits of small insects that could reach the honey without touching the stamens, adopt various methods of keeping out these robbers; for example, the tobacco plant is sticky on the outside, which prevents insects crawling up to the entrance of the tube. In other plants the flowers open at night and close by day; for example, the evening primrose, when night-flying moths are about. Other night-flowering plants produce a strong scent as an attraction to insects. Another example is the common barberry which has sensitive stamens, at the base of which honey is secreted. As soon as the insect touches the sensitive base of the *stamen*, the *stamen* suddenly springs up, and coming sharply into contact with the body of the insect the *anthers* burst and cover the insect with *pollen*. The insect then proceeds to a fresh flower, and the *pollen* from the

insect's body is deposited on the sticky surface of the *stigma*, and cross-fertilization is effected. When cross-fertilization fails, as a last resource some plants fertilize themselves, but, generally-speaking, it has been proved that from cross-fertilized flowers stronger and more healthy plants are produced.

Seed distribution.—Seeds of plants are distributed in various ways. Some distribute their own seeds by the bursting of the seed-vessel, for examples, the violet and herb robert; others by wind, for example, the dandelion (*pappus*), elm, and sycamore (winged-fruits). Prickly seed-heads are frequently distributed by animals and even man, for on a recent ramble through a bit of untenanted cover, I was smothered almost from head to foot with the prickly seed-vessels of burdock. When I discovered the state of my clothing I promptly dislodged the curious-looking fruit, and throwing it down by the wayside helped unconsciously to distribute this plant in places where under more natural conditions it might not perchance have been carried.

Seeds are also eaten by birds—for example, the seeds of chickweed, plantain, thistles, etc., are partaken of by finches and other birds—and not only are the seeds distributed by being scattered broadcast as the birds ravenously extract them, but are carried by them to some secluded retreat (some probably being dropped on the way) where

they can enjoy their meal in quietude. Thus it comes about that one finds cherry trees, raspberries, currants, gooseberries, and other fruits growing in woods through the seeds having been either dropped by the birds, or having passed through their bodies uninjured.

The great Charles Darwin once grew no less than eighty-two plants from seeds secreted in a ball of clay which he had taken from the foot of a red-legged or French partridge, a bird, by the way, which is increasing very prominently in this country. This single instance illustrates very forcibly one of the ways in which birds act as distributing agencies in Nature, and beyond this proves the practical experiments which the great scientist above mentioned carried out.

Amongst the many interesting points raised by Lord Avebury, in one of his presidential addresses to the Selborne Society, was that of the seed-scattering powers of the little herb robert, or wild geranium, whose fresh pink blossoms garland the hedge-banks, more especially in the neighbourhood of a wood, during the summer time. Lord Avebury stated that he had carried out an experiment whereby to ascertain the distance herb robert could disperse its seeds. He obtained a plant containing a seed-vessel and placed it on his study table. The seed-vessel duly burst, but the seeds had been scattered beyond the limits of the table,

and could not be found. Another plant was then placed on a billiard-table, but the seeds also dispersed beyond the limits of this, although, if I remember rightly, his lordship did not state whether it was a full-size table or not. A cloth was then stretched at the end of the billiard table, and with this addition the limit of the scattering powers of herb robert was discovered, as Lord Avebury traced the seeds on the cloth, and found on examination that the distance they were thrown was no less than 20 feet !

Bearing in mind that the seeds were not dispersed with the plant growing amidst its own native habitat, this must be considered a really remarkable experiment, and it is only reasonable to suppose that in a state of nature the seeds of the herb robert are scattered to a distance of 20 feet or more ; for under more favourable conditions than those alluded to, the distance traversed would doubtless be much greater.

One of the many fascinating items in the study of outdoor botany is the extraordinary and unlikely places in which wild flowers are continually making their appearance. This plant-distribution is of course largely governed by the nature of the soil ; thus on a chalky soil the flora varies a great deal from that which is found on a clay soil, and instances might be multiplied. What I specially want to convey to the reader, however, is the

extraordinary places in which wild flowers unaccountably propagate themselves on certain occasions. For instance, I have often found the willow herbs—which delight in marshy situations—growing strong and well in a barren, dry, stony road; but a most extraordinary occurrence was recently brought to my notice. In a friend's drawing-room a field convolvulus had actually grown from the foundations of the house, and forced itself through the small crack in the skirting round the room! At the time of writing the plant is several inches long, has quite a number of leaves, and is being carefully trailed round the fireplace! The house has been built some two or three years, and this reminds me that in the drawing-room of my own house a similar incident occurred, but I do not remember what the particular plants were which made such an uncanny appearance in my own room!

The Cuckoo Pint.—Among the earliest spring plants which thrusts its twisted green spathe through the earth and pleases the eye of the rambler with the fresh green flush, is the cuckoo pint, more commonly known as lords and ladies.

For preference, obtain a plant from the countryside—for they are extremely numerous, and no harm will be done by plucking one, more especially as you have some object in view—or follow my remarks by carefully noting the two illustrations

given of this wild plant (Figs. 42, 43). Early in the spring—indeed, for some time after the plant has forced its way through the earth—the curious spathe which envelops the interior does not unroll, but as the essential organs of reproduction inside the spathe come to maturity and are ready for fertilization, the spathe opens as depicted in our first cuckoo pint photograph (Fig. 42), and allows a full view of the very curious fleshy column inside, which is called a spadix. It will be noticed that the spathe acts as a sort of protecting hood, and is a beautiful illustration of how Dame Nature looks after and protects her children.

Now, this spathe is called a bract, not a calyx, and is one of the most largely developed bracts found on any British plant. Carefully note the flower-head as seen in Fig. 42, and then accompany me to Fig. 43. Here our photographer has taken away a part of the spathe to allow us to peep into the very curious interior. Notice the club-shaped spadix in the first place, then follow down the spadix from where it so considerably narrows. You will observe white hair-like appendages; these are called rudimentary stamens. They play no part in the real fertilization, and yet are important agents in a manner which we shall shortly see. Next to these comes a ring of red seed-like objects. What may these be? These, then, are the stamens proper. Next comes another set of hair-like



FIG. 48.—WILD ROSES.



FIG. 50.—HORSE CHESTNUT SHOWING FLOWER.



