



NATURE'S PLAYGROUND





A. GAY FLÜTTERER

*Front's piece*

The brilliant-coloured Emperor Moth is found on heather moors, where it can be seen flying on summer afternoons and evenings. The male is of a much brighter hue than the female, but both have "eye-spots".

# NATURE'S PLAYGROUND

IN FOUR BOOKS

by  
*M. Cordelia E. Leigh*

*Illustrated with over 250  
Photographs and Diagrams*



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appear at the beginning of each  
section.*



## SPREADING THE NEWS

*Above all flouris in the mede,  
Then love I most these flouris white and rede,  
Soche that men callen daisies in our towne . . . .  
And whanne that it is eve, I renne blithe,  
As soone as ever the sunne ginneth west,  
To seene this floure, how it will go to rest,  
For fear of night, so hateth she darknesse,  
Her chere is plainly spread in the brightnesse  
Of the sun, for there it will unclose.*

CHAUCER

THE other day I was listening to some music, and in the programme I found that a song was to be sung called "Spreading the News." When its turn came, I heard how the skylark told the robin, the robin told the wren, all the birds told each other, the snowdrop told the rain, and the rain told a little girl, a great piece of news—"Spring has come again!" Indeed, I believe that if we look about us we may see for ourselves that spring has come.

For here in the hedgerows and the woods we see Celandines (sometimes called Pilewort), Dog's Mercury, Dead Nettles, red and white, and Primroses are beginning to peep. Shall we pick a Celandine and look at it closely and make out its different parts? A Celandine is different from a Buttercup though it belongs to the same family, and is related to all the Crowfoots. But while Buttercup has only five petals, if you count the Celandine's you will find it has from eight to ten. And the green leaves are different. Buttercup's leaves are rather fern-like, Celandine's are more solid, broader and more heart shaped.

The bright golden petals together form the "corolla," which means "little crown." The "calyx," or flower cup, which is like a little case or envelope surrounding the golden crown, is made up of three little green

OPPOSITE: *We are all glad when the "Dancing daffodils" rear their heads to whisper that spring has come. This Lake District scene shows them in all their glory.*

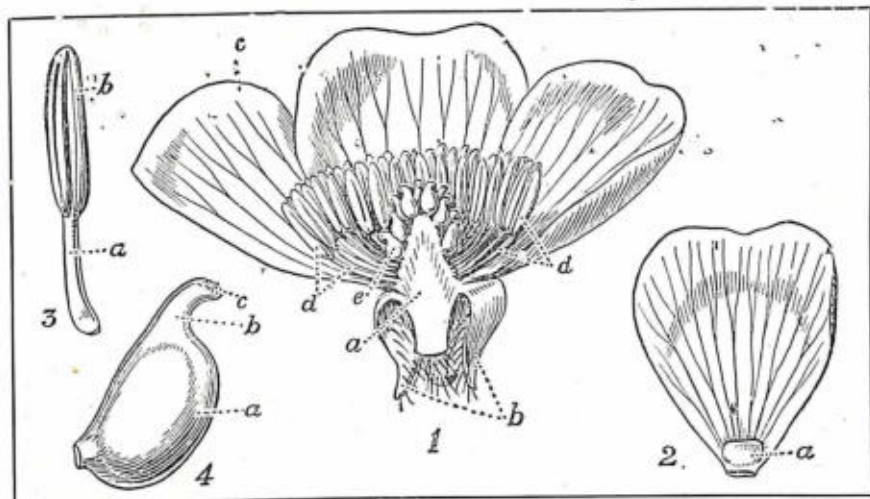
leaves called "sepals." Then if you look into the flower you will see a number of threads or stalks with broader tips. These are the stamens, and they hold the pollen dust which will make the seed grow. In the very middle of the flower is a green knob, called the pistil. This covers the seed box holding the tiny grains which one day will be seeds.

Later in the spring, when Celandine's relations, the Buttercups, have arrived, I advise you to look at one carefully. Put it up against your face and your nose will be covered with yellow pollen from the stamens. The pistil is easily seen if you pull off the petals. It looks rather like a little green, unripe blackberry and you will see the tiny yellow stalks with hooked tips coming out from the pistil. These are called stigmas. Inside the pistil is the seed box, where the seeds will ripen when the time comes. Try to remember these names of the different parts of a flower. We shall want to talk about them again when we think about insects visiting flowers.

If you look in a botany book for our Celandine you will find that

*BELOW: The hardy Buttercup makes a brave show with its fern-like leaves of dark-green and its deep golden flowers. Buttercup appears quite early in the spring, though not so early as its relative, the lesser Celandine.*





The parts of a Buttercup: 1. Vertical section through flower: (a) receptacle; (b) sepals; (c) petals; (d) stamens; (e) pistils. 2. Petal: (a) nectary. 3. Stamen: (a) filament; (b) anther. 4. Pistil: (a) ovary; (b) style; (c) stigma.

it is called the Lesser Celandine. There is another flower called Celandine, but it does not belong to the Buttercup family. It is one of the Poppy tribe, and it flowers later in the year: in fact its grand Latin name, *Chelidonium*, comes from "a swallow," probably because it flowers about the time that the swallows arrive.

The Lesser Celandine's Latin name is shorter—*Ficaria*, from "a fig"—so you can call it Fig Buttercup if you like! I think you will see how it gets its name if you pick one up by the roots. You will see that it has little fig-shaped swellings on the roots, like baby potatoes, and like potatoes these are called tubers. A great deal of food-starch, sugar, etc. is stored up in these tubers, which no doubt is the reason why it flowers so freely and so early in the year.

The poet Wordsworth wrote in praise of the small Celandine.

"Pansies, lilies, kingcups, daisies  
Let them live upon their praises.  
Long as there's a sun that sets  
Primroses will have their glory,

Long as there are violets  
 They will have a place in story.  
 There's a flower that shall be mine,  
 'Tis the little celandine."

But the farmers do not love it as the poet did! It injures herbs growing near it, and cattle refuse it. Its roots are very bitter, but they are used in medicine. Little Celandine likes a good rest: it closes its flowers from five in the evening to nine next morning.



*The dainty Wood Anemone  
 likes a windy home.*

The Buttercup or Crowfoot family is a large one, and some members of the family such as the Windflowers—Wood Anemone, the Pasque Flower, and two very rare kinds, the Blue Mountain Anemone, and the Yellow Wood Anemone—come out early in spring. The Pasque Anemones are not very common: they like chalk downs and limy soils, and there is a curious legend that they only grow "where Danish blood has been shed." The petals give a rich green dye, which was used in old days for dyeing Easter or Pace Eggs, and this is why the Anemone was given its name of Pasque Flower. Old records tell that in the time of Edward I. four hundred eggs were brought to be stained and gilded

for the royal household. The pretty little Wood Anemone well deserves its name, for it will flourish in high windy places as well as in woods.

There are near relations of the Buttercup which come out later in the spring—Water Crowfoot, River Crowfoot, Water Fennel, Mud Crowfoot, Ivy-leaved Crowfoot, Wood Crowfoot (very like the meadow Buttercup, but the flowers are smaller, and it grows in a more straggling way) and Celery-leaved Crowfoot which may blister your skin if you are not careful in picking it. One of the smaller Buttercups which flowers early, is the bulbous-rooted Crowfoot. It spreads itself over the meadows and turns them golden in May.

Let us see if we can find some other early spring flowers. The Winter Aconite, which also belongs to the Buttercup (*Ranunculus*) family, is not a native of England, but we can sometimes find it growing wild, probably an "escape" from some garden. It is a near relation of the Hellebores—Green Hellebore, Fetid Hellebore or Setter-Wort, and the welcome Christmas Rose of our gardens is a Hellebore. Its Latin name is *Hellebore niger*, "niger" or "black" from its black root.

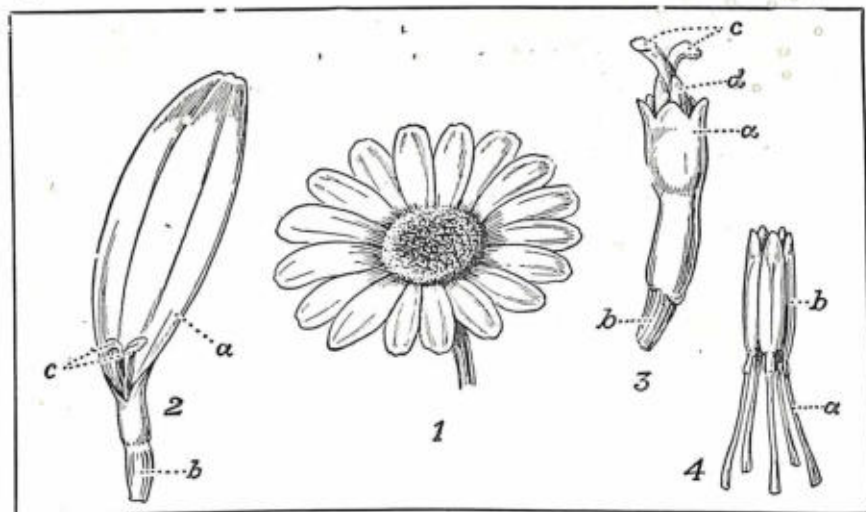
Thus, February has been made by a poet to sing:

The crocus, the snowdrop, the star wort appear,  
The hellebore waited to see me and die,  
And sweet polyanthus peeps up at the sky.

A welcome sign that spring has come is the appearance of this queer flower, the spotted-leaved Arum, called also Cuckoo Pint, Wake Robin or Lords and Ladies. Look at the tall yellow or purplish club-shaped pillar rising up like a spear from the large green leaf called the "spathe." The flowers have no calyx and no petals, but a ring of little stamens surrounds the pillar, and below them is the pistil. You might think it would be very easy for the pollen to fall out of the stamens on to the pistil to make the seeds grow, but this would be useless, as the pistil ripens and is ready for the pollen before the pollen is ripe. So what is to be done? Well, the work will be carried out by a number of small insects which are enticed by the bright colour of the pillar, and by its smell, which to us is very disagreeable, but is no doubt delightful to them!

They crawl down the tube while the pistil is still ripe, and at the narrow part of the tube is a fringe of hairs. The hairs point backwards, and so the flies get in easily, but once in they are kept prisoners for a time till the stamens ripen, when the hairs shrivel up and they are set free. Meanwhile, if they have brought pollen from another Arum on their hairy wings, it is shaken off into the pistil while they are searching for honey. Presently the pistil dies down, the stamen ripens, a fresh shower of pollen is scattered upon the insects, the hairs shrivel up, and the insects fly away, carrying the pollen to the next Arum which they visit, and leave it on its pistil.

In late summer or autumn the pillar and the great green leaf will



The sections of a Daisy, above, are: 1. Flower head. 2. Outer flower: (a) corolla; (b) ovary; (c) stigmas. 3. Inner flower: (a) tubular corolla; (b) ovary; (c) stigmas; (d) stamens. 4. Stamens from inner flower; (a) filaments; (b) anthers.

die away, and only bright red berries will be left, very pretty to look at, but very poisonous.

And here are some very common favourites, belonging to a very large family called the Composites or Compound flowers, because each flower is "composed" or made up of a number of little florets, every floret complete in itself. The Daisies and Dandelions, "rosette flowers" as they have been called, belong to the Composites. Look carefully at a floret of a Dandelion, and you will see that it has a little green envelope or case (called *involucre* in botany books) to keep its seed box safe, five yellow petals, five stamens holding the pollen, and a tiny tube-shaped pistil with two curved hooks at the top, each like the curved handle of a fairy's umbrella. And there may be from one hundred to two hundred of these little florets making up the Dandelion's bright golden corolla or flower head. Its name comes from the French *dent du lion*, as its leaf is supposed to look rather like a lion's tooth in shape.

An English visitor to the Botanic Garden at Sydney, in Australia, tells how he saw a very fine specimen of an English Dandelion holding

an important place in the exhibition there, and grandly labelled *Leontodum Taraxacum*. No doubt many of the Australians who had never seen a Dandelion before greatly admired it, and so should we if we were not in the habit of looking down on it as just a common weed. Its glowing golden rosette attracts many insects.

The Dandelion takes care of its pollen and seeds, shutting up on a rainy day, or at about five on a fine evening, opening again about seven next morning. You know how the Daisy—"day's eye"—opens at sunrise and shuts at sunset. The French name for Daisy is *Marguerite*, which also means a pearl. In old English both pearls and Daisies were known as *Marguerites*. Thus in Wicliff's translation of the Bible we have in St. Matthew viii.: "Nyle ye give hooly things to houndis neither cast ye your marguerites before swyn."

Dandelions and Daisies are both very hardy plants, as the farmer knows to his cost, and so is another troublesome Composite, the Coltsfoot. This comes out very early in the spring, and looks rather like a smaller Dandelion, but without the bright green leaf. Its Latin name, *Tussilage*, from *tussis*, a cough, was given because formerly it was much used in medicine for chest complaints. It is fond of clayey soils, where it grows in abundance, for every part of its rootstock can send up a fresh plant.

BELOW: *Though the Daisy is the humblest of flowers it has an unassuming beauty of its own. It is not particular where it makes its home.*





## WHITHER AWAY?

O thou  
 Who chariotest to their dark wintry bed  
 The winged seeds, where they lie cold and low,  
 Each like a corpse within its grave, until  
 Thine azure sister of the spring shall blow  
 Her clarion o'er the dreaming earth, and fill  
 (Driving sweet buds like flocks to feed in air)  
 With living hues and odours plain and hill.

SHELLEY

*(Ode to the West Wind)*

WHEN we thought about the Dandelion we said how widely it spreads itself, on patches of waste land and in fields and by the roadside. Can you think how this happens? Well, I dare say that sometimes you have played at "blowing dandelion clocks," and you know how after the yellow petals have fallen, the fluffy, silky, white "clock" is left, and this is easily puffed off the stalk. It is the silky covering of the Dandelion seed, and when the wind blows the seed is carried far and wide by its little charioteer.

The Coltsfoot also has a fluffy covering to its seed, and has a rather curious way of behaving. Now, in the early spring, we may see the flower's stalks standing up straight and stiff, with a yellow flower head on every stalk, but there are no green leaves as yet. Coltsfoot seems to be giving all its attention to its seed, and to be in a hurry to set it before many other flowers come out. When the seeds are set the yellow flower head droops and bends itself over to keep the seed safe from wind and spring showers. Soon the feathery seeds ripen, and the stalk lengthens and raises its head again, and the seeds are scattered by the March winds. Then the green leaves begin to shoot out from the creeping underground stem, covered with white down on their undersides.

OPPOSITE: *The Wild Clematis creeps its way along the hedges. The wind helps to spread its seeds around the countryside.*



*The golden Dandelion has to thank the wind for spreading abroad its fluffy "clocks."*

Coltsfoot's near relation, the Butterbur, which also loves damp places, behaves in very much the same odd way. Its pale flesh-coloured or purplish flowers come out during April and May, and its leaves are very large, sometimes nearly three feet broad, standing on stalks a foot long.

A well-known plant with feathery seeds is the Groundsel, which your canary enjoys so much. Another pretty, but very tiresome, flower is the Great Willow Herb, sometimes called Codlins and Cream—tiresome because when the seeds,

tufted with long down, and falling from their pod-shaped seed cases, are blown about by the wind, the flowers may become too plentiful if they find their way into the garden. But in their proper place, growing for instance on the banks of a river, they will give us pleasure in the summer by looking so beautiful.

We were speaking lately of the Buttercup. Buttercup's seeds are very tiny, and each lies cosily inside a little brown case: they are very light, and may be carried a long way by the wind, for they have flat surfaces against which the wind can press.

I am sure you can think of another plant with feathery seeds which are blown about far and near. You know Thistle-down, little feathery balls of Thistle seeds floating about in the air like toy balloons? There

is a legend that homesick Scotsmen carried Thistles to different parts of the world, and now the mischievous weed flourishes where formerly it was not known, but probably this is a made up story! They are most plentiful later in the summer, especially in July, when we shall see the humble bees enjoying themselves, sucking their honey and not seeming to mind the prickles.

The Scotch or Cotton Thistle is the Thistle which the Scots take as the emblem of Scotland: and an old story tells how a Dane stealing on some sleeping Scots whose country the Danes were invading, trod on a Thistle and cried out, and so woke them. Hence Scotland took the Thistle as its emblem. The Cotton Thistle is very prickly and thorny, both in its flower and its leaves, which gives point to the Scottish motto, "No one touches me without being punished,"\* or "Ye mauna meddle wi' me!"

We generally think of Thistles as being good food only for donkeys, but in old days people ate the young shoots of most kinds of Thistles, and they were used in medicine in the seventeenth century. How would you have liked to have tried "plague water," given in those days to prevent people from catching the plague—made up of Thistle, Masterwort, Angelica, Peony, Butterbur, Viper Grass,



*The Cotton Sedge, with its white plumes, is found growing in boggy ground.*

\*"Nemo me impune lacessit."

Virginian Snake-Root, Rue, Balm, Water-Germander, Marigold, Goat's Rue and Mint, infused in spirit of wine!

The Wild Clematis, also called Traveller's Joy, is another plant with feathery seeds which I dare say you know well. It has other pretty names—Withywind, Old Man's Beard, Virgin's Bower. When autumn comes we shall see its clusters of seeds hanging like cobwebs in the hedges. By means of these seeds, scattered by the wind, and also by twisting itself round and round other plants in the hedgerow, Traveller's Joy spreads itself far and wide.

We sometimes see boggy, marshy land looking as if some one had



*The Poppy sends out her seeds in dry weather, when the wind shakes them abroad.*

been scattering tufts of cotton wool about the marsh. These wool-like tufts are the feathery white seeds of Cotton Grass which the wind carries to and fro.

There is a plant which has an odd way of jerking out its seeds to a distance if it is touched. This is the Wood Sorrel, the pretty white flower with triple leaf which blossoms from May onwards through the summer. Some think that it was the "Shamrock" or "Shamrog" which St. Patrick held up before the Irish when he preached to them of the Trinity, but others believe the Shamrock to have been one of the clovers.

The Yellow Balsam,

or Touch-me-not, which is common in gardens, though not often found growing wild, behaves in a very rude way, for if you touch it, even gently, its long brown seed pod curls itself back and bursts, and jerks its seeds into your face.

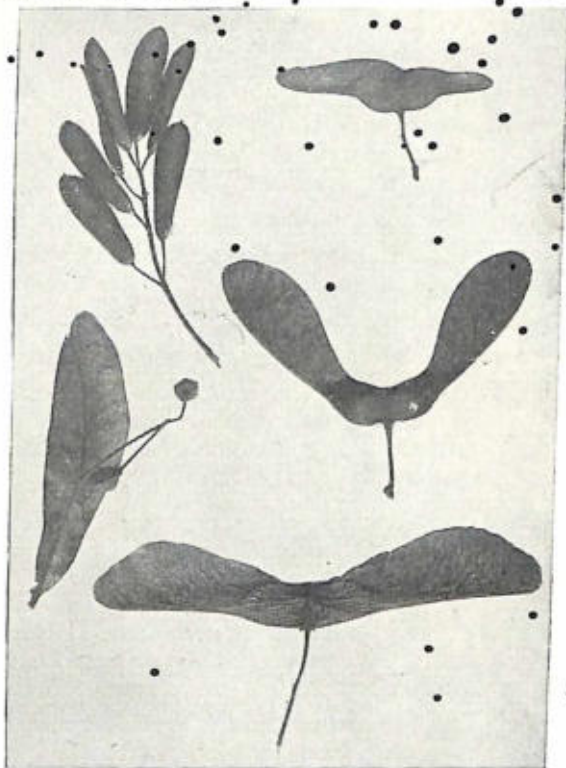
The same sort of thing happens in the case of the Peas and the Gorse and Broom. Their pods burst and the seeds are scattered. In autumn, when the Gorse seeds are ripe you can hear their pods crackling and sometimes exploding with a noise like fairy pistol shots.

You know how a Poppy head has little cells or rooms inside it for its small black seeds. When

the Poppy head is ripe, the small teeth at the top roll back, and when it sways in the wind the seeds are shaken out from its little "pores" or holes like pepper from a pepper pot.

Perhaps when autumn comes, you will like to pick up and eat some of the little brown Beech nuts which have fallen out of their prickly shells or "mast." Some of these Beech nuts may be carried off and buried by squirrels, red and grey, which like to hoard up treasure for the winter, and so the seeds will be spread.

Now for some seeds which are furnished with "wings." We think of some of the forest trees, Elms, Maples, Sycamores, Ash trees. We



*The "aeroplane" fruits of the maple, sycamore, ash and lime are easily carried on the wind.*



*These wayside fruits are Woody Nightshade, Wild Rose, Honeysuckle, Wild Arum, Hawthorn and Yew.*

remember now we can see the pairs of winged seeds, "keys" as they are called, hanging from the Maple branches, and often turning a beautiful red colour in the autumn. The narrow keys of the Ash are sometimes called spinners, as each wing has a little twist which sends it spinning round like a teetotum when it is blown by the wind. It comes fluttering down to earth, and the part which holds the seed touches the ground first.

Later in spring we shall find the ground under the Elm trees covered with their winged seeds, each wing looking like a little

scrap of brown paper with a bump where the seed lies.

Can you think of some other trees which often grow in windy places and which have winged seeds? Pines and Firs have winged seeds inside their cones. It is difficult to cut a cone in half, but if you come across one that has just split open you will find the seeds ready to drop out, and they will soon be scattered by the wind.

You may spread seeds yourself if you walk through woods in summer or autumn, and sticky burrs from the Burdock plant, or from Goose Grass (also called Cleavers, or Sticky Willie) fasten on to your dress. They may hook themselves also on to animals, sheep or rabbits.

Another way in which you may scatter seeds without knowing it is by eating an apple or an orange and throwing away the core and the

pips. The nice, fat, rosy part of the apple which is so good to eat is not really the fruit—it is the outside covering of the fruit, called the “ovary” in botany books, left behind after the petals of the flower have fallen: the real fruit is the hard core in the middle, with its neat little rooms or cells, each holding its pip or seed. In the same way, you eat the fruit case of an orange or lemon or grape fruit and throw away the real fruit which is the seed in the middle. Thus the seeds are scattered.

The Mistletoe berry is very sticky, as you may have found out if you have hung up a branch at Christmas. When the birds peck at it they will clean their beaks against the bark of trees, and some of the seeds left on their beaks are planted in the bark. Birds, too, are attracted by bright berries such as hips and haws, and when they eat the soft parts the hard seeds pass through their bodies and are scattered.

Ants are very fond of oily seeds, such as Gorse seeds, Cow Wheat, Cornflower: they carry them away to store in their ant-hills, and no doubt drop many on the way.

We have only thought of a few of the many ways in which seeds are scattered. You may find out other ways yourselves if you watch for them.

BELOW: *The Mistletoe, which you may find hanging thickly from the branches of a gnarled Apple tree. Its sticky berries are carried away by the hungry birds, who leave some of the seeds in the bark of trees where they take root and grow.*





## A MUSICAL INSTRUMENT

*Spring, the sweet Spring, is the year's pleasant king:  
Then blooms each thing, then maids dance in a ring,  
Cold doth not sting, the pretty birds do sing—  
Cuckoo, jug-jug, pu-we, to-witta-woo!*

T. NASHE, 16th cent.

HAVE you a singing class in your school? If so, I dare say you enjoy practising your songs. What is it which makes us able to speak and sing? Well, in our throats there is a kind of musical box called a larynx, with strings on which the air from the windpipe plays and sets it moving, and this makes us able to speak and sing and make sounds. We might almost say that we have a little piano or little harp inside our throats! Now a bird also has a little musical box with strings inside its throat, in the lower part of its windpipe, called the syrinx. It does not use its tongue in singing. The strings can be loosened or tightened, and so we hear many different sounds from birds' throats, the songs of the singing birds, call notes and warning notes, the quack of the Duck, the hoot of the Owl, the croak of the Raven, the scream of the Peacock, and so on.

In the springtime we hear many of the birds again which were silent in the winter. The cock Blackbird indeed may be heard even in February. We may know him from his wife by his jet black coat, yellow beak and yellow eyelids: his wife is sooty brown with a dull beak, and the little ones are rather like her.

Blackbirds and Thrushes are quite ready to sing happily through the rain, and even when thunder is rolling and lightning flashing. Indeed the Missel Thrush gets its name of "Stormcock" because it will sing through storms. Its other name of Missel Thrush comes from its supposed fondness of feeding on mistletoe berries.

Its song is louder than that of the Song Thrush, but it is a shy bird,

OPPOSITE: *Jenny Wren, seen at her front door, is almost as sweet a singer as is the Nightingale, though she is much smaller.*

and does not often allow a listener to come near enough to hear the song in its full strength.

The Missel Thrush generally nests in trees rather than in bushes or shrubs: and builds a beautiful nest of various kinds of moss, leaves, grass and wool, lines it first with mud, and over the mud spreads a nice carpet of long grass strengthened with twigs. In this nest Mrs. Missel Thrush lays four eggs, bluish-green or pale buff, spotted reddish-brown or grey.

The Song Thrush or Mavis is smaller than the Missel Thrush and less spotted. She lays five beautiful blue eggs, sometimes spotted with black or mauve. Her nest is made of dry grass, moss and leaves, lined with damp, rotten wood, and she hollows it into a cup shape by turning herself round and round in it.

When the little, naked young Thrushes are hatched, both parents will feed them very busily with earthworms and insects. By about the end of March the first brood will be on the wing or hunting for food for themselves, and soon the parents will be busy with a new nest, for Thrushes rear two or three broods in one season.

BELOW: *The Song Thrush, another merry singer, is heard as early as February.*





*These dainty Missel Thrushes are very sweet songsters. At the height of a storm their song is heard at its best.*

The Song Thrush is very fond of snails, and I dare say you have seen him hammering an unhappy snail on a stone in order to break the shell and get at the nice tit-bit inside. This done, he will stand on one leg and thrill out a song, which some one has written down thus: "Knee-deep, knee-deep, knee-deep, cherrydu, cherrydu, cherrydu, white hat, white hat, white hat, pretty Joey, pretty Joey, pretty Joey."

I wonder which bird's song you like best? Some people think that the Song Thrush's is the finest of all. A writer on Natural History tells how during the Great War he heard a Thrush singing in the ruins of Arras Cathedral while a battle was going on not far away. The bird sang on till it was almost dark, and then it flew down from its perch in the frame of a broken window and settled itself near its sitting mate, in the shelter of a small bush in the courtyard.

Nightingales are said to sing their best in a storm, when they seem to be trying to outdo the noise of the thunder, or when they are rivalling other birds, Thrushes, Blackbirds, Blackcaps, Missel Thrushes, all singing their loudest. Many people imagine that Nightingales sing



*The Blackbird's cheerful song, heard in early spring, is a welcome sound. Here the mother bird, who is not so black as her mate, is sitting on her eggs.*

only at night; this is a mistake, as, though of course they do sing at night when other birds are silent, they give forth their songs equally in the daytime. Another mistake, which is to be found in some of the poems on Nightingales, is to speak of the singing Nightingale as "She," as only the male Nightingale is the songster.

"Lord," writes Isaac Walton when praising the Nightingale, "what music hast Thou provided for the Saints in heaven, when Thou affordest bad men such music on earth!"

But to go back to the early spring songsters. The Blackbird is a first cousin of the Thrush, for he belongs to the large Thrush family. You know how we often see Blackbirds and Thrushes hopping about together in our gardens and on our lawns: the Blackbird generally cheerful and excited, sometimes giving his alarm cry "tchuk, tchuk," sometimes pouring out his rich contralto song; which is unlike that of any other bird except perhaps the Missel Thrush. In the early spring the male Blackbirds have some good fights with a great deal of noise

and excitement, but there is very little harm done. Each Blackbird wants to have his own piece of ground for himself and his wife and family and to keep the others away. If you watch I think you will find that a Blackbird will build in the same bush or hedge or wall year after year.

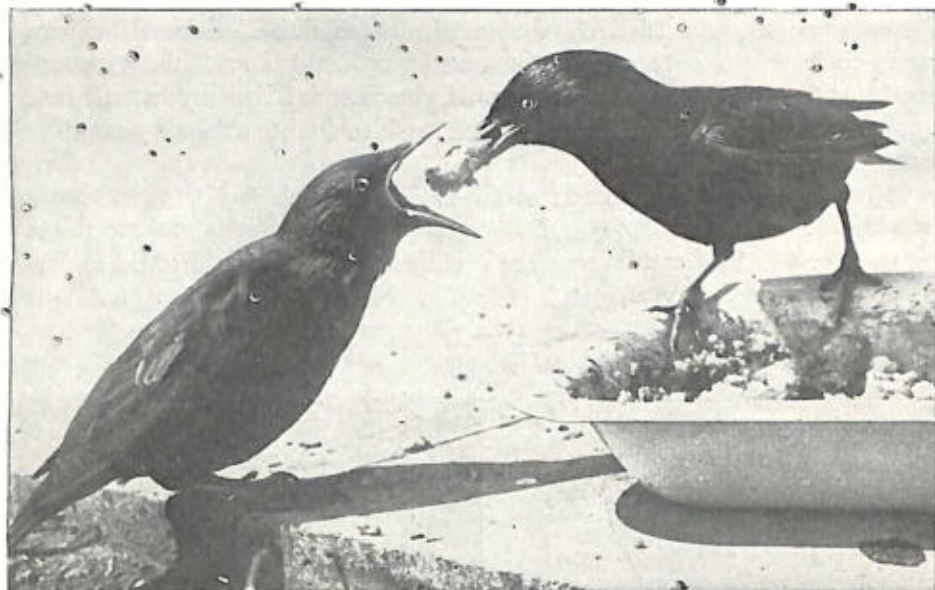
How do young birds learn to sing? Naturalists say that in many cases their parents teach them, but that some young birds pick up notes for themselves by listening to their elders just as a little child learns to speak. Perhaps if you watch carefully this spring you may find out something about this for yourselves. But remember, that if you want to discover anything about wild creatures you must go into some hiding-place and there be very quiet while you are watching: you will discover nothing if you move about or make any sort of sound.