FIG. 49.—HORSE CHESTNUT SHOWING BUDS.

appendages; these are barren pistils; and last come the pistils themselves. Now, how do you think this plant is fertilized? You have already been told what pollination and fertilization mean, namely, pollen grains from the anthers of the stamens must come into contact with the ripe stigma of the pistil. You will probably reply that the plant is self-fertilized; that the pollen becomes ripened, the anthers burst and let the pollen grains fall upon the pistils below. A very logical and simple answer; but it has been proved that the pistils are usually fertilized before its own pollen is ripe; therefore pollen from another plant must have been obtained.

It is rare, then, that the cuckoo pint is self-fertilized. But what happens? Examine a cuckoo-pint plant in the spring, open out the spathe, and you will in every probability find several small insects secreted right at the base of the spadix, just near the pistils—over one hundred small insects have been found inside one plant. These little insects crawl inside the spathe and proceed downwards. The hair-like rudimentary stamens and barren pistils do not deter this progress, for they have their ends curved downwards for the most part, and so help it. The insects reach the base of the spadix, and having stayed there a sufficient time for their purpose they ascend, but on going up they find their progress barred by the

barren pistils and the rudimentary stamens. In fact, they find themselves prisoners, and descend once more to the base of the plant, in the little cup-shaped bottom depicted in Fig. 42. Here they remain.

But, you will say, for what purpose? Because Nature has ordained it that those little insects and those rudimentary stamens and barren pistils are to play an important part in the fertilization of this plant. By-and-by, the anthers of the stamens ripen, the pollen falls upon the bodies of these insects. About the same time the hair-like objects which have imprisoned the insects wither and dry up, the insects climb the spathe or the spadix, and find themselves free. What do they do then? They hie away to a neighbouring cuckoo pint plant, crawl inside the spathe and hasten to the base. The pistils there being ready to receive the precious pollen, and the insects being laden with the pollen from the plant just left, their burden falls from their little bodies on to the pistils, the stigma receives the precious grains, and fertilization is effected! Later on in the year, towards autumn, the arrow-shaped leaves of the cuckoo pint (which are often spotted) have withered away, exposing to view the prominent bunch of scarlet berries.

The Round-Leaved Sundew.—This most interesting plant is widely distributed throughout the world; indeed, where the soil is at all boggy or



FIG. 51.—HORSE CHESTNUT SHOWING FRUIT AND LEAVES.



FIG. 52.—LEAVES, TO SHOW SHAPE AND VEINING.

marshy there this plant may be looked for. It cannot, either, very well escape the notice of the most casual observer, as its bright and round little leaves and the peculiar hairy nature of the same cannot fail to attract attention. The reader, however, may hardly credit the information that an English plant catches and devours flies and other insects! Yet this is actually what this wonderful little plant performs in its struggle for existence. It is, in fact, an insectivorous plant; the very small roots which it possesses merely supply it with water, but at the apex of every tentacle of its leaves is secreted a sticky moisture, which aids the plant in catching small insects and holding them fast. Once having secured its prey, the plant has the power of giving out, through the clubbed end of the hair, more of the sticky fluid, making the insect a veritable prisoner, the sensitive hairs then close over the insect and doubly secure him. Then, if the plant be carefully watched, it will be observed that others of the little hairs are drawn towards the insect, and curl round it in the same manner as do the tentacles of a sea-anemone round its food, and the acid-like fluid in every hair or gland increases. All help to quickly dissolve the insect's body, and thus aid in feeding the whole plant by means of the glands carrying the juices from the insect's body!

No more wonderful illustration of the habit of

this plant is needed than to obtain one such and keep it in a saucer of water, feed it with small pieces of meat or an insect of some sort, and watch it enjoying a meal! When the hairs uncurl and the leaves are fully open, digestion may be said to be complete. Sometimes the wing of a butterfly or the leg of some other creature may be seen attached to the sticky leaves.

This plant is not a free bloomer, and the little white flowers very frequently go to seed without opening their petals, acting entirely independent of insect aid in this respect.

The Wood Sorrel.—This fragile but graceful little plant is one of the earliest to open its welcome blossoms in the spring. It is a typical woodland flower, and is often confused by dwellers in the country with the wood anemone described on page 257. It may be found in flower during early April—I have observed it in March—and it has a great love for damp, shady places in the woodland. The leaves, as will be seen from Fig. 44, are borne on long, slender stalks, and each leaf is made up of three heart-shaped leaflets which are delicate yellowish-green above and darkish purple below. Towards evening or in wet weather these leaflets hang their heads and droop. The flowers are pure white, streaked with delicate veins of purplish-pink. There are five petals and a similar number of sepals. The stamens number ten, and



FIG. 53.—BEECH TREE IN WINTER.



FIG. 54.—TREES PLANTED BY NATURE.

these will be found to be in two rings, the five opposite the petals being the largest. The leaves have an acid taste, hence the Latin name *Oxalis acetosella*, and the natural order to which the plant belongs, namely, *Oxalidaceæ*. Many people are of opinion that this is the real shamrock which is so largely worn on St. Patrick's day, but space does not permit me to enter into this controversy.

The Primrose.—What boy is there living in the country who does not early in the spring hie away to some secluded woodland to gather a bunch of pale primroses, risking a good hiding from the farmer or gamekeeper as a result of trespass? Shakespeare was a good observer of Nature—although he was not always accurate—and he has well called the primrose—

‘First-born child of Ver,
Merry springtime's harbinger.’

The sight of the first primroses of early spring gladdens our sense of sight as the plaintive call of the cuckoo does our sense of hearing, and how delightful it is to pluck the pale flowers from their leafy-strewn bed in the woodland glade! How pleasing to again inhale the cool sweet breath of spring-time, to listen to the woodland chorus of quickly mating birds, to observe the first courageous butterfly upon the wing! The primrose belongs to the order *Primulaceæ*, and derives its name of *primula* from

the Latin *primus*, 'first,' by reason of the early appearance of the flower. It is an early blooming plant, often opening its welcome blossoms in March, and in Sussex I have seen a great many in flower as early as Christmas Day! The beautiful pale sulphur colour of the flower is hardly met with in any other British plant, and as this favourite plant is so well known, it only remains for me to add that there are two kinds found, which differ in the position of the pistil and the stamens, one having the pistil protruding almost out of the corolla tube and much above the stamens (which are attached to the sides of the corolla tube), and another form in which the pistil is much below the stamens; these are called pin-eyed and thrum-eyed flowers respectively.