Many birds are quite good mimics of other birds' songs. Blackbirds, for instance, have even been heard to crow like a barndoor cock and cackle like a hen. Starlings can be taught to speak words and even sentences as talking Parrots do.

You know that in summer the birds begin their songs very early. One bird lover who sat up through a night and the small hours of the morning in June, to time their dawn chorus, writes that a Skylark began it at two-five a.m. The



*The Nightingale, king of songsters, is heard warbling sweetly by day as well as by night.*



*The Starling likes to whistle little tunes and can be taught many simple little melodies. Meal-time is in progress above. The baby is as big as mother.*

lark was soon followed by Whinchats, and then by a Song Thrush. A Blackbird and a Cuckoo sang at two-thirty: these were quickly followed by a Redbreast, and a Whitethroat sang at three-two, and a Tree Pipit at three-five. A Chaffinch was to be heard at three twenty-five, then a Greenfinch, and a Turtle Dove at three-forty a.m.

Thrushes, Blackbirds, Tits, all belong to the great family of Finches, and so do our tame Canaries. They are also called the perchers. You know that your Canary has three toes in front and one behind? This makes it easy for him to cling to his perch, and in the same way all the Finches can settle themselves on twigs or palings. Can you think of any other kind of birds which could possibly perch on a twig?

Then notice Dicky's beak. See him snap up the seeds you give him and crack them with a funny little noise. He has a narrow sharp beak for slitting the seeds easily, and so have other hard billed birds, such as the Greenfinch, which is fond of dandelion and thistle seeds. Now if you have the chance, look—perhaps with a field-glass—at the beak of a

Thrush or a Blackbird: you will find that it is not quite so slender as the Canary's but neither is it blunt: it is a useful beak, formed for snapping up insects and fruit, as well as seeds.

While we are thinking about birds feeding, we may remember that people have different ideas about the good or the harm done by the birds. It is of course true that Blackbirds steal some of the fruit in our gardens, but I think we should miss their songs if they were all driven away! And though many birds steal grain and fruit, many also feed largely on harmful insects, grubs, snails and slugs, so that some would plead that they may be spared, not only because of their pleasant songs but also on account of the good they do as insect and slug eaters.



*The photographer who seized the opportunity to snap these five baby Tits was a lucky man. He hid near the nest and waited until the little birds gathered themselves into this delightful group. Then he pressed the shutter of his camera.*



*First stage: From Egg to Tadpole.*



*Development of the Tadpole.*



*Second stage: From Tadpole to Frog.*



*Third stage: The tail disappears.*

*Last stage:  
The Mature Frog.*



*The Tadpole's interesting life-story is enacted in the above picture.*

## SWIMMERS, CRAWLERS AND JUMPERS

*And yet He has made dark things  
To be glad and merry as light:  
There's a little dark bird sits and sings,  
There's a dark stream ripples out of sight,  
And the dark frogs chant in the safe morass.*

E. B. BROWNING

DO you know a creature which can live both on land and in the water, and begins life like a fish and ends as an animal with lungs something between a fish and a reptile? I am thinking of a Frog. Frogs, Toads, Newts, Salamanders, all belong to a tribe with a long name, "Batrachians," from the Greek word for a Frog. All begin life in the water.

If you want to watch the Tadpoles, or "big heads," coming out from the Frog's or Toad's spawn and growing by degrees, you should collect the spawn in February or March and put it in a tank with plenty of water plants. Do not leave any Water Beetles or other water creatures in the tank for they might quickly kill the Tadpoles. The Frog's spawn looks like lumps of jelly, with a black spot which is the egg in the middle of each lump. The Toad's spawn, which is laid rather later than the Frog's, is arranged in long strings of sticky beads, often wound round water plants.

When the baby Tadpoles first come out they are like tiny fish, and they may not eat anything for a day or two. But when they begin to swim about they will nibble at any green stuff with their beak-like mouths. At the end of about six weeks a right hind leg will break through the skin, then a left, and now you may give them some very small bits of cooked meat. In another two or three weeks front legs will appear, and they will come up from time to time to the surface of the water to breathe the air. This is because their lungs are beginning to form. Now you might provide a floating slab of cork for them to sit on if they wish.

Wait another fortnight. What has happened to their tails? Have they fallen off? No, they have been "absorbed" or taken into the little Frog's bodies to help to form a larger head. And the heart is changing too. Taddy had a fish's heart with two "rooms" or divisions: now, Froggy is getting a reptile's heart with three "rooms."

Just before the last change you will find that the gills are dwindling down, the skin is spotted. The little creature has not yet got any teeth in its wide mouth (a Toad by the way never has teeth) but it sits in the crouching way of a full-grown Frog. Then the jaws will be seen, it will begin to cut its teeth (if it is a Frog), it will want to feed on flies and worms, and will be ready to leave the water, no longer a Tadpole but a Frog or Toad.



*The Tadpoles enjoy the freedom of the pond from which they will soon emerge as Frogs.*

Of course, Mr. Froggy can still swim. He has very strong legs for jumping and swimming. And his feet are webbed like a duck's. He does not, however, want to spend all his time in the water; he often goes on to the dry land. But he will shrivel and dry up if left too long without water. He does not drink. He takes in water through his skin, and if you find a Frog looking very thin and dry but still alive, and put him on wet blotting paper or a damp sponge, you will see him gradually swelling out and getting plump and well again.

I once kept some common Frogs which became quite tame and would crawl up my arm and sit on my shoulder. I gave them a dish full of water to swim in and some large stones on which they could sit if they wished to be on dry ground. It was very amusing to watch them feeding. Froggy has a very long, forked tongue fastened in front of the mouth, with the tip pointing downwards towards the throat. If a fly comes near, he whips out his tongue like a flash of lightning, catches it on the sticky tip, and then sends



*The Frog is at home both on land and in the water where he is seen in action above.*

his tongue backwards so that the unhappy fly goes down his throat.

A Frog has a curious backbone: the front is cut up into eight joints, and the back part is in one single piece: this gives him a somewhat hunchbacked-look, as the back goes up in a hump in the middle, and then suddenly drops.

Froggy often changes his coat and his colour, and can be greenish-yellow or brown. He has a strange way of getting rid of his old coat: he pulls it off as you might pull off a glove, rolls and pats it into a neat ball, and swallows it.

If you watch a Frog which is just going to croak you will see his throat swell and then he will puff out his fat cheek pouches. In some parts of England Frogs are called "Cambridgeshire Nightingales." Froggy's throat is always moving up and down. This is because his great gaping mouth acts like a kind of air pump, pumping air into his lungs.



*The Toad's colour varies according to his surroundings, so that he may blend with the earth and escape his enemies. He does not share the Frog's interest in jumping.*

There are Horned Frogs in Brazil which make a sort of barking noise and can bite like dogs. But our English Frogs and Toads are quite harmless, and indeed a Toad is very useful in a garden in getting rid of insects and slugs. In old days people thought that Toads spit poison, and you may remember that Shakespeare says, "The toad ugly and venomous wears yet a precious jewel in its head." Perhaps the Toad's great bright eyes, which are really rather beautiful, were thought to be precious jewels. It is true that the Toad can send out a thick, sticky liquid from the warts on its back if it is disturbed, which would make a dog drop it quickly if it tried to take it in its mouth, and this may have given rise to the notion that it is poisonous.

A Toad's tadpoles will sometimes leave the water on damp evenings and scramble about on land. And by the end of June, Frogs and Toads will come out from the neighbourhood of ponds, especially after a good shower of rain, and sometimes travel quite a long way. If they have to cross a road many will be crushed by passing cars.

Frogs croak loudly, but Toads have more gentle and flute-like voices. A Toad is more puffy than a Frog, and its skin is covered with warts. But the easiest way to tell a Frog from a Toad is to watch its movements: a Frog jumps and a Toad crawls sedately.

You probably know some queer little relations of the Frogs, the Newts, or "Efts" as they are sometimes called. A baby Newt is very much like a Frog's tadpole, but has larger gills when it comes out of the egg. These gills become smaller by degrees, and as they become smaller and the lungs grow larger, and the Newt rises to the surface of the water from time to time, he puts his snout just out of the water, and with a little popping noise lets out the used up air and takes in a fresh supply. But he does not lose his tail, and indeed he uses it a great deal in pushing himself about in the water.

When the breeding season comes on, the gentleman Newt puts up a lovely toothed waving crest from his head to his hind legs, and the tail has a crest also, but with smooth edges. At this time he wears a beautiful courting dress, olive brown on the upper parts, darker brown at the sides, yellow underneath, and on the graceful tail there is a patch of orange and a line of blue. His lady has much duller colours, mostly dull olive brown or yellow.

It is quite easy to keep Newts in a fair-sized tank, with a good supply of water plants such as Hornwort, Water Milfoil, and American Weed. The female lays her eggs on the leaf of a water plant which she folds over with her hind legs. Do not forget to give your pets some kind of a floating raft or solid substance to sit upon when they get tired of being in the water.



*The Newt finds his long tail useful for pushing himself through his watery home.*



## BEAUTIFUL FISHERS AND FAITHFUL MESSENGERS

*From the woods  
Came voices of the well-contented doves.  
The lark could scarce get out his notes for joy,  
But shook his song together as he near'd  
His happy home the ground. To left and right  
The cuckoo told his name to all the hills.*

TENNYSON

GOING along by the side of a river or stream we may be startled by a brilliant flash of blue, green and chestnut darting in front of us, and perhaps we hear a rather plaintive cry, *seep, seep*. We look again and see that it is a Kingfisher hunting for his dinner. Perhaps it is a fish he is about to pounce upon. He will catch it in his long, sharp beak, and if it is small enough he will gulp it down at once, but if too large to be disposed of in this way, he will kill it by knocking it against a stump or branch to stop its struggles. He may throw it into the air several times and catch it again till it is in what he considers the right position for swallowing, that is, head first. Or perhaps, instead of fishing he may plunge into the water for a short bath.

You will not find the Kingfisher's nest easily. It is made in a tunnel in a bank, either in an old rat hole, or in a tunnel which the two birds, working together, have made for themselves by burrowing. Here they collect old fishbones, sometimes surrounded by a mass of putrid fish. On this evil-smelling collection Mrs. Kingfisher lays from six to eight snowy white eggs tinged with delicate pink.

The baby Kingfishers are as ugly as their parents are beautiful. They look as if they are all mouth and quills, and one curious fact about them may be noticed, which is that they can walk backwards as well as forwards. They have a little pad on the hock joint so that they can rest "sitting back on their heels" as it were, as is the case with

OPPOSITE: *The gaudy Kingfisher is an expert fisher but a very poor housekeeper.*

many other young birds. When they have learnt to fish for themselves, their Spartan-like parents turn them out of the nest.

Kingfishers will fly about over water quite close to busy roads, and sometimes a fisherman has had the joy of seeing one settle on his rod!



*When the young bird can fend for itself, the parents drive it away from the nest.*

If the streams are frozen over in the winter they will often fly off to the nearest seashore and fish for shrimps, small fish, etc. in the little pools left by the tide, but they seem to like fresh water best.

A naturalist tells an amusing story of a friend who found three young Kingfishers sitting on a branch squealing for food. He fetched various sorts of food for them, but two died. The third survived, and lived for some time, coming regularly to be fed, but never brave enough to go into the house. Later this bird found a mate and had a little family, but he still went regularly to his kind friend

to beg for food for himself and the mother bird and all the little ones.

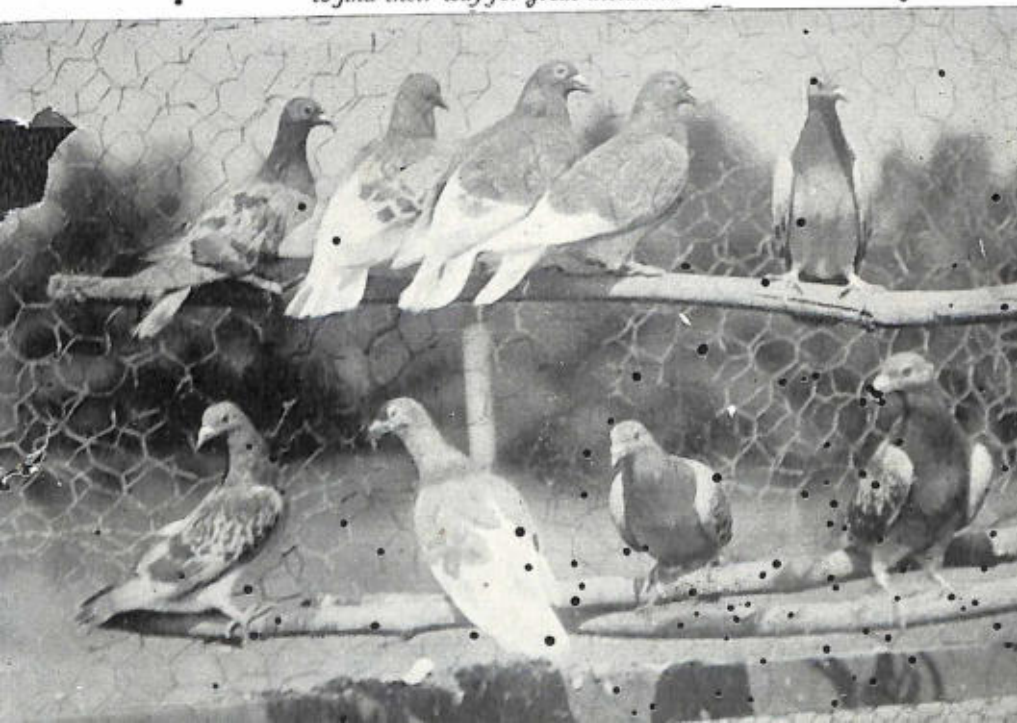
The Kingfisher is perhaps the most beautiful of our British birds in colour, but there are other British birds of quite a different kind which show beautiful colours on their breasts and heads. These are the Doves, and especially the "fancy" Pigeons. Some of the Pigeon family can be trained, as you know, to carry messages and to fly out a long way from home and back again. A Homing Pigeon can fly at the rate of a mile a minute and keep up the speed for two hundred miles.