The Marsh Marigold.—Another beautiful plant which lights up the moist meadows with flaring gold in early spring is the marsh marigold, more commonly called king-cups. The following note as to the late (or early?) flowering of this plant and other wild flowers found in bloom during October is extracted from my diary for October, 1904:—

'I was very much surprised to find several marsh marigolds in flower on October 16 last. One usually associates this flower with early spring, and it is certainly quite the very latest (or earliest?) date I have ever recorded it in flower. On

October 12, 1902, I found the dog violet in flower, and these two instances are the only two out-of-the-way records in my notebook of the autumn blooming of any typical spring flowers. On the same date, too, I found fifty-three further species of wild flowers in bloom, doubtless owing to the mild and open weather we have so far experienced during the present autumn. I do not know that any of the remaining fifty-three species on my list need special mention, excepting perhaps the common flax, field scabious, white campion, lesser stitchwort, oxeye daisy, white bryony, herb robert, St. John's wort, bramble, comfrey, and scarlet poppy.

'One of the latest wild plants to burst into flower is the ivy, and by the insect-life which one can see and hear around the blossoms during mid-October, it is pretty evident that several inhabitants of the insect-world appreciate the welcome honey which the ivy flowers supply to them. And this is all the more welcome because it is the season of the year when almost daily the list of wild plants in flower is being considerably lessened.

'This latter reminds me that we have experienced our first frosts and heavy gale of wind, and with them both, down have come the leaves toppling to the ground from their summer mansions. The whole countryside around wears its autumn dress now, and it is distinctly pleasing to ramble at this season by the river and notice the delicious fresh

green of the plants that flourish in its limpid depths. The comparison of the two affords an interesting object-lesson—the pure, fresh, green, spring-like flush in the clear stream, the sere and yellow leaf on land! The hedgerows are festooned with berries of many species of wild plants, the black bryony being especially noticeable in this respect. I noticed on one particular plant three differently coloured berries, red, green, and yellow. Hard by, the traveller's joy is quickly seeding and merging into beautiful bunches of soft, downy-like clusters—hence one of its local and old-fashioned names of daddy's beard. These clusters will festoon the hedgerows for many weeks to come, and are in great acquisition for decorative purposes at Christmastide.'

To resume my remarks upon the marigold, it is mostly found in damp meadows. The flowers have no corolla, as in the closely allied buttercup, and what one would call the petals are, botanically-speaking, five petaloid sepals. It has large, fleshy leaves, and grows to a height of about 12 ins.; indeed, the whole plant, flower-stalk included, is very glabrous. The marsh marigold grows mostly in tufts or masses, and the large golden flowers and shining green leaves present a brilliant spectacle.

The Wood Anemone.—During your rambles through the woodland in the spring, you cannot



FIG. 55.—TREES PLANTED BY MAN.

fail to have noticed the beautiful, graceful anemones which raise their white, starry heads to the refreshing March breezes. It is not restricted to woods, however, for it may be found along sheltered hedgerows, the banks of which are often quite whitened by the snow-white blossoms. On a nice day the flowers open fully, but towards evening, or when the weather is dull, they hang their heads, for they revel in a clear, windy atmosphere, and love the invigorating spring sunshine. Our photographer has supplied us with a very charming picture of these beautiful flowers (Fig. 47), and here one may observe the large, green, deeply cut-up leaves. The flowers, although looking so exquisite in Nature's own garden, are very fragile, and are of little use for table decoration, soon withering when held in a hot hand. The anemone is referred to by many of the poets as the wind flower, and Bloomfield, in describing the springtime, refers to it in the line—

' Now daisies blush, and wind flowers fill with dew.'

Mr. Edgar Wright, Wellingborough, has very kindly forwarded me a dried flower of the common wood anemone, the curious point about it being that it has at the tip of one of the white sepals a green growth, as of a partly developed leaf. Looked at cursorily, the flower head appears very curious, a sort of floral optical illusion, but there

is no doubt whatever that the green leaf-like appendage is attached to, and actually growing on, the sepal. My correspondent asks, 'Is this kind of growth common in flowers?'

To this I may reply that the curious growth above referred to is a deterioration which is common in the order *Ranunculaceæ*, and the growth may, shortly stated, be explained as one of the sepals reverting back to the foliage leaf, from which all floral organs are derived. To cite an instance of this, I might perhaps mention the sepals of the green hellebore, which resemble the foliage leaves, especially in colour. The order *Ranunculaceæ* is one of the simplest orders of plants, and this being so, very little progress has been made in evolution.

I believe I am correct in stating that this reverting back of the sepal to the foliage leaf is not so commonly found in the higher orders of plants, but is mostly common in the order *Ranunculaceæ*.

A Useful Weed.—One would imagine that no matter what refuse or waste heaps there might be, some species of plant would grow thereon, for we well remember that many of our botanical 'finds' have been made on the nearest refuse heap. In the recent report, therefore, of the chief inspector of Alkali Works, it surprised me to note that Dr. Alfred C. Fryer states that for years no plant, 'no blade of grass or humble weed,' would grow upon

the unsightly heaps of alkali waste at Nekham, near Bristol. It is pleasing to record, however, that a plant has now been discovered which really will grow and flourish upon these heaps of unsightly waste, and this is the wall rocket, or narrow-leaved wall-mustard (*Diplotaxis tenuifolia*). It is a glaucous plant, $1\frac{1}{2}$ ft. high, with flowers of a pale, lemon-yellow colour. It would be well worth experimenting, I think, upon other arid heaps of chemical refuse, heaps of coal-shale, and other unsightly heaps, to ascertain if this useful weed cannot be utilized as a means of improving the landscape, and covering up with verdure these ugly blots in the beauty of the countryside.

The Daisy.—The beautiful little daisies, which so brightly illumine the countryside in springtime, are too often disregarded by the rambler in the country. Closely examined, it is a really perfect little flower—indeed, a series of flowers, for it belongs to the *Compositæ*, and is made up of a number of florets, each a perfect flower in itself—and its life-history has much to unfold to us of wonderment and beauty. It is these common things in wild Nature which have been too heedlessly passed by as unworthy of notice, but it is now being found that the object-lessons to be learned from these common things are as interesting and wonderful as the rarer forms of plant-life. Indeed, so great an authority as Sir Robert Ball

has stated that a whole lifetime devoted to the study of the insignificant-looking little daisy would not be sufficient to reveal all the wonders and the mysteries of its life. I close my few remarks upon this flower with some lines written by Dr. J. Mason Good—

‘Not worlds on worlds in phalanx deep,
 Need we to prove a God is here ;
 The daisy, fresh from Nature’s sleep,
 Tells of His hand in lines as clear.
 For who but He who arched the skies
 And pours the dayspring’s living flood,
 Wondrous alike in all He tries,
 Could raise the daisy’s purple bud,
 Mould its green cup, its wiry stem,
 Its fringed border nicely spin,
 That, set in silver, gleams within,
 And fling it, unrestrained and free
 O’er hill and dale and desert sod,
 That man, where’er he walks, may see
 In every step the stamp of God?’

The Wild Rose.—The accompanying photograph of wild roses, taken during the memorable bright summer of 1904 (Fig. 48), reminds me that it is many years since I can recall such a wealth of rose blossoms as during the aforesaid year. I never remember such gorgeous masses of wild rose blossoms, the wax-like blooms hanging in dense yet exquisitely graceful festoons upon the pliant branches. It was one of those floral sights which will linger in the memory for many a long day, and it is pleasing to me to be able to include here a pictorial memento of the wild rose year of 1904.

The roses in the photograph are dog roses; these usually have delicate pink petals, whilst the wild rose bearing white petals is known as the field rose. Of the two, the former is easily first favourite, but as with the anemone, these flowers are not to be plucked; they soon shatter when picked, and it is almost hopeless to take a bunch home for decorative purposes, unless specimens which have not yet unfolded their delicate petals are gathered. The flowers of the dog rose vary in colour; some are almost white and others a very deep pink, and they throw off a very pleasing aroma.

The field rose trails more than its near relative, the dog rose; the general form of the foliage is the same, if we except the more shiny surface, and the leaves are somewhat smaller. Unlike the beautiful dog rose, the flowers are almost scentless, and more commonly grow in little bunches. The stamens of the field rose are collected into a column which surrounds the pistil, whereas in the dog rose the stamens are free.

There are several other species of wild roses in our country, but considerations of space forbid their inclusion. It only remains for me to comment upon the beautiful seed-vessels, called 'hips,' which are so conspicuous an ornament to the hedgerows during winter-time. These scarlet hips are often used for medicinal purposes; beyond

which, birds feed largely upon them, and especially during severe winters.

The Colours of Early Spring Flowers.—My attention has been called to the interesting fact that most of our early spring flowers are either white or yellow. In this particular may be mentioned the yellow flowers, there being the celandine, coltsfoot, crowfoot, dandelion, groundsel, cowslip, oxlip, furze, sallow, yellow rocket, goldilocks, and marsh marigold. Amongst the early white flowers are the blackthorn, greater stitchwort, garlic mustard, wild cherry, chickweed, vernal whitlow grass, hedge parsley, strawberry-leaved potentil, shepherd's purse, daisy, white dead nettle, shepherd's needle, wood sorrel, wood anemone, and snowdrop. Among early spring flowers which are neither white nor yellow may be noticed the dog's mercury, green hellebore, red dead nettle, hearts-ease, primrose, violet (there is, of course, the white violet, which should perhaps go in the white flowers list), ground ivy, cuckoo flower, wild arum, and wild hyacinth.

All these flowers may during a favourable and fairly forward springtide be found in blossom before the end of April, and it will be noticed that the lists of white and yellow flowers are far larger than the mixed colours. The point raised is an extremely interesting one, and I cannot offer any satisfactory reason for this, as my correspondent

asks, unless it be due to the fact that in early spring the few insects which are on the wing are easily attracted by these simple colours, whereas when flowers are more numerous it is necessary for them to vie with one another as to their bright distinguishing colour for the purpose of attracting insects.

Afforestation and an Arbor Day.—In a speech delivered to the technical instruction classes of the Monmouth County Council at Abergavenny, the late President of the Board of Agriculture said he thought the question of afforestation demanded attention, 'since the trees were being used for paper making, and unless something were done there would soon be a timber famine.' This latter statement may or may not be open to doubt, but this question of afforestation brings to the fore again the exceedingly useful institution of an arbor day in every part of the land.

There is perhaps no more charming way of commemorating a holiday or festival than the planting of a tree in some waste or desolate place, and one has only to mention the wonderful success which has attended the establishment of an arbor day in America, to encourage Nature-lovers as to the good results which arboriculture brings in more than one direction. Beyond the fact that the planting of trees helps to beautify the landscape, and improve many a barren waste, the trees are

happy sanctuaries for the birds and other forms of wild life ; the roots aid in the consolidation of the soil ; the foliage shades the ground, attracts moisture, and tempers the winds ; the air is purified by the fragrance they exhale, and trees thus act as veritable sanitary agents in Nature ; they supply man with fruits, fuel, raiment, medicine, and timber. Generally, then, trees are indispensable, and the wholesale destruction of them would be one of the greatest calamities that could possibly happen. For this statement of the case I am indebted to *The Poetry of Plants*, by Hugh Macmillan, in which is included a level-headed essay on the establishment of an arbor day, to which all lovers of the countryside should accord their earnest support.

Date of Foliation of Trees and Shrubs.—I am indebted to a correspondent for the following list of the foliation of trees and shrubs, made by Mr. Stillingfleet, in Norfolk, in the year 1765. A note added at the foot of the list states :—‘In different years, and in different soils and expositions, these trees and shrubs vary as to their leafing, but they are invariable *as to their succession*, being bound to it by Nature herself.’

‘Foliation of the trees and shrubs of this kingdom, by Mr. Stillingfleet, made in Norfolk, 1765’—