Pigeons have been kept in England for hundreds of years, and in some places we may see ancient dovecotes which belonged to old manor houses. In books about Pigeon breeding written long ago we may read many of the names still in use. There are many different kinds of Fancy Pigeons—Carrier, Cropper, Fantail, Jacobin, Trumpeter, Tumbler, and many others.

If you ask a Pigeon fancier to tell you about the way in which he trains his charges he may say something like this—"About the month of March I place in my loft a small nest box lined with straw, one for each pair, and about eight to ten days later the first egg is laid: a day passes, then a second egg is laid. The eggs are pure white, and take seventeen days to hatch. The young ones, sometimes called "squeakers," are fed by their parents with a curd-like substance from inside their crops, called "soft food," or sometimes "pigeon's milk." Later this is mixed with half-digested food. The parent bird takes the soft bills of the young ones in her own, and pumps up the food into their mouths, and the young ones suck it down.

"When the young birds are about twenty-four days old they begin to feed themselves, and soon I allow them to go outside the cote and look around, and they will begin to fly. In another fortnight or so they will fly about with the old birds and enjoy the exercise each night and morning.

BELOW: *Homing Pigeons have an unerring "bump of locality" and can be trained to find their way for great distances.*



"If I wish to train my birds to "home" from certain distances, I must catch them quietly while they are still young, and set them free, first about two miles from home, then three miles, then six, ten, twenty, thirty-five, fifty, eighty-five up to one hundred miles. I choose fine days for my lessons, and keep a straight line as far as the railway stations will allow. After they have managed one hundred miles twice we look on them as good Homing Pigeons.

"With the wind behind them they can fly about sixty miles an hour, but if the wind is against them and the light is poor, I consider that they have done well, if they have managed thirty miles an hour. They are apt to get lost in a fog and are much upset if the country is covered with snow."

During the Great War our Pigeons rendered wonderful service, getting through with information when everything else failed. A message would be written down and put inside a small carrier made of metal, and this was fastened to the bird's leg, or wired underneath the tail. The Pigeon could carry a small parcel four inches long and an

BELOW: *The cooing Wood Pigeon, with its plaintive cry, is a gentle bird, with a very placid and peaceful disposition.*



inch across, without any trouble, under its tail. Pigeons were used a great deal in the North Sea to let the people on the East Coast know when enemy aircraft was coming near our shores. One bird received the Victoria Cross for carrying an important message through, though badly wounded on its flight. Pigeons are represented together with horses on the beautiful War Memorial in Edinburgh.

Our domestic Pigeons are thought to come from the wild Rock Dove. And it is noticeable that, just as the Rock Dove perches and nests on rocks, so all tame Pigeons like to perch on rocks and in buildings if they have the chance, whereas all other wild Pigeons prefer to roost in trees. I have read that a flock of Pigeons which had been hatched in a dovecote opposite Merton Tower in Oxford gradually deserted their loft, and took up their abode as near as possible to the top of the Tower, keeping company there with Owls and Jackdaws.

One of the largest of our wild Pigeons is the well-known Wood-Pigeon or Ringdove. I am sure you know its plaintive cry, coo-coo, roo-oo, which gave it in old days the name of *Queest*, from the Latin *questus*, complaining—or *Cushat*. The Stock Dove is rather smaller, and has a softer note. One of the smallest of the wild Pigeons is the Turtle Dove, which is only with us from early spring, when, "the voice of the turtle is heard in our land," till August or September. It spreads out its tail widely when flying, and it gives out a long, moaning note—"tur-r, tur-r," whence its Latin name of *turtur*, and English turtle.

In some ways Pigeons and Doves are clever and in other ways curiously stupid! In a book called *The Minds of Animals* the writer tells how Pigeons cannot find their own eggs if the eggs are moved a few inches away, and will sit brooding quite happily day after day on a nest where there are no eggs at all.

In the same book we read of a number of Pouter Pigeons which were feeding on some grains of oats that had fallen out of a horse's nose-bag. When they had finished all the grain on the ground, a large Pouter rose up and flew at the horse's eyes, flapping its wings furiously; this made the horse toss his head and in so doing, of course, he shook out more corn. The Pigeon did this several times till the supply was used up.



ABOVE: *The Water Vole, which is often mistaken for a Rat, is one of the most harmless of rodents.*

BELOW: *The much-persecuted Rabbit always has its ears alert for danger-signals.*



## CHAPTER SIX

# LITTLE MISCHIEF-MAKERS

*Amid her household cares He guides the wren,  
He guards the shifty mouse from poverty,  
He knows all wants, allots each where and when,  
Whatso it be.*

CHRISTINA ROSSETTI



THERE are some little creatures which are very greedy and tiresome: they like to come into our houses and scuttle about at night, and we do our best to get rid of them. And yet there is something rather pretty about them, with their bright little eyes, and their way of sitting up and washing their faces with tiny paws. You have guessed, of course, that I am thinking of Mice.

Mice, and their near relations, Rats, which I suppose nobody admires or loves, belong to a large family called "rodents," which means gnawers.

Other members of the family are Squirrels, Rabbits, Hares, Dormice and Beavers. All these have good teeth for gnawing, two at the top and two at the bottom of their jaws, like sharp chisels. And these teeth are always growing. When they are worn down by constant gnawing the "rodent" need not pay a visit to the dentist, for the sharp part grows again; the bottom part or stump of the front tooth passes deeply into the jawbone and is fed there with a kind of pulpy stuff from which the tooth is formed.

You may have noticed the funny way in which a Rabbit seems to munch sideways when he is eating lettuce? In the rodent family the lower jaw slides backwards and forwards and so helps the teeth to work through their food.

It is not difficult to train Mice. If you have not kept them yourself you have probably seen white, brown, and pied mice shown in the streets, running up and down toy ladders and playing, to the amusement of passers-by.



*The Mouse never refuses a meal and is always nibbling away at something. It, too, has many enemies to evade.*

The Long-Tailed Field or Wood Mouse is rather larger than the House Mouse, and is bright reddish-grey and white: it is very active, and can climb, jump and swim, and it burrows and nests underground, where it stores stolen grain and other food.

It is particularly fond of the hips of the wild rose, and will take a collection of hips to a deserted bird's nest to eat at leisure. When the baby Mice are born the parents sit on the top of them to keep them warm till the babies' fur coats have grown.

Next to the Pygmy Shrew, the smallest of all the animals called mammals is the pretty little Harvest Mouse. It is not quite five inches long, and its tail takes up about half the length. It is very pleasing to look at, with its soft, thick yellowish-red fur and bright black eyes, when it sits up on some plant, balancing itself by curling its tail around the stem. It often likes to make its nest in a hay or wheat field, using dried grass or blades of wheat and plaiting them very cleverly into a round nest about the size of a cricket ball, which it hangs in the stem of the corn. The mother Harvest Mouse is very devoted to her young ones, and if the nest is carried off in a sheaf of corn by the reaping machine, the mother if she escapes will look everywhere for her little ones and continue to care for them.

The Black and Brown Rats are said to have been brought to Europe in the ships of the Crusaders and in vessels which went on voyages of

discovery in the fourteenth and fifteenth centuries. Chronicles of the Middle Ages tell that armies of Rats swam the Danube and invaded countries where they were unknown before.

Farmers, butchers, sailors, poultry keepers all hate the big, fierce Brown Rat. He gets into corn ricks and gnaws the corn, he gets at the meat in the butcher's shop unless it is hung well out of the way, he can be a perfect plague on board ship, and he loves to creep into a hen roost or a rabbit hutch at night and feed upon the unfortunate stock if he can manage it without being caught.

But stories have been told showing that Rats can be very kind to each other. And they can be tamed and become quite fond of their owners. A young nephew of mine had a white Rat which he called James, and he and James and his Cairn Terrier, Sandy, were all good friends together. It is said that white Rats are known to have been kept as pets two thousand years ago!



*No one likes the Brown Rat very much. Its ugly habits make it far from popular.*

Rats and Mice, by the way, are very clean creatures by nature. So if tame Mice or white Rats are kept as pets, the owner should keep the cage very clean, and change the bedding fairly often. Hay, white cotton wool (not black) or rags do well for bedding, and dry sand should be sprinkled on the floor of the cage.

A harmless rodent which is often accused quite wrongfully is the Water Vole! People see the wicked Brown Rat stealing down to the water to catch fish, and when they next see the poor little Water Vole they say, "There is the Water Rat up to mischief! He ought to be skot!" But if you disturb a small animal on the bank of a stream and it flops under the water you will know it is a Water Vole: if it scampers off overlaid it is a Rat.

The Water Vole, which is plump and sleek with a snub nose and little beady eyes close together, is darker than the Rat. His ears are almost buried in his fur, while the Rat's ears are large and stand out away from the head, and the Vole's tail is furry and much shorter than the Rat's tail which is long and wiry. The Water Vole does not eat fish. He feeds chiefly on vegetable food, and indeed, he is very useful in destroying water weeds and thus helping to keep the stream clear.

But the Field and Bank Voles do a great deal of mischief in woods and plantations by burrowing under trees and shrubs, feeding on their living roots, and sometimes nibbling off the bark.

A lady who wrote a book many years ago, called *Quiet Hours with Nature*, gave an amusing account of how she caught and tamed some Short-Tailed Field Voles. She enticed them at first by scattering oatmeal and canary seed every day in the same place, and at last caught one by placing a glass globe in that spot with some oatmeal inside, and a piece of wood leaning against it so that the little creature could climb up the wood and jump down into the globe through the hole at the top. It seemed in no way frightened, and let its captor stroke its soft fur. It would sit up

like a squirrel and hold a grain of wheat in its paws and nibble it, then, thoroughly clean its fur, brush its whiskers, and go to sleep in a lump of cotton wool and moss.

In a few days' time the lady caught a second Vole to be a mate for it, and after a few months she found four little sprawling infants in the box, bright pink, the heads nearly half the length of the bodies, and eyes tightly shut. When one little Vole was only thirteen days old, and still blind, the lady was holding



*The Bank Vole, who does all his prowling by night, is rarely seen.*



*Mother is giving her young Bunnies a lesson on how to find food and how to recognise danger-signals when the enemy is at hand.*

it in her hand in order to take its portrait, "when" she wrote, "it surprised me by sitting up and beginning to clean its fur and whiskers, as carefully and neatly as if it had been a cat by the fireside, even licking each little paw in succession until its toilet was complete. On the fourteenth day the little Voles could see and became quite enterprising, nibbling lettuce leaves and oatmeal and roaming about their small domain."

Until the killer disease, myxamatosis was introduced deliberately into Great Britain, rabbits had become a plague in some places. They multiply quickly—a pair may have fifty children in a year!—and they eat up grain and gnaw the bark of trees if they get the chance. But in the old days, when they were first brought into England, perhaps about the time of the Conquest and for long afterwards, they were highly prized. In 1309 at a feast given when the Abbot of St. Austin's was installed, six hundred Rabbits were served at the table at a cost of sixpence each, and in those days sixpence would have been the price of a pig.

Rabbits have many enemies—Foxes, Weasels, Owls, poaching Cats, as well as the sportsman with his gun: even Moles and Crows may kill a young Rabbit. The mother Rabbit digs the safest place she can find for a nursery, sometimes in the middle of a cornfield, and lines it with fur from her own body. The nursery warren has only one opening, which she stops up with the earth or grass when she goes out to get her meals. The ordinary Rabbit warren has two openings, one is the front door, the other an "emergency exit" if danger threatens. Rabbits like to play together on moonlight nights, but if one sees or hears something which may be an enemy, he gives an alarm signal by stamping

on the ground with his hind feet. Then all scuttle away to their burrows, raising their short tails and showing the white "scut" beneath, which is thought to act as a guide to the younger Rabbits, showing them where to go. In a few seconds no Rabbit is to be seen.

• If you keep Rabbits, be sure that they have dry, well-aired hutches, and are properly fed, with a pan of clean drinking water fresh every day. Bran, oats, hay, are food for them, and green food such as lettuce, groundsel or dandelion, and in winter carrots or swedes. I remember an osier bed on the bank of a river which had been fenced on the land side to prevent Rabbits from getting in to gnaw the osiers. There came a very hard winter when the river was frozen over, and the Rabbits trotted gaily across the ice and got to their beloved osiers after all!

There are many different kinds of tamed Rabbits. For instance, there is the Angora, with very long fleecy fur, white, fawn, blue, grey or black; the "English" black, blue, grey or tortoiseshell; the big Flemish Giant, steel grey, and the chocolate-brown Havana; the Imperial, with blue eyes and blue coat; the Lop-Eared, with many different colours and very long and large ears and pouched chin; they may be black, black and white, blue, blue and white, fawn, fawn and white, grey, grey and white or tortoiseshell. Then there are the Silver, the Tan, the Himalayan, the Polish and others.

Rabbits are tamed much more easily than Hares, but it is not impossible to tame a Hare. The poet Cowper was very fond of his pet Hares, as Mrs. Browning writes :

"Wild timid hares were drawn from woods to share his  
home caresses,  
Uplooking to his human eyes with sylvan tendernesses."

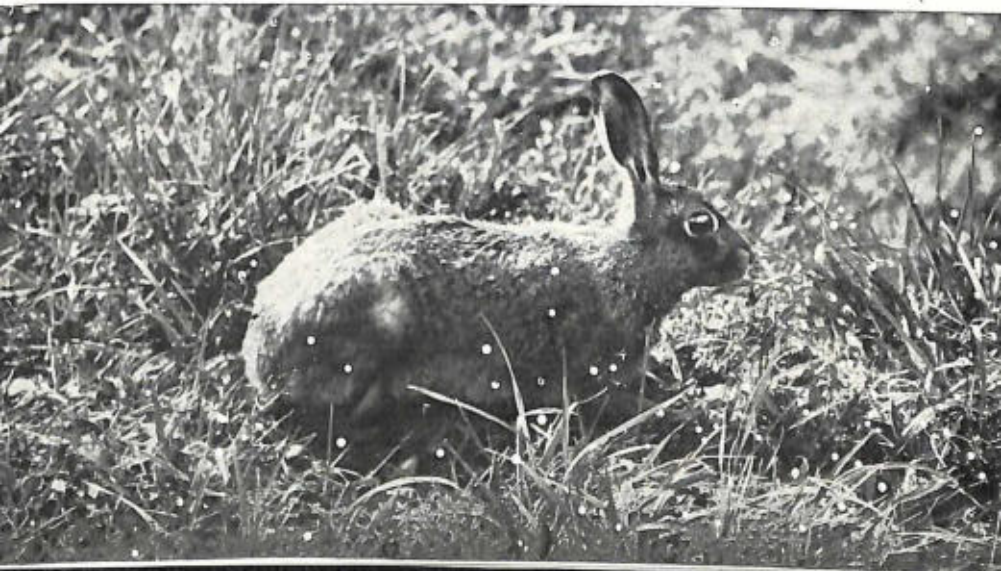
• He had three, Bess who died young, Tiny who lived to be nine, and Puss, who was nearly twelve when she died. They had never seen a dog, till a spaniel, who equally had never seen a Hare, was introduced into the family, and they made great friends with each other and ate out of the same dish.

A Hare is larger than a Rabbit and has very long ears, nearly an inch longer than its head, big staring eyes, and very long hind legs. These long hind legs make it able to take tremendous leaps, and it can run very swiftly and swim well.

Hares do not live in burrows, but they scoop out little hollows in the ground called the Hare's "form." And here Mrs. Hare crouches, with her body pressed so close to the ground that it is difficult to make out that she is there. She changes her "form" according to the time of year, trying to find a sunny spot in winter and a shady place in summer. If snow falls heavily she scoops out a place for herself under the snow, like a cave with a domed roof, and a little round breathing hole kept open by the warmth of her breath. The young Hares, or Leverets, come into the world ready dressed in their fur coats, with wide-open eyes, and soon ready to be off and away, unlike their little Rabbit cousins who are born in their comfortable burrows naked, blind and deaf for a time. When mother Hare wants to call her young she gives a gentle little cry.

It is amusing to see Hares frisking about, standing up on their hind legs and sometimes having a regular boxing match, waltzing round and round and "drumming" on each other with their forelegs.

BELOW: *The Hare, with its powerful limbs and keen senses, does not need to hide underground as the Rabbit does.*





## NUTCRACKERS AND ENGINEERS

*A lover true, who knew by heart  
 Each joy the mountain dales impart . . .  
 Many haps fall in the field  
 Seldom seen by wishful eyes:  
 But all her shows did Nature yield  
 To please and win this pilgrim wise . . .  
 What others did at distance hear,  
 And guessed within the thicket's gloom,  
 Was shown to this philosopher,  
 And at his bidding seemed to come.*

RALPH WALDO EMERSON

WE have been talking a good deal about rodents, but there is a rather interesting rodent which we have not spoken about yet; I mean the Squirrel. The Brown Squirrel (generally called the Red Squirrel, though he is really more brown than red) is a native of England. The somewhat rat-like Grey Squirrel was brought from America in 1890, and has spread himself everywhere—unfortunately as many people think.

The Brown (or Red) Squirrel is smaller than the Grey, and has a shorter tail. And he has little tufts on his ears in summer, which later dwindle away. I dare say you know his amusing way of running round to the other side of the trunk if you go near the tree where he is sitting, and peeping at you from between the branches, and chattering, no doubt using bad words in squirrel language! He has a clever way of spreading his legs and tail to form a kind of parachute and “planing” from tree to tree.

He feeds on nuts, acorns, seeds, fungi, beechmast, insects, and even on birds' eggs and nestlings. And he is fond of splitting cones, especially fir cones, and getting out the seeds, and he will nibble the bark of

OPPOSITE: *The Grey Squirrel, though a very pretty creature, has a bad character. He is accused of causing destruction and of chasing away the Brown Squirrel.*



*Though of a frisky nature, the Brown Squirrel does not waste all his time in idle play, but remembers to lay up stores for rainy days to come.*

some trees. He stores up and buries nuts and acorns and other dainties ready for winter, as he does not sleep all through the cold weather, but comes out from his winter nest to get some food when he feels hungry.

He builds a nest, or "drey" as it is called, of fibre and twigs lined with moss, with a domed roof, on the top of a tree, often a hawthorn, and here the little Squirrels are born, at first blind and naked.

The Grey Squirrel is a very bold little animal. On one occasion a Grey Squirrel jumped from a tree in Regent's Park on to a passing omnibus, and enjoyed a free ride to Mill Hill, where it jumped off again. Another was seen to come through the railings in Hyde Park, and climb up to the window-sill of a house where it bit off all the flowers from the plants in a window-box.

Grey Squirrels are now to be seen in nineteen English counties, North Wales, and parts of Scotland. They are accused of robbing orchards and gardens, eating bulbs and peas, destroying fruits, killing

and eating birds, eating birds' eggs, even those of partridges and pheasants, and they seem to be driving away our little friends the Red Squirrels in all parts of the country. A writer from Richmond in Surrey gives them this shocking character, "As destroyers of gardens they are unsurpassed by any animal or bird that lives. They eat anything that can be eaten, and destroy twenty times more than they can eat . . . They are driving away certain birds, notably Blackbirds and Thrushes."

A rodent which makes a kind of link between the Mice and the Squirrels is the Dormouse, so called from the French word *dormouse* for sleeper or sluggard. The little creature deserves its name for it spends the whole of the winter in a deep sleep, during which its heart almost stops beating, and it can be taken from its bed and rolled along the ground sometimes without causing it to uncurl or wake up: this is not a kind experiment however, as if it is suddenly roused the shock may be too great and it may die.

It makes its winter bed, generally about October, in a mossy bank or a hollow in a tree stump, and there it sleeps till April. But it is clever enough to store up some nuts near its sleeping place, in case a



*The sleeping Dormouse does not like to be disturbed during its winter sleep which lasts for six months.*

mild spell of weather should wake it up for a short time and it should feel the need of a little food before going to sleep again. Towards the end of autumn it becomes extremely fat, and it seems to live on its own fat during its winter sleep, for when it comes out from its bedroom in the spring it is a shadow of its former self! It sleeps curled up with its nose tucked down under its body, and tail thrown over the top of its head.

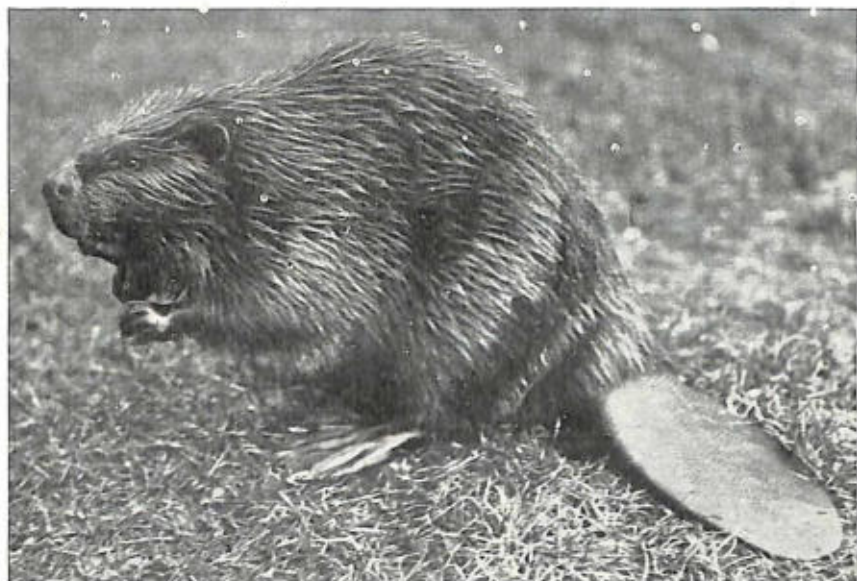
But though it is such a sleepy little creature in winter, and in the daytime, it is very active at night during the rest of the year. It feeds on seeds, nuts, acorns, buds, corn, berries, and even the eggs of small birds. It goes about very silently, for it has fleshy pads on the soles of its feet: these indeed serve as "shock absorbers" when it jumps, for it is a great jumper, and is said to be able to leap six feet up into the air.

The summer nest where it sleeps in the daytime is globe-shaped, and is generally built high up in some bush or hedge, of grass, leaves, moss and twigs cleverly woven together. The front door is closed up when Dormouse is in residence, but when he roams abroad he leaves it freely open.

Though not found in England we must talk a little about a very clever and interesting rodent, the Beaver—woodcutter, builder and engineer! Beavers were common in England in the Middle Ages, and we find some towns named after them, such as Beverley and Beverbroke.



*This house carefully built of twigs, grass and moss, is the Dormouse's winter stronghold.*



*One of the cleverest and most industrious of animals is the Beaver, whose flat tail acts as a paddle in the water. It is interesting to learn how they fell trees.*

Beavers fell trees by gnawing the trunks round and round till they give way and fall. They feed on the bark, and they use the logs for making their "lodges" in the water. They also dam streams with branches, mud and stones, so that they may have enough deep water at all seasons and in all weathers. In building they use both their sharp teeth and their clever hands. When they are swimming in the water they use their tails as rudders, and when they want to give a danger signal they lash the water with their tails. It is amusing to see the baby Beavers trying to mimic their parents by rolling logs along, and often teasing them while they are at work, but the elders are very patient with the little ones.

For many years Beavers have been hunted and trapped in North America on account of their beautiful fur, and so many were killed that some years ago there was a danger of their dying out altogether. A certain man, the son of a Scots father and a North American Indian mother, who was known by North American Indians as "Grey Owl," or



*Here is the Beaver at work using its sharp teeth and quick hands as it gathers material for the building of its "lodge."*

"He who travels by night," became very much interested in the clever little animals. He set to work, by writing in magazines and in other ways, to persuade people in authority to have a certain number preserved in great parks or pieces of land set aside as sanctuaries for wild animals. Grey Owl was given the post of naturalist keeper in Prince Albert Park in Saskatchewan, and he and his Indian wife, Anahareo, lived in a little log cabin on the shores of a beautiful lake there, called Ajawaan Lake. It is covered with water-lilies and surrounded by dense forest.

Their two pet Beavers called Jellyroll and Rawhide had a "lodge" in one corner of the cabin, fenced off by logs from the other part. A visitor to Grey Owl describes how Jellyroll walked into the cabin on her hind legs, her arms laden with twigs which she threw on to the pile of logs with a grunt of satisfaction, then tugged at Grey Owl's trouser with her forepaw, scolded, and made him understand that she wanted an apple. Then she sat back on her large, flat tail and combed her silky fur with a nail of her hind foot.

Grey Owl told of another Beaver who would not leave the cabin, and stayed with him all one winter. This Beaver dug a tunnel, spreading the earth over the cabin floor. One day, Grey Owl came home to find the door blocked so tightly with blankets from the bunk that he had to get in through a window. The Beaver had blocked

other windows with firewood so as to keep out possible enemies!

Another visitor writes that he went out into the forest at night with his host, who told him that the many animals who were about at night might be frightened by the sound of a strange voice. So Grey Owl frequently called out, "All right," in a tone which they would recognise, and so be assured that their friend was at hand. For he had a wonderful way of making friends with wild animals. Grey Owl's living memorial is Prince Albert Park, where his wild friends still live in the safety and freedom he gave them.



*Here is Grey Owl with one of his Beaver friends, who came out of the water at his call, and whose habits he studied closely.*



**ABOVE:** *The blind Mole burrows out a fortress with a snug nursery of leaves and grass. Here the tiny Moles are born naked and pink.*

**BELOW:** *Mother Hedgehog takes her children for a walk and warns them to roll themselves into prickly balls if danger is at hand.*



## SAPPERS AND ARMoured ANIMALS

*Safe in his excavated gallery*

*The burrowing mole groped on from year to year:*

*No harmless hedgehog curled because of me*

*His prickly back for fear.*

CHRISTINA ROSSETTI

WE will think to-day of some creatures which are protected from enemies by their coats, or which hide themselves underground. When we speak of an underground creature I dare say you will think of "the little gentleman in a velvet coat," the Mole, who spends most of his life in the dark. His front feet are like great shovels, or spades, with which he digs and burrows, furnished with strong, sharp, curved claws. His velvet-like fur does not "set" in any particular direction, so when he is burrowing he can move backwards as easily as forwards. He has tiny bead-like eyes, hidden away in his fur, and they seem to be of little use, as he is nearly blind. But as he spends most of his life underground, I suppose he can do very well without having good eyesight. And his dull sight is made up for by sharp hearing, and a keen sense of smell and touch. Perhaps when he is hunting for worms he is helped by his wonderful hearing. You may have heard the saying "To tread so softly that the blind Mole may not hear a footfall."

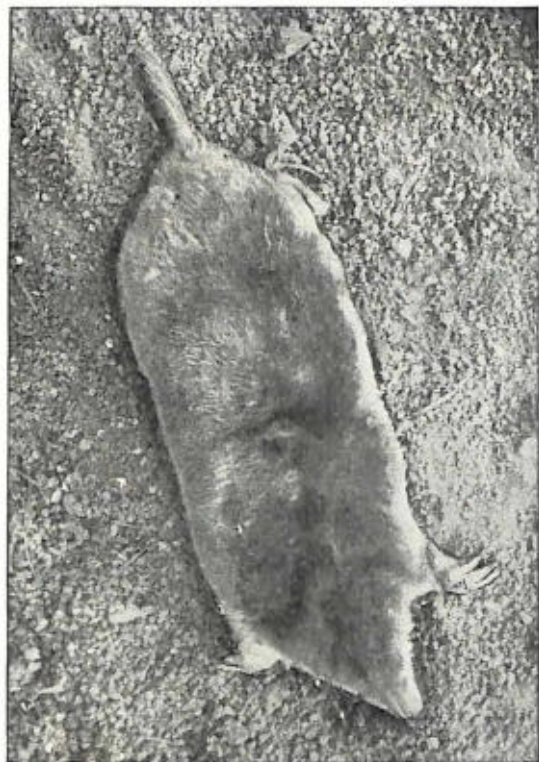
The Mole smells about with his long nose, wriggling his snout backwards and forwards. If a worm is put in front of him he gets very much excited, smelling around eagerly till he finds it: then seizes it in his mouth, and holds it down with his paws while he feels along it with his nose, then gobbles it up, biting with quick jerks.

You know the mole-hills which we often see in the fields. These are formed of the earth which the Mole throws out when he is making his tunnels. The tunnels lead into his underground winter dwelling, which has been called the "fortress" or "keep," lined with grass, where he can keep himself warm and snug. There are passages in all directions rather like a maze, along which he can travel looking for

food, and a "bolt hole" through which he can escape from enemies, such as Badgers or Weasels.

Mrs. Mole also has a special nest in which she brings up her young. It is a ball of grass and leaves, rather like a well-wound ball of knitting wool without any visible opening.