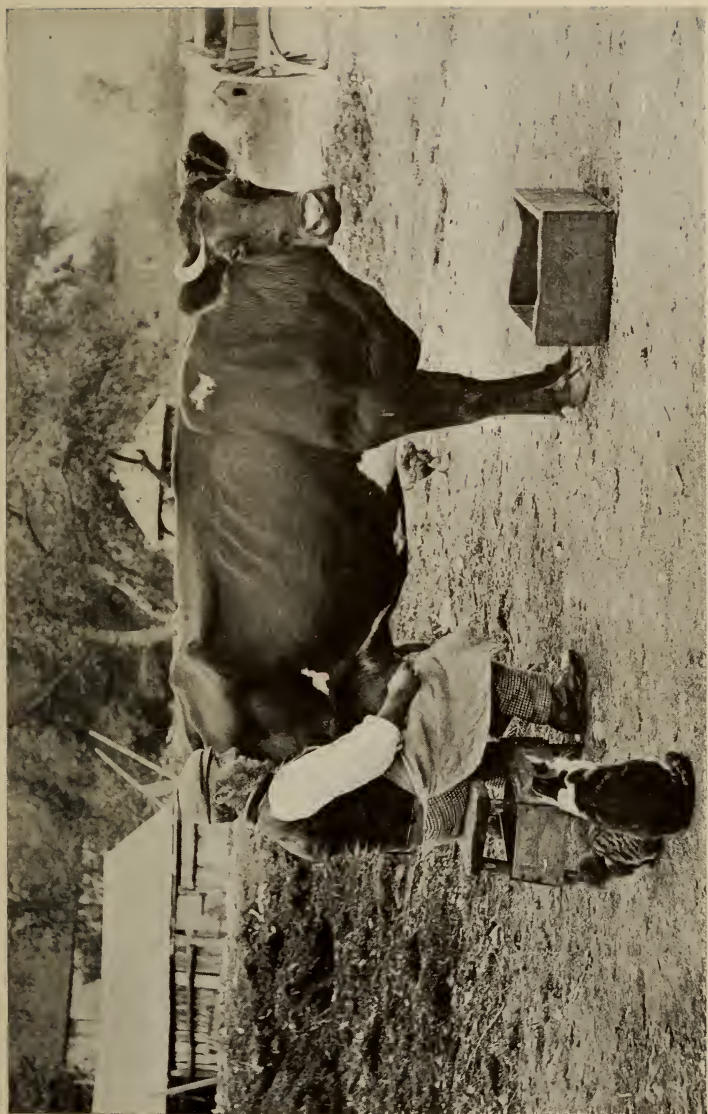


FIG. 57.—MILKING.



FIG. 58.—CUTTING THE HAY.

FOLIATION OF TREES AND SHRUBS 105

1. Honeysuckle ... Jan. 15	19. Marsh Elder ... April 11
2. Gooseberry ... March 11	20. Wych Elm ... " 12
3. Currant ... " 11	21. Mountain Ash ... " 13
4. Elder ... " 11	22. Hornbeam ... " 13
5. Birch ... April 1	23. Apple-tree ... " 14
6. Weeping Willow ... " 1	24. Abele ... " 16
7. Raspberry ... " 3	25. Chestnut ... " 16
8. Bramble ... " 3	26. Willow ... " 17
9. Briar ... " 4	27. Oak ... " 18
10. Plum ... " 6	28. Lime ... " 18
11. Apricot ... " 6	29. Maple ... " 19
12. Peach ... " 6	30. Walnut ... " 21
13. Filbert... " 7	31. Plane ... " 21
14. Sallow ... " 7	32. Black Poplar ... " 21
15. Alder ... " 7	33. Beech ... " 21
16. Sycamore ... " 9	34. Acacia Robinia ... " 21
17. Elm ... " 10	35. Ash ... " 22
18. Quince... " 10	36. Carolina Poplar ... " 22

You British boys, who read this book, would do well to record in your note-books the dates when you notice the appearance of the first leaves upon the trees in springtime, as well as the first flowers, the earliest birds' nests, the first appearance of the fairy swallow, and the first time you hear the plaintive call of the cuckoo. There are many more entries which you can make with pleasure and profit; and in after years it is distinctly interesting, useful, and instructive to compare these dates, taking into due account whether the season generally was early or late.

The Horse Chestnut.—Perhaps, next to the oak tree, the horse chestnut is best known to all boys who live in the country, not because of the

curious knotted buds which may be observed in the horse chestnut illustration (Fig. 49), nor because of the beautiful graceful festoons of white and pink blossoms. Why, then, do you know this tree so well? I think I can almost hear you supplying the answer! Because of the eagerness with which, as the first fruit of the horse chestnut becomes ripe, you scamper away to that favourite chestnut avenue or grove and search for the chestnuts wherewith to play 'conquers'! I have done it myself more times than I can recount, and even now as I sometimes gather a pocketful of the clean, crisp nuts from their prickly husky cradles, I have a sort of sneaking regard for those far-off days of schooltime, never, alas! to return.

Our three illustrations speak for themselves. First, the buds (Fig. 49), which are covered with a sticky substance, thus protecting them from the keen winds of early spring; second (Fig. 50), the flower; and third (Fig. 51), the prickly fruit. Now, when standing under a chestnut tree during a storm, have you ever noticed how the raindrops patter from leaf to leaf over your head, and how right underneath the tree it remains almost dry, the water eventually being thrown off all round the tree at some distance from the trunk? But what of this? you may say. You probably think—and think rightly too—that the dense mass of leaves prevents the rain percolating through, and the

water is thrown off from leaf to leaf outwardly, until eventually it reaches the ground at the bottom of the tree, where the branches are the longest and most spreading. Perfectly correct; but do you ever stop to think why this is? It is because this tree and several other trees and plants are what may be termed self-irrigating, that is, the young roots stretch out far away from the trunk, thrusting their crafty rootlets just under the surface of the ground some distance away, and these are part of the life of the tree, and require sustenance. The consequence is that when it rains, the young roots, which are for the most part *not* underneath the tree itself, receive the precious distilled raindrops in the manner which I have indicated. You will observe that in trees and plants which have not a wealth of foliage the water falls near the base of the plant or tree. Quite natural, you reply; there are no leaves in the way to prevent it doing so! Your answer is correct; but there is something more to be said. Such trees and plants as these do not throw out such spreading roots—they rather grow deep down in the soil, and the spotted orchis is a plant which specially occurs to me as I write—and it is necessary that the rain should reach the plant at its base to provide sustenance for it. This, then, is accomplished.

The pictures in the plate (Fig. 52) may be produced without a camera by putting the leaves

themselves next to the sensitive plate or paper, and letting the light pass through them to the emulsion below. Very interesting pictures may thus be made, and pretty foliated designs, before the camera is acquired.

Shapes of Leaves and their Value to Man.—

A whole chapter might be devoted to this most interesting branch of study, but space forbids. My last remarks bear upon this very subject in a large measure. Keep in mind that the colours and forms of flowers, the shape of the leaf, and other parts and functions of trees and plants are all specially adapted and developed to fulfil a purpose. They are not all arranged haphazard; they have not evolved to the colour, position, and structure in which we see them to-day through accident. There is design—and very wonderful design too—in Nature; and wherever there is design there is a Designer.

Now, not only are leaves especially interesting because of their various forms (see plate, Fig. 52) and colours, but leaves are the most important organs which a tree or plant possesses. By means of leaves they digest food, which is partly drawn up by the roots, dissolved in water. As noted in my remarks on afforestation and an arbor day on p. 263, trees especially are of great service to you and me, for the reason that the leaves take in and live upon the impure carbonic acid gas present in

the air which you and I breathe out of our lungs. During the daytime—more especially when the welcome and indispensable sun shines—leaves and other green parts of trees and plants not only take in the bad air but give off in exchange pure air in the form of oxygen, which you and I inhale, and without which we could neither live, move, nor have our being.

Space prevents me from commenting at any length upon the remaining photographs which accompany these closing pages. I would, however, specially direct your attention to the beautiful symmetry of trees as revealed by these charming pictures—especially when they have lost their foliage—and also to the two photographs (Figs. 54, 55), where you may observe with interest a natural avenue planted by Dame Nature herself, and an avenue of trees planted by man. I wonder which you like best, the handiwork of Nature or of man?

CHAPTER IV

ON THE FARM AND MISCELLANEOUS

THERE are many British boys who, on being asked what they would like to become in after years, reply, 'A Farmer.' It is the open-air life which makes many boys wish to become farmers; boys revel, or at least should do, in the pure unadulterated country. Boys, get as much exercise as you possibly can; cold and pure fresh air will never do you any harm, but keep out of draughts; avoid getting hot and perspiring, then standing about and catching a chill. Have a good rub down after your stiff performance on the cricket or football field or with the harriers. But do not be afraid of cold. Better be out in the teeth of an easterly blizzard, than hang about in a draughty, stifled room.

Now, to our subject. Life on a farm is an enjoyable one, no doubt; it has its advantages and its disadvantages, and a farmer's life is not always a 'bed of roses.' With these it does not come within my province to deal, and this chapter is



FIG. 59.—MAKING THE HAYRICK.



FIG. 60. — FOALS.

—as a matter of fact—a pictorial record of the charming scenes and objects which can be depicted on and around a farm by the aid of a camera.

Look at our picture (Fig. 57), a fine docile cow being milked by the cowman, who has worked on the same farm much longer than he cares to remember. See how the cow is eyeing our guide, philosopher (or should it be photographer?) and friend, Mr. Sedgwick, as he prepares to take a picture of the cowman and his charge. Notice the contented look on the cowman's face, and his two cat companions hard by, the larger of the two seeming quite interested in the milking process.

A ramble round a farm is most enjoyable, because of the nature of the surroundings and the great variety of the objects and pursuits which one comes across. Here the cowman busily milking; there the man who looks after the poultry busily feeding the chicks; there the pigs grunting in their sty and wallowing in the mire (yet who says he does **not** like pork!); yonder the faithful dog snoozing near his kennel, but all excited and watchful when a stranger appears; on the old moss-grown roof of the farmhouse many varieties of pigeons alight, and then tumble, rather than fly, through the air; growing crops which will yield us corn wherewith to make bread; and on we might go. But the busiest time of all, perhaps, is when the hay and corn harvests commence. Our next

picture (Fig. 58) illustrates a team of horses attached to a hay-cutting machine. Rapidly that field of rich waving grasses is being laid low, and under the welcome sunshine quickly dries, ready for raking into hay-cocks. Various tenants of the hayfield appear and disappear. First the reaper, then the hay-makers, or turners of the precious crops. Old men, young men, middle-age men; 'ancient Britons,' old enough to be our grandmothers, middle-age women, maidens fair, all lend a helping hand. The hay-cocks are all built up, and presently the empty carts come lumbering in at the gate towards the far end of the field, and hay-carting commences in earnest. And the men and boys are in earnest, too. They work faithfully and well, from early morn to dewy eve, under the sweltering sun.

In Fig. 64 you have a picture representing this latter scene. How enjoyable to sit quietly down and watch the progress of the hay-carting, and eventually follow the cart out of the field containing 'the last load!' Proceed to the stackyard. Here is a busy scene, all bustle and excitement. The stack assumes big proportions in almost less time than it takes to tell the story, and when at last completed the thatcher comes along—thatching is quite an art in itself—and securely roofs in safe from the rain and snows, the valuable contents which will go to swell the farmer's banking account



FIG. 61.—THE FAVOURITE GREY HORSE.



FIG. 62.—WILD HORSES IN THE NEW FOREST.



FIG. 63.—GRAZING.

FIG. 64.—CARTING THE HAY.

FIG. 65.—A QUIET COUNTRY SCENE.

if he can 'hold on' until hay fetches a good price.

Watch the ploughmen with their sturdy teams ploughing in deep furrows the rich brown soil; the sower of various seeds in the season of the year; the men and women hoeing; the hedger and ditcher; the potato weighing and the pits wherein to shelter them during the winter; the young lambs in the sheepfold in early spring; the foals in the pasture-lands gambolling in the sunshine. It is all very enjoyable and interesting, and a distinct education to participate in scenes in farming life.

On a quiet evening, when all is still, take a walk round a farm. Perchance you will meet hardly a living soul; perhaps the farmer himself taking a last look round and enjoying the pipe of peace. Another of our pictures (Fig. 65) displays one of these quiet country scenes towards the gloaming hour. A small company of pond-loving ducks just emerged from their favourite pond, and preparing to toddle (or waddle) home for the night. How delightfully peaceful is this scene!

You stand and admire a fine herd of cows grazing, speak a kind word to 'the favourite grey horse,' and watch with interest and pleasure the cattle 'chewing the cud.'

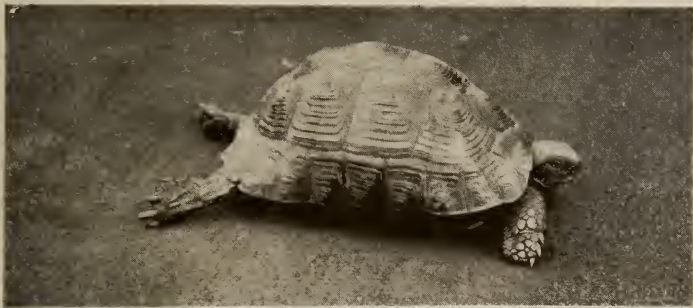
The four pictures (Figs. 60, 61, 62, 63) illustrate scenes other than those to be observed

on the farm, and account for the 'Miscellaneous' in this Chapter. Mr. Sedgwick's clever study of wild horses in the New Forest in Hampshire will be gazed upon with pleasant memories by all who have visited this beautiful district of rural England. In the forest there are numbers of these horses, but, although they run about wild, they are all the property of ascertained owners. Besides horses there are wild donkeys, pigs, cows, sheep, deer, badgers, foxes, and squirrels in plenty in the forest. Of course all the domesticated animals, although roaming about in a fairly wild condition, have their owners, and many of the animals return at nightfall with wonderful regularity to their respective homes.