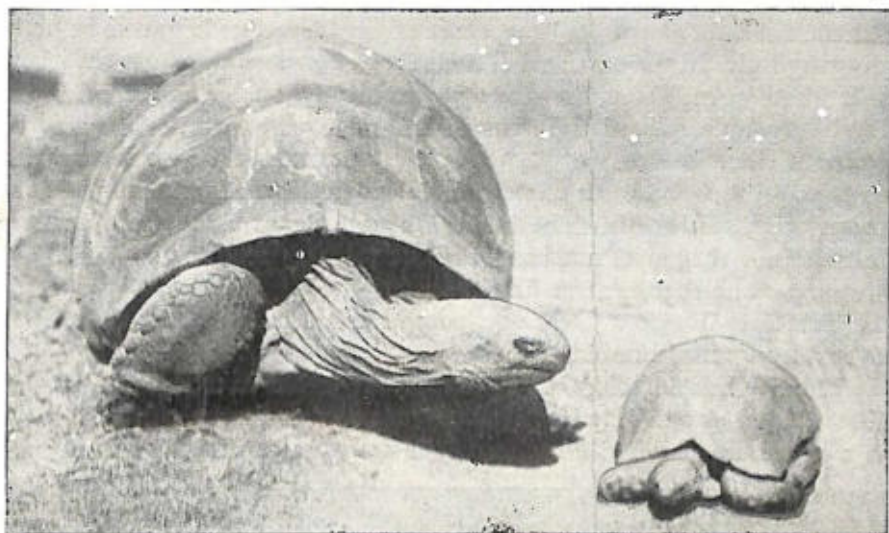
• Mr. Mole is a great fighter, and a great eater! Sometimes he has a furious fight with another Mole: and he might be quite ready to give you a sharp bite if you tried to pick him up. He is said to eat his own weight of food quite happily—worms, cockchafer grubs and the like. Indeed, he is very dependent on food, and may die if he has to fast for a few hours.



*Mr. Mole, who can eat his own weight in food, spends most of his time looking for it.*

Besides having a good appetite, he likes to drink a great deal of water, and makes his home whenever possible in some place where he can easily get a good drink. Should the season be very dry and the supply be cut off, he sets to work to dig till he gets to water—in short, he sinks a well. He is a good swimmer, and has sometimes been seen swimming through a flood.

The well-known naturalist, J. G. Wood, wrote, "the whole life of the Mole is one of fury . . . he labours, eats, fights, and loves, as if animated by one of the furies, or rather by all of them together."



*The Giant Galapagos Tortoise is a sleepy creature who lives to an enormous age. Here he is looking with great scorn at a tiny relative.*

Another creature which buries itself underground in winter is the Tortoise, which may be said to go about dressed in armour. He does not live underground all the year round like the Mole. The Tortoise is not a native of England, but I dare say you know him well as he is often sold in shops and in the streets. The kind sold in this country is the common Land Tortoise, sometimes called the Algerian Tortoise.

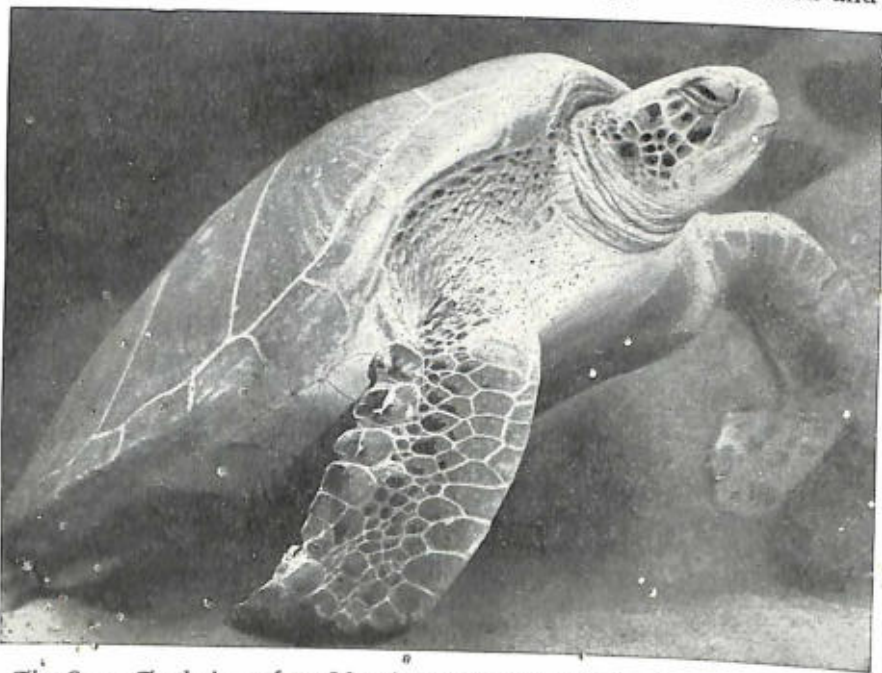
The Tortoise is a vegetable feeder, and is very fond of lettuce, and also enjoys milk, which it will scoop up with its lower jaw and then raise its funny little head and let the milk run down its throat. It has no teeth, but the edge of its jaws is sharp and horny. It is easily tamed. I knew of a Tortoise which would always waddle to meet its owner when she went into her garden in summer, crawl over her feet to attract attention and make an odd little noise rather like the mewling of a young kitten.

A lady writing in a magazine lately told how she kept Tortoises in a cold frame in her garden in summer, and in autumn gave them a packing-case with leaves, hay, and earth in which to bury themselves

for their winter sleep. In June, some of her Tortoises began to be busy digging holes in the earth with their front claws, and in July they laid soft white eggs, about the size of a small dove's egg, and then dug a final deep hole, placed the eggs in it, and covered the hole carefully over. If there is plenty of sunshine the heat warms the earth, and the eggs will hatch, and out come the tiniest, perfectly marked baby Tortoises with soft shells. The babies do not sleep through the winter, but though they will not bury themselves they seem to be in a half-stupor and neither eat nor drink.

Tortoises live to a great age, some having been known to be well over a hundred years old.

The Gopher Tortoises of America live together in troops in burrows like rabbits. A pair inhabits each burrow, and at the end of the burrow is a room lined with branches of fir trees dragged in for food and



*The Green Turtle is a powerful swimmer though he is far from speedy on land. A relation of the Tortoise, he also lives to a great age.*

warmth. Then at nesting time they make another room as a nursery for the eggs and the little ones. They like to come outside to bask in the sunshine in mild weather, but they have a great dislike to intense heat, and a shower of rain drives them back into their shelter.

You may see a huge Tortoise in the Zoological Gardens in London, very large and probably very old, and seeming to spend most of his time sleeping. He is called the Giant Tortoise. The Giant Tortoises are very rare now, and only found on the Aldabras and Seychelles Islands in the Indian Ocean and the Galapagos in the Pacific.

In the Tortoise House in the Zoo you may also see a curious little Water Tortoise which always promptly turns itself right side up, in a determined way, when its keeper puts it down on its back. Some of the little American water Tortoises, called Terrapins, make pretty and amusing pets, and some are good to eat.

Turtles are near relations of Tortoises, but they are water animals, only leaving their homes in the sea or in rivers in order to lay their eggs. Mrs. Turtle looks for a place where the soil is soft and muddy, and here she wallows and digs, taking her time over the work, which may perhaps occupy a week or more. Then she lays several dozen round white eggs, and when she pulls herself out of the slough with her strong forelegs the mud or sand slides back off her smooth shell, covering the eggs well over, and there she leaves them to be hatched by the heat of the sun and thinks no more about them.

The famous turtle soup is made from the Green Turtle which is found in all warm seas. An enormous Green Turtle, known as Fanny, died of pneumonia at the Zoo in 1936. She was said to weigh four hundredweight, and her shell, not counting the curve, measured over four feet. Tortoiseshell is the shell of the Hawksbill Turtle, so called because its mouth is shaped like the beak of a hawk.

Now for a quaint little creature which always carries about a covering of prickly armour—the Hedgehog, Hedgepig or Urchin as it is sometimes called. If you look closely at one of its prickly spines you will see that it is not unlike a large pin, with a sharp point and a round head like a bead. These prickles are kept in place in the Hedgehog's skin by the round heads, while the sharp points stick out like bayonets all round the body when the animal rolls itself into a ball.



*When Mr. Hedgehog has to negotiate a wall he hangs over the edge, then rolls himself into a ball and drops.*

You may read in history that the Romans used Hedgehog's spines for combing out hemp when they were making cloth.

The Hedgehog curls himself up into a ball by "contracting" as it is called (drawing in) certain muscles which form a very strong, broad band round the lower part of its head and body. And a curious thing is that the same kind of muscles make a horse able to twitch its skin to drive flies off, and the same kind comes into play when a human being frowns: so that a writer has said, "the Hedgehog's contraction is a frightful, fearful, frantic frown!"

Of course, Mr. Prickles' sharp spines keep him tolerably safe from any dog or fox or other enemy which may wish to attack him. Also he can throw himself like Humpty Dumpty from the top of a wall, and unlike Humpty Dumpty he does not need all the king's horses and all the king's men, for he will not be hurt by his fall but will just unroll himself and trot calmly away.

A Hedgehog has five toes, and his feet end in sharp claws so that he can dig into the ground if he wishes to do so. He is fond of eating insects, worms and snails, and many people like to have a Hedgehog in the kitchen to rid them of black beetles, while he is a treasure in the garden where he destroys snails and harmful insects. He much enjoys a dish of bread and milk.

Unfortunately, Mr. Prickles is also very greedy if he gets a chance of killing and eating poultry or game, and has been known to destroy fifteen turkey poults in one night! And if he finds an egg, he is clever enough to lay the choice morsel on the ground, hold it between his

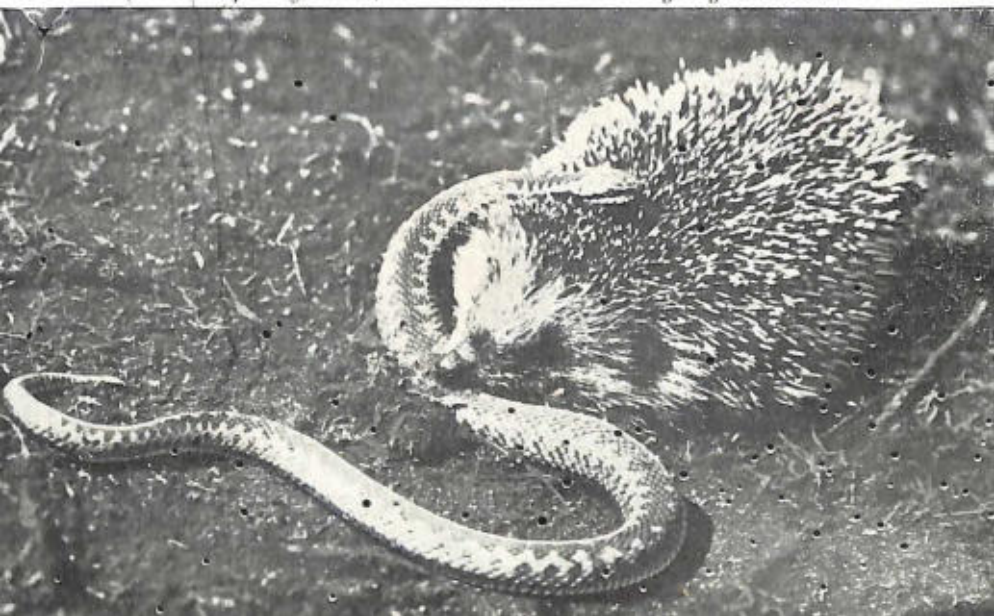
forefeet, bite a hole in the top of the shell, and quickly suck out the contents with his tongue.

But on the credit side we can place the killing of snakes, and curiously enough, a Hedgehog is never injured by any sort of poison, so can fight, kill and eat a poisonous snake without taking any harm.

The Hedgehog sleeps through the winter and "hibernates," as it is called, more thoroughly than a Squirrel or a Dormouse, as it does not store up food but simply sleeps the winter through. It is a silent animal as a rule, but it can give out a wailing sound, and sometimes if it is pleased it will make a sort of grunting cough.

It is not easy to see a grown-up Hedgehog's tail, as it is almost hidden under the quills, but you can see the tail plainly in a young baby Hedgehog, as the babies have very few spines and what they have are soft and nearly white, so that the babies look rather like young birds with white feathers. Oddly enough, they are not only born blind, like young kittens, but also their ears are closed. But they soon begin to grow up and in about four months' time they look like their parents, only smaller. One may sometimes have the good fortune to see a whole family party, father, mother, and little ones, out for a walk together.

BELOW: *The Hedgehog's enemies are unpleasantly surprised when they find that he is a grim fighter. The Snake is having the worst of this tussle, for even should he pierce the prickly screen, his venom will do the Hedgehog no harm.*





## THE HARVESTS OF THE WORLD.

*Here I come creeping, creeping, everywhere:  
By the rusty roadside,  
On the sunny hillside,  
Close by the noisy brook,  
In every shady nook,  
I come creeping, creeping, everywhere.*

DO you know these lines by an American poet?

Can you guess what the poet was thinking about?

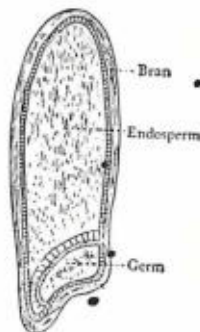
It is Grass which comes creeping, creeping everywhere. You may roll a croquet ground till it is as smooth as a plate, but if you do not keep it rolled constantly it will soon become untidy and overgrown again: rough bits of Grass will come up "creeping everywhere."

You know, of course, that cattle eat Grass, but have you ever eaten any? Well, in a sense we may say that we are eating Grass every day! For we eat bread made from Wheat, and Wheat belongs to the important family of Grasses. Cane sugar is another member of the family, for the Sugar Cane is a Grass.

We have been talking lately about Seeds and Fruits.

A grain of Wheat is the fruit of the Wheat plant. If you cut a ripe grain open you will find it full of white powdery starch and gluten which feed the baby plant in the corner of the grain (called the "embryo" in botany books), and which feed us too when the Wheat is ground into flour and the flour is made into bread.

But supposing the grain is buried in the earth. Presently, the bud, or young green Wheat as we call it, will begin to push itself above the



*Sections of Wheat grain showing the different parts, each rich in vitamins.*

OPPOSITE: *Before the golden harvest can be finally reaped there are many weary months of labour in the fields, beginning with the hard task of ploughing.*

ground out of its little white coat, and so a fresh plant will come up. "First the blade, then the ear, after that the full corn in the ear."