And now as to our concluding three photographs of a Grecian tortoise. In Fig. 67 one of these creatures is seen making his way towards a large stone, which he evidently wishes to mount, because he is interested in that camera and its owner, and is anxious to observe the proceedings from an exalted position. Fig. 68 shows the tortoise just in the act of mounting his 'throne,' and our last photograph (Fig. 69) depicts the sagacious creature well mounted and surveying the surroundings with a critical eye. All visitors to the Zoological Gardens should visit the small glass-house beyond the snake-house, and make themselves acquainted with the giant tortoises



FIG. 66.—FINE CATTLE.



GRECIAN TORTOISE.

FIG. 67.—WALKING. FIG. 68.—MOUNTING HIS THRONE.
FIG. 69.—ON HIS THRONE.

there 'housed.' These interesting animals live to a great age, and although they have indeed a heavy plate of armour to carry about with them, I have seen the Hon. Walter Rothschild comfortably mounted on one of their 'backs,' the wonderful animal bearing his bulky burden with ease and facility.

There must be many thousands of Grecian tortoises sold alive in England every year, and most of them die unnatural deaths, being literally starved by their ignorant owners. They should be fed regularly on bread and milk, as well as a vegetable diet—such as lettuce-leaves, etc.

In the winter they go to sleep, and should be provided with a dry bed. I know one tortoise which has been kept as a pet for ten years, and is as healthy as ever; he spends the winter in the coal-cellar, and on one occasion, at least, the servant used his hard back as a hammer to break up the coal. It is said that he slept serenely through it all!

Now my pleasant task has ended; I hope I have succeeded in writing for you an interesting and a useful book, and wish you every success in your Natural History studies.

INDEX

AMPHIBIANS, 21-27

- Frog, common, 21
- „ edible, 24
- Newt, common or smooth, 26
- „ great water, 27
- „ palmated, 27
- Toad, common, 24
- „ natterjack, 25

FARM AND MISCELLANEOUS, 110-115

FISH, 27-48

- Barbel, 40
- Bleak, 44
- Bream, 43
- Carp, common, 38
- „ crucian, 39
- Chub, 42
- Dace, 42
- Eel, 37
- Grayling, 45
- Gudgeon, 40
- Life-history of a fish, 28-48
- Loach, 44
- Miller's thumb, 36
- Minnow, 42
- Perch, 35
- Pike, 45
- Pope, or Ruff, 36
- Roach, 40
- Rudd, 41
- Salmon, 44
- Stickleback, three-spined, 36
- „ ten-spined, 37
- Tench, 42
- Trout, common, 32

FROG, SKELETON OF A, 20

INSECTS, ETCETERA, 49-71

- Cockchafer, 63
- Convolvulus hawk moth, 64
- Dragon fly, 61
- Earthworm, 68
- Eyed-hawk moth, 65
- Glow-worm, 54
- Life-history of an insect, 49-54
- Maggie moth, 60
- Mimicry, 59
- Orange-tip butterfly, 69
- Peacock butterfly, 57
- Purple emperor butterfly, 66
- Small garden-white butterfly, 62
- Snail, edible, 60
- Spider, garden, 58

REPTILES, 11-21

- Adder, 15
- Common, grass, or ringed snake, 19
- Lizard, common, 13
- „ sand, 13
- Slow-worm, 14
- Snake, smooth, 19

WILD FLOWERS AND TREES, 72-109

- A useful weed, 98
- Afforestation and an Arbor Day, 101
- Classification of plants, 72-76

WILD FLOWERS AND TREES—

continued

- Colours of early spring flowers, 102
- Cuckoo pint, 87
- Daisy, 99
- Date of foliation of trees and shrubs, 104-105
- Horse-chestnut, 105
- How plants are cross-fertilized and seeds distributed, 81-87

WILD FLOWERS AND TREES—

continued

- Marsh marigold, 94
- Plant structure and pollination, 76-81
- Primrose, 93
- Round-leaved sundew, 90
- Shapes of leaves and their value to man, 108
- Wild rose, 100
- Wood anemone, 96
- Wood sorrel, 92

:: :: SOME :: ::

NATURE BOOKS

POPULARLY WRITTEN, SCIENTIFICALLY ACCURATE
AND PROFUSELY ILLUSTRATED.

By **OLIVER G. PIKE, F.Z.S., F.R.P.S.**

Birdland's Little People.

Illustrated by Photographs from Nature taken by the author.
Attractively Bound in Coloured Picture Cover. Foolscap
quarto ($8\frac{1}{2} \times 6\frac{1}{2}$ inches).

"Young readers will be drawn to the book as to a fairy tale."

—*The Aberdeen Free Press.*

"For writing a series of nature studies for children, Captain Oliver G. Pike possesses the two prime qualifications that he knows birds and knows children. The volume is charmingly illustrated."—*The Scotsman.*

By **OLIVER G. PIKE, F.Z.S., F.R.P.S.**

Birdland Stories for Young People.

Another splendid "Bird" Book by this popular author, written in his usual captivating manner. It consists of twelve delightful sketches of as many birds, each illustrated by two beautiful and rare photographs. A feature of the book is a clear but short description of the birds mentioned in the volume.

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

Nature, Curious and Beautiful.

Fourth Edition. With 69 Illustrations from Drawings made by the author. Crown 8vo, cloth gilt, Coloured Medallion on Cover. The aim of this volume is to induce young readers to think more of the curiosities to be found in nature's many workshops.

"It is as interesting and instructive as it is delightful and uncommon."

—*The Birmingham Post.*

"It is well adapted to interest young readers in Nature."—*The Times.*

By **MRS. BRIGHTWEN, F.E.S.**

Rambles with Nature Students.

Third Impression. With 130 Illustrations by Theo. Carreras. Large crown 8vo, cloth boards.

"A beautiful volume, full of facts about plants, insects and birds. Its contents are as bright as they are varied."—*The London Quarterly Review.*

"An admirable little guide for all who are weary of bricks and mortar."

—*The Academy.*

THE "R.T.S.," 4, BOUVERIE STREET, LONDON, E.C. 4.