Nobody knows when men first began to grow Wheat. But it must have been many thousands of years ago. Grains of Wheat have been found in the coffins of Egyptian mummies. But it does not seem to have been grown in Britain before the time of the Romans. The old Latin poet Virgil, who lived 70 B.C., wrote a very long poem about cultivating the fields, called the *Georgics*. *Georgius*, whence comes the name George, is Latin for a husbandman or farmer.

Wheat grows best in temperate climates, that is to say countries where the weather is not very hot or very cold. Thus it is grown in most parts of Europe, in the more northern parts of Asia, in North Africa, Australia, and very largely in North America and Canada.

Farmers have made many experiments in growing the best kinds, so that there are many different sorts of Wheat, and they like different kinds of soils.

You remember too that, besides the grain which is ground into flour, the straw is used in many ways, for fodder, litter, thatching, straw hats, paper making, etc.

Couch Grass, or Creeping Wheat, belongs to the Wheat family. Cattle eat it in spring: its roots form food for pigs, and in times of famine have even been made into bread. But the roots are troublesome to the farmer, as they travel along under the ground, and are very difficult to root out. This Grass has some funny names, such as Twitch, and Quickens.

There is a grass called Darnel which in some parts of the country grows amongst Barley, Rye and Wheat. While it is still in blade it looks so like the



*Couch Grass, though it provides food for cattle and pigs, becomes at times a nuisance to the farmer.*



*The culmination of the year's labours is reached when the fields yield up their rich harvest which is carefully carted home to the farmstead.*

corn that it is difficult to pull it up without running the risk of spoiling the crop by rooting up the corn also. Probably Darnel is meant by the "tares" in the Gospel Parable of the Wheat and Tares.

I dare say you know the wild Barley Grasses. Two, called the Wall Barley, and Sea Side Barley, or sometimes Squirrel Tail Grass, have very prickly "awns" as the long hairs on the ears are called. If you put one of these awns in your sleeve and give it a push it will creep up to your shoulder.

The cultivated Barley is grown all over the world, and does not seem to mind heat or cold. It can be made into bread, but its chief use is for malt in brewing beer and porter, and Pearl Barley is very useful in making barley water, a pleasant drink for invalids.

Wild Oats are very much like the cultivated Oats. The word Oat is Saxon, and evidently comes from the verb "to eat." In very old books it is called Haver Corn.

Shall we imagine ourselves going off in an aeroplane to some of the



*In America, Maize or Indian Corn is used extensively for food. This picture shows a field of young Maize which will eventually yield a good harvest.*

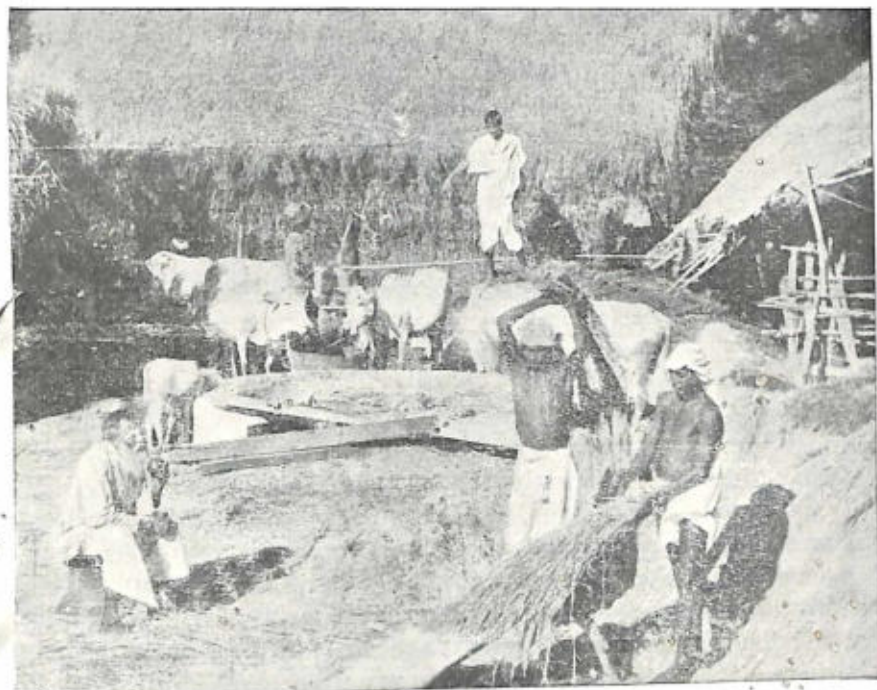
other harvests of the world? If we travel to China, Japan, India, Ceylon, or elsewhere in Asia, and then on to the United States of America, we shall find great fields of Rice, or "paddy fields" as they are called. Rice again is a tall yellow Grass. It grows best in low land by the side of rivers, and the Rice growers flood the land if they can do so before sowing the seed, and steep the seed in water while waiting to sow it.

Then in the hot parts of America, and also in India and the warmer parts of Europe, we shall find harvests of Maize or Indian Corn. Maize is one of the Grass family, though it hardly looks like a Grass with its great plume of flowers and big flag-like leaves. It has a well-packed head of seeds, called the "cob," with sometimes as many as eight hundred large grains in one head. A dish of Indian Corn, called "mush" in America, and "polenta" in Italy, is made by strewing the meal into boiling water with one hand and stirring hard with a spoon with the other. The thick paste can be eaten hot with butter or milk and treacle, or left to become cold and then fried.

We fly on to the West Indies, and find that, in the spring, cuttings of Sugar Cane were planted ready for the harvest later. The Sugar

Cane is a Grass too, and nobody knows where it was first cultivated. But it has nine names in Sanskrit, and one is Khand, from which perhaps we get our word sugar candy. The natives of the West Indies say that the Sugar Cane never blossoms, but this is because they cut it before the flowers can appear, in order to get the sweet sap. If the Cane is left uncut, the drooping flowers which blossom later are beautiful. The Sugar Cane is grown also in China.

And here in the West Indies we find another harvest, but not of Grasses this time. From the dried flowers of these Clove trees come the little black Cloves which you find in an apple tart to give it a spicy taste. Cloves are used in spices and to make oil of Cloves. There are Clove plantations in East Africa near Zanzibar, and especially in an island there called Pemba.



*On the Punjab, farmers use a very primitive method of threshing paddy to separate their Rice grain. Here they are seen at work.*

Again in many parts of the world we may see a harvest of Oranges. I have read lately of a lorry arriving to take two thousand Oranges for shipment from the veranda of a Kindergarten School at a place called Magila in East Africa. Six hundred were taken first, but then rain came down in torrents, and the road was turned into a muddy slough so that the next journey had to be given up—a disappointment to the Orange pickers, but huge joy to the school children! They were told that they could take as many of the one thousand four hundred remaining



*This sunny scene above shows an Orange grove in California where crowds of workmen are gathering the fruit ready for packing.*

Oranges as they could carry away. Pockets, jumpers, and "sheeties" (a kind of long frock) were crammed full, over and over again, and twenty-four hours later only a few squashed Oranges were left.

We find another curious harvest in these islands, and that is a Sponge harvest! Did you know that the Sponge you use in your bath is really made up of the skeletons of an animal, rather like a tiny lump of jelly, so low down in the animal kingdom that it hardly counts as an animal at all? The people of the Bahamas in the West Indies are mostly Sponge gatherers, who go off to sea for weeks at a time, to dive for the Sponges with long-handled pronged forks and drag-nets. The Sponges are generally taken to a market at Nassau in New Providence Island.

We might think of one other kind of harvest of quite a different kind, and that is a harvest of Silk! If we go to China, France, or Italy, we may see great Silkworm rearing houses, where the little black eggs of the Silkworm Moth are collected, and the caterpillars which come out are tended, and fed on mulberry leaves till they are ready to spin their silk cocoons. In these cocoons they turn into chrysalides. A great many of the chrysalides have to be killed, otherwise they would spoil the silk when they turned into moths and pierced the cocoons in order to come out. But others are allowed to live and change into moths and lay a fresh supply of eggs. A single moth will lay from three hundred to seven hundred. Every care is taken of the eggs and Silkworms. The house is carefully warmed, and plenty of fresh air provided for. The usual length of a thread of silk taken from one cocoon is a little over three hundred yards and twelve pounds of cocoons give about one pound of raw silk. This raw silk has to be cleaned, twisted, doubled, and wound on to bobbins ready for the weaver. Experiments in Silkworm rearing are being made in England.

When we see our trim, green English meadows and golden corn-fields it is interesting to think how different our country must have looked in the far away time before men began to cultivate the land. There must have been miles and miles of marshy fenland, and huge forests of tall trees and dense undergrowth. Years passed, and at last there came a time when we find good King Alfred sending out directions as to what a skilful farmer ought to do. He was to clear off "Fern, Bracken, Thorns, Sloe, Bramble, Whin and Weeds." And it is amusing to read how the Angle-Saxons thought about farming when they named some of the months. May was Thrimlyce, because Cows might then be milked three times a day. August was Weedmonoth, meaning Weed month. And November was given the unpleasant name of Blotmonoth, as Cattle were then killed to supply salt beef for the winter.



## CHAPTER TEN

### WINGED CATS

*When icicles hang by the wall,  
And Dick the shepherd blows his nail,  
And Tom bears logs into the hall,  
And milk comes frozen home in pail,  
When blood is nipped, and ways be foul,  
Then nightly sings the staring owl,  
To-whoo:  
To-whit, to-whoo, a merry note.*

SHAKESPEARE

IF you have been standing in a wood or field when a flock of Pigeons flew off not far away, you will remember what a noise they made, flapping their wings in their "smiting" flight. But if you were in the wood at night, an Owl might have flown over your head without your knowing it, for an Owl has very soft feathers, exactly fitted for a noiseless flight, and he floats along like a wind-borne aeroplane, except that unlike an aeroplane he may make no noise!

But of course he can make a great noise in another way when he strikes, and after noiselessly pouncing on his prey, he may give vent to a loud cry. "Hoo-hoo-hoo!" cries the Brown Owl, and "Kewick-kewick!" answers his mate. And "kiaw! kiaw!" cries the Barn or Screech Owl, but he is less noisy than the Brown Owl (or Tawny or Wood Owl as he is sometimes called).

But though you may not hear the Owl if he flies silently over your head without hooting, he will certainly hear you, for he has enormous ears, and very large, round, solemn eyes placed well forward in front of his head. A writer in a paper recently tells how an Owl has taken up his abode in a large shed used as a garage for lorries, close to a railway station. Every time that a train is approaching, and before

OPPOSITE: *This Long-Eared Owl does not trouble to make a nest but gate-crashes into some other ready-made home deserted by Crow or Hawk.*

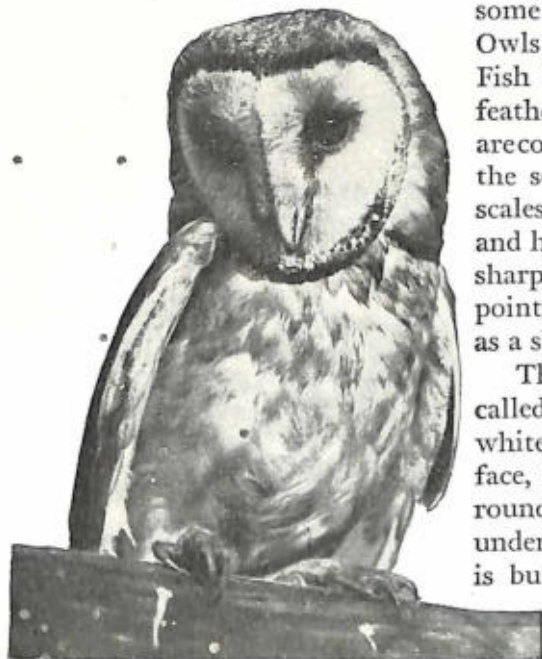
a human ear can hear it coming, this Owl hoots several times. It never makes a mistake, and never hoots at any other time.

Owls have been well called Winged Cats. Indeed, there is something about an Owl's broad, solemn face and great round eyes which remind one of a Cat when it looks one full in the face, and its love of hunting by night and soft noiseless movements make one think of pussy's nightly prowls.

The Owl's thick feathers make him seem to be a large bird, but if we could see them without their feathers we should find that the bodies of most of the Owls are really rather small. Many are feathered down to the feet: and the outer toe can be turned backwards or forwards at will, so that the prey can be grasped easily. For, as you know, they hunt Rats, Mice, Voles, and sometimes young Rabbits, and Frogs, and

some go after Fish. The Fishing Owls have mostly bare legs. Thus a Fish Owl of Asia has hardly any feathers on his legs and feet, which are covered instead with little scales: the soles of the feet have prickly scales for catching the slippery prey, and he has large curved claws with sharp cutting edges and sharpened points, so that he is well fitted out as a skilful fisherman.

The Barn or Screech Owl is also called the "White Owl": he is not white all over, but he has a white face, and a frill of white feathers round his dark shiny eyes, and his underpart is chiefly white; his back is buffish-orange with splashes of orange and grey. He loves old buildings, and when in his dark hole he makes a heavy snoring sound, and waves his head from side to side.



*The Barn Owl, so drowsy by day, is wide awake at night when he hunts for food. Notice his sharp beak and talons.*

A writer in a Natural History book tells how he saw two White Owls drifting over the reedy side of a stream, one at the edge of the reeds, the other flying softly just above them, evidently hunting in couples. At last one gave a scream, a Rat dashed through the reeds and was caught by the other. He also tells how he watched a Brown Owl hovering over a lily pond. Some Frogs which had been croaking in the pond before the Owl's arrival suddenly became silent and sank to the bottom, burying themselves in the mud. After waiting a long time one at last moved, and the Owl instantly swooped down upon him.



*The knowing-looking Tawny Owl well deserves to be called a "wise" bird.*

You may have heard an amusing story on the radio, when a lecturer told how one very dark night he took a toy Mouse out of doors, wound it up, and set it on the ground near a tree where he knew that some Owls often sat. Soon an Owl appeared, swooped down, and carried it off still whirring and humming: but evidently he was rather frightened of the noise which the machinery made, for presently he dropped it, and it lay upside down on the ground still whirring. Then he flew down, examined the toy with his head on one side, and gave a loud hoot to his mate, as if to say, "Do come and look at this strange thing, my dear; I can't make it out at all." The lecturer thought that the Owl also gave him a look which meant "If *that* is your idea of a joke it is not mine!"

Some birds which are really small members of the great Eagle Owl family are the Long Eared and Short Eared Owls. They are not so common as the Brown and Barn Owls, but the Long Eared may sometimes be seen in fir woods, where he likes to take possession of the forsaken nest of a Jay or a Wood Pigeon, or a Squirrel's drey, and the Short Eared sometimes flies about in winter, even in the daytime, on marshes or moors or ploughed land.