SOME NATURE BOOKS

POPULARLY WRITTEN, SCIENTIFICALLY ACCURATE
AND PROFUSELY ILLUSTRATED.

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

Fifty-Two Nature Rambles.

Sixth Impression. With 5 Coloured Plates from drawings by C. F. Newall, and 100 other illustrations from photographs. Large crown 8vo, cloth gilt, Coloured Medallion on Cover.

"A young reader might search long before finding a better or more congenial introduction to the Study of Nature."—*The Scotsman*.

"The studies are simple, accurate, and entertaining. The range of subjects is wide; flowers, birds, and beasts of all sorts being noticed."—*The Morning Post*.

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

Every Boy's Book of British Natural History.

Eighth Impression. With Coloured Frontispiece, 64 plates from photographs taken with a home-made camera by the Rev. S. N. Sedgwick, and with an introduction by the Right Hon. Lord Avebury. Large crown 8vo, cloth gilt, Coloured Medallion on Cover.

"A volume which many a lad will welcome just as heartily as any work of fiction."—*The Glasgow Herald*.

By W. PERCIVAL WESTELL, F.L.S., M.B.O.U.

The Boy's Own Nature Book.

Fourth Impression. With 2 Folded Coloured Plates, Coloured Frontispiece, and 64 plates from photographs taken direct from Nature by the Rev. S. N. Sedgwick, M.A. Coloured Medallion on Cover, large crown 8vo, cloth gilt.

"For parents who may be anxious to direct their boys in Nature-study, this book can be highly commended."—*The Daily Chronicle*.

"Crammed full of just the information a boy ought to have about the things he sees in every-day country life."—*The Life of Faith*.

By ANNE PRATT.

Wild Flowers of the Year.

Containing 48 Coloured Plates of 95 Flowers selected, described in an Appendix, and indexed by the Rev. Professor George Henslow, M.A., F.L.S., F.G.S. Large crown 8vo, cloth boards.

"Essentially a volume for the Lover of Nature."—*The Educational News*.

"A very delightful volume for the youthful botanist. Of very considerable educational utility."—*The Western Daily Press*.

SOME NATURE BOOKS

POPULARLY WRITTEN, SCIENTIFICALLY ACCURATE
AND PROFUSELY ILLUSTRATED.

By **FRANK BULLEN, F.R.G.S.**

Creatures of the Sea.

Fifth Edition. With 40 full-page Illustrations by Theo. Carreras. Demy 8vo, cloth gilt.

"Mr. Bullen's book is pervaded by that wholesome sea air which has marked every page that he has hitherto written. . . . All the denizens of the deep sail through these brilliant and entertaining pages."—*The Spectator*.

"Full of information. After reading the book I felt as if I had received a fresh education in natural history."—*The British Weekly*.

By **GEORGE HENSLOW, F.L.S., F.G.S.**

Examiner in Botany for the College of Preceptors.

How to Study Wild Flowers.

Seventh Impression. With Appendix, 12 double page Coloured Plates and 57 other Illustrations. Crown 8vo, cloth gilt, coloured Medallion on Cover.

"Mr. Henslow is a teacher of tested accuracy and gift. His botanical manuals have long been deservedly popular."—*The London Quarterly Review*.

"We could have no more accurate and complete guide to the study of British wild flowers. . . . Mr. Henslow has given special attention to simplicity and arrangement, and lucidity and clearness in imparting knowledge."

—*The Liverpool Daily Courier*.

By **LEWIS WRIGHT.**

A Popular Handbook to the Microscope.

Fourth Edition. With many Illustrations.
Crown 8vo, cloth gilt.

For one about to study Nature through the microscope this work will be of inestimable value. Mr. Wright fully explains the manipulation of the instrument and also the preparation, mounting, and selection of objects.

"The author's practical suggestions will be of great value, not alone to beginners."—*The Times*.

By **HENRY SCHERREN, F.Z.S.**

Through a Pocket Lens.

Second Impression. With 90 Illustrations, crown 8vo,
cloth gilt.

"We cannot imagine a more useful preliminary training for a young student than working with a pocket lens through the course indicated by the author."—*The Field*.

"Give this book to an intelligent boy or girl with a taste for natural history, and let it be used not merely as a reading-book, but as a guide-book to Nature study, and you will do more towards cultivating the spirit of investigation than by dozens of lectures."—*Nature*.

SOME NATURE BOOKS

POPULARLY WRITTEN, SCIENTIFICALLY ACCURATE
AND PROFUSELY ILLUSTRATED.

By HENRY SCHERREN, F.Z.S.

Popular Natural History of the Lower Animals.

Second Edition. With 168 Illustrations, Coloured Medallion
on Cover. Crown 8vo. Cloth gilt.

This work, which confines itself to the backboneless animals, is written in simple language. The volume will be of equal value to the young naturalist and the more advanced student.

"A volume that we can recommend with every confidence as a reliable text-book."
—*The Schoolmaster.*

"This book is a world of wonders, and Mr. Scherren explains the marvels of insects, worms, star-fish, sponges, etc., in a way that will make his readers eager to pursue the study. A book of exceptional interest and merit"—*The London Quarterly Review.*

By HENRY SCHERREN, F.Z.S.

Ponds and Rock Pools.

Fourth Impression. With 67 Illustrations. Crown 8vo.
Cloth gilt.

Describes how to search ponds and rock pools for minute animals; what instruments to get and how to use them; and how to preserve and how to study under the microscope the animal forms met with.

"Written in clear, simple phraseology, and full of practical hints, the book is an admirable guide for the young collector, telling him where, how, and when to make his researches."—*The Manchester Courier.*

"The amateur will find Mr. Scherren's book a very valuable and accurate guide."
—*The Daily Chronicle.*

By JOHN W. GOFTON.

Talks about Trees.

With numerous Illustrations by the Author. Crown 8vo.
Cloth boards.

"An interesting and reliable book, whose usefulness for beginners is enhanced by the author's illustrations."—*The Glasgow Herald.*

"Gives us all the information we require in order to recognise and distinguish one tree from another."—*The Irish Presbyterian.*

By AGNES GIBERNE.

This Wonder-World.

With 8 Plates and numerous Illustrations in the Text. Crown 8vo.
Cloth boards.

"An altogether welcome book, which should find its way further than the schools, for which it is written."—*The School Guardian.*

"Just to make boys and girls think appears to be the main idea of this charmingly written book, and we confidently anticipate that the object will be attained."
—*The Schoolmaster.*

~~25~~
37

018290