The so-called "ears" are strictly speaking ear tufts, and in the handsome Long Eared Owl these tufts stand up well above the head. Yet the ears themselves are very interesting and curious. It is easy to understand that a bird of prey, hunting by night, needs very sharp hearing, and the Long Eared and Short Eared Owls have their right ears differently formed from their left. The valve or channel for carrying sound in the right ear, is arranged so that sounds can be heard from above, and in the left ear the valve carries sound from beneath.

A great deal has been said and written in newspapers lately about the Little Owl. This queer little brown-and-white bird, looking rather

BELOW: *Though the Little Owl is very small, he is a fierce killer, and has many a meal of birds and mice which he carries to his lair.*



like a wizened old gentleman in spectacles, with a hooked nose, can be a very amusing pet. One writer tells of a pair which he kept in a cage in his garden in the suburbs of London. His kitchen had been infested by Black Beetles. So at night he would take the Owls into the kitchen, turn down the gas, and let the birds sit on his hands like tamed hawks. Their bright little eyes would turn in all directions, and presently their heads would begin to bob, which meant that a Black Beetle had crawled out of its hiding-place. Then down would fly an



*The Common Kestrel is sometimes called Wind-hover because of its habit of hovering above its prey.*

Owl from its perch, spread out a wing to hide its prey from any one who might wish to steal it, grasp the Beetle in its claws and munch it up. And great would be the slaughter of Black Beetles carried on in one night in that kitchen. But many farmers and gamekeepers and poultry farmers accuse the Little Owl of killing poultry, song birds and game birds, as well as mice and insects.

The Little Owl was seldom seen in England till about fifty years ago, when certain bird lovers introduced it thinking that it would be an interesting visitor. It has a curious cry which has been written down as "cuc-koo-va-ee."

Among other birds of prey which are "carnivorous," or feeding on flesh, may be counted the Falcons, Hawks, Kites, Eagles, Harriers, Buzzards and Vultures. Of these, some are hardly ever seen now in England, except in the Zoological Gardens. But we may still see the

Kestrel or Windhover, a small falcon which feeds on smaller birds and mice, hovering gracefully over them with quivering wings and fanlike tail spread out, and then suddenly swooping down and seizing them with its long claws.

We may read in history, and in novels which tell of old times, such as Whyte Melville's *Holmby House*, how in old days hawking or falconry was a common sport in England. A favourite bird for the purpose was the Peregrine Falcon, and others were the Iceland Falcon, the Goshawk and Gyrfalcon. In the reign of Edward III. it was counted a serious crime to steal a Falcon, and if a person took the eggs, even in his own grounds, he might be imprisoned for a year and a day, besides being subject to "a fine at the king's pleasure!"

The now rare Peregrine Falcon is still to be seen near St. David's in Wales, and occasionally near other places on our coasts.

In falconry, only the female was called the Falcon: the male was the "Tiercel" or "Tarsel." If a Heron came in sight, the falconer would let loose a "cast" or pair of Falcons, and the Heron and the Falcons would try to soar above each other, but probably in the end first one Falcon and then the other would succeed in swooping down upon the Heron and bringing it to the ground. The Tiercel was flown at Partridges and Magpies.

Whole books have been written about the art of falconry. In a case of ancient books in St. Alban's Cathedral I have seen a blackletter volume, probably of the fifteenth century, which gives instruction in "the manere to speke of hawks fro an egge tyl they ben able to be taken. How ye shal demeane you in takyng of hawkis."

It is sad that the handsome Osprey or Fishing Eagle, sometimes called the Fish Hawk, is no longer to be seen in our Islands. A hundred years ago it was common among the lochs and little islets in the Highlands of Scotland. But it has been persecuted on account of its fishing habits. Probably the Ospreys are happiest in some lonely forest on the shores of a lake well stocked with fish, where they can catch their food to their heart's content, and build their nests on the top of some tall forest tree. The nests are so large that they can sometimes be seen at a distance of a mile.

Red Kites also are seldom, if ever seen now in England, but formerly

they seem to have been as common as sparrows. There is an amusing account of how in the seventeenth century "so abundant are they that they affect to prey in cities and places frequented by men; so that the very gardens and courts and yards of houses are not secure from their ravines. For which cause our good housewives are very angry with them and of all the birds hated curse them most." There is a record of a nest in London in 1777, and this seems to be the last.

In far away mountains in Scotland and the Hebrides you might by great good fortune still see a Golden Eagle, a fine bird with very powerful wings and claws, a strong hooked beak (as have all Eagles and Falcons) and wonderful eyes which seem to be looking far away into the distance, and which are shaded from the sun by a kind of small roof of feathers. The female bird is larger than the male and measures about three feet six inches in length, while the stretch of her wings from point to point may be about nine feet. The Golden Eagle gets its name from the rich golden red feathers on the head and neck, the rest of the body being chiefly of a rich blackish-brown colour.

The Eagle and his mate help each other in hunting and they pounce upon smaller birds, Rabbits, Hares, Chickens, Squirrels, Fish and even young Lambs and Deer. The great bird does not chase its prey, but it



*The Peregrine Falcon, terror of other birds, has deadly claws which it uses ruthlessly.*



*The Golden Eagle carries to its lofty fortress a supply of heather to line its nest. Here it is monarch of all it surveys.*

sweeps through the air in curves, each curve carrying it higher, "mounting up with wings" and yet hardly seeming to move them, till at length it has risen high enough to mark its prey down, and then it swoops down upon it like a flash of lightning. A curious story has been told of a Golden Eagle which had been tamed, and lived in a yard near her owner's house fastened to a post by a long chain. On one occasion a sickly, pining chicken was offered to her: she refused it, and seemed to be struck with pity of its miserable state, for she took it under her wing, which she stretched out as a shield, and when a man foolishly tried to take it from her she attacked him fiercely and drove him away.

Eagles take food to their young so long as the little ones cannot help themselves, but when they have come to their full growth and are able to fly, the parents sternly drive them from home.

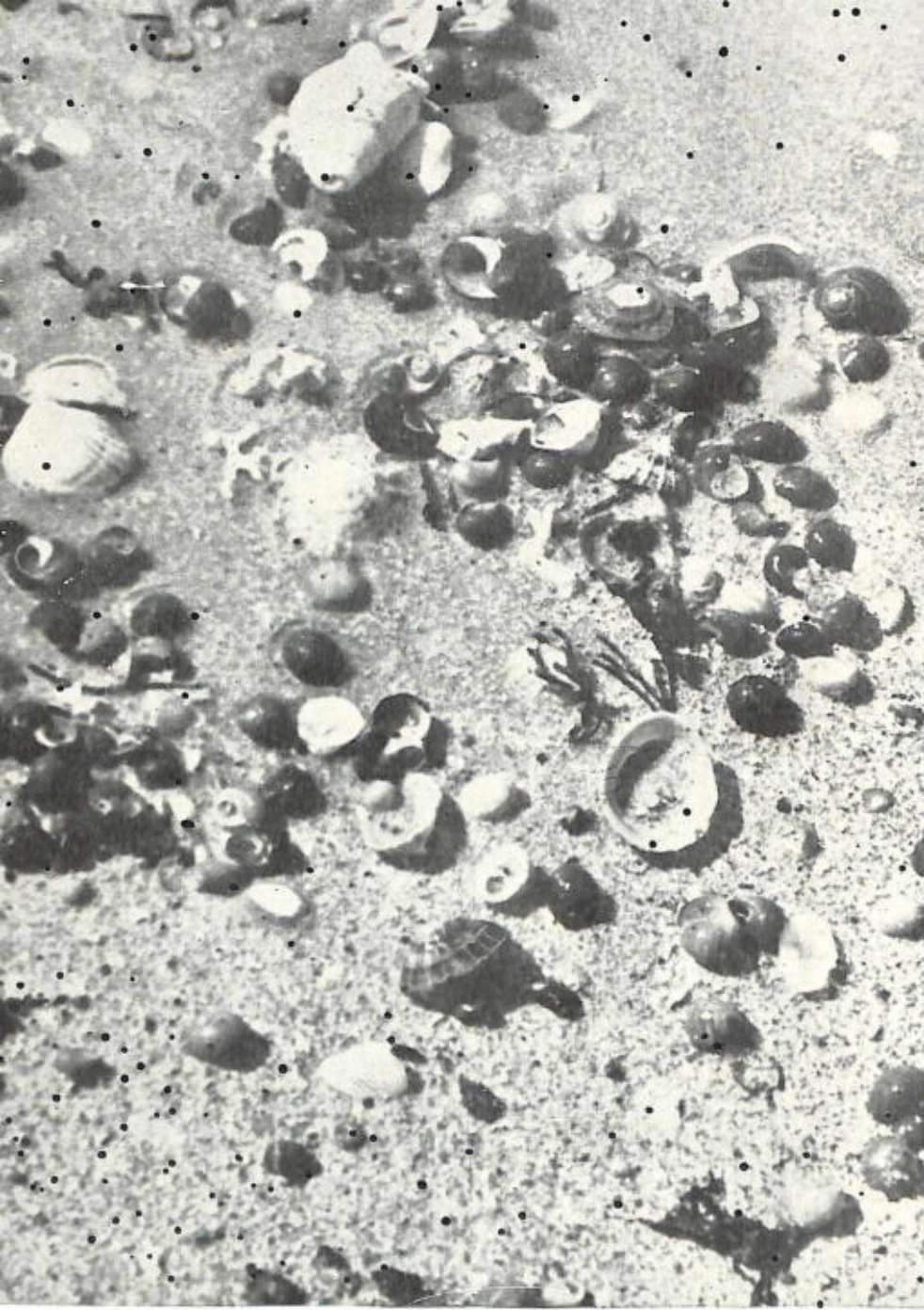
The Eagle's nest—eyrie as it is called—is built in some high place, on the ledge of a rock or sometimes, but less often, in a tree, and is made of a collection of sticks which look as if they had been carelessly thrown together, with a lining of tufts of grass or heather. Near the

nest a sort of larder is often arranged on some large stone, where the parent Eagles have collected a store of food. An account in a Swiss paper some years ago gave this list of the remains of a feast found in or near an Eagle's eyrie—fresh and stale meat, a recently killed hare, twenty-seven chamois' feet, four pigeons' feet, three chickens' feet, thirty pheasants' feet, eleven chickens' heads, eighteen heads of grouse and other wild birds, and remains of snakes, squirrels, rabbits, marmots and other game.

The smallest of the Falcons is the Merlin, who is only about the size of a Blackbird or about eleven inches long, but he is a brave hunter, and always ready to fight smaller birds, and even a bird much bigger than himself. He has been seen to swoop down upon a Buzzard, and the Buzzard cried out in terror. A bird lover writes of a certain Merlin which seemed able to think things out! She had been caught in a noose, and one foot was fixed in the strong knotted string. At first the bird struggled hard to get free, but when she found that struggling was useless she looked carefully at the knot, turning her head from side to side, and then carefully pulled at it with her beak, and went on pulling till she had loosened the knot and set herself free.

**BELOW:** *The Golden Eagle tends her nest in her lovely mountain home between journeys in search of prey.*





## MAILED FIGHTERS AND SOME ODDITIES

*There, with a light and easy motion,  
 The fan-coral sweeps through the clear, deep sea,  
 And the yellow and scarlet tufts of ocean  
 Are bending like corn on the upland lea:  
 And life, in rare and beautiful forms,  
 Is sporting amid those bowers of stone,  
 And is safe, when the wrathful spirit of storms  
 Has made the top of the wave his own.*

J. G. PERCIVAL

LET us go down to the seashore on this fine afternoon, and see what we can find at low tide. If we walk along the wet sand, which the outgoing sea has passed over, leaving pretty ripple marks, we are sure to find some little Crabs scuttling about, very much frightened by our approach: some try to flatten themselves against the ground, hoping that we shall think they are only pebbles, and some will hide themselves under this bunch of sea wrack.

If, instead of exploring here in England, we were walking along the seashore in some parts of the United States in the dusk, we might be startled by seeing ghost-like creatures scampering away on very long legs, with shining black eyes set on long stalks: just now we saw nothing, for their pale, yellowish-grey colour just matched the yellow beach as they crouched down upon it; but now they have scuttled away very quickly after Sand Hoppers, and we find that they are Crabs—well-named Ghost Crabs. Their homes are burrows dug deep into the sand, with a round hole as the door, where sometimes they stand on guard, and though they are able to swim, they seem to like the sand much better than sea water.

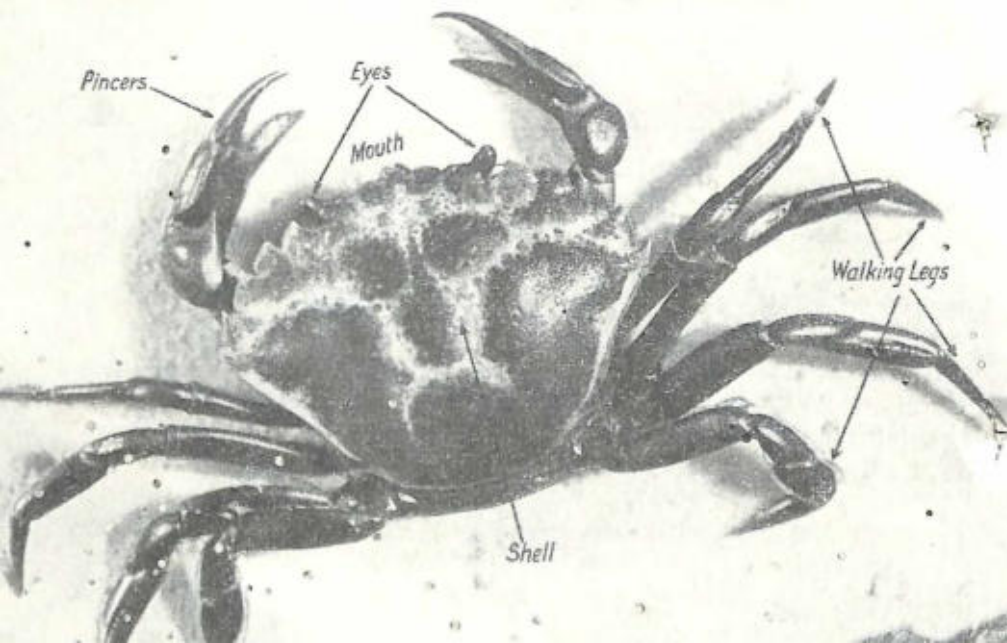
But here at home if we lift up this heavy bunch of seaweed we may

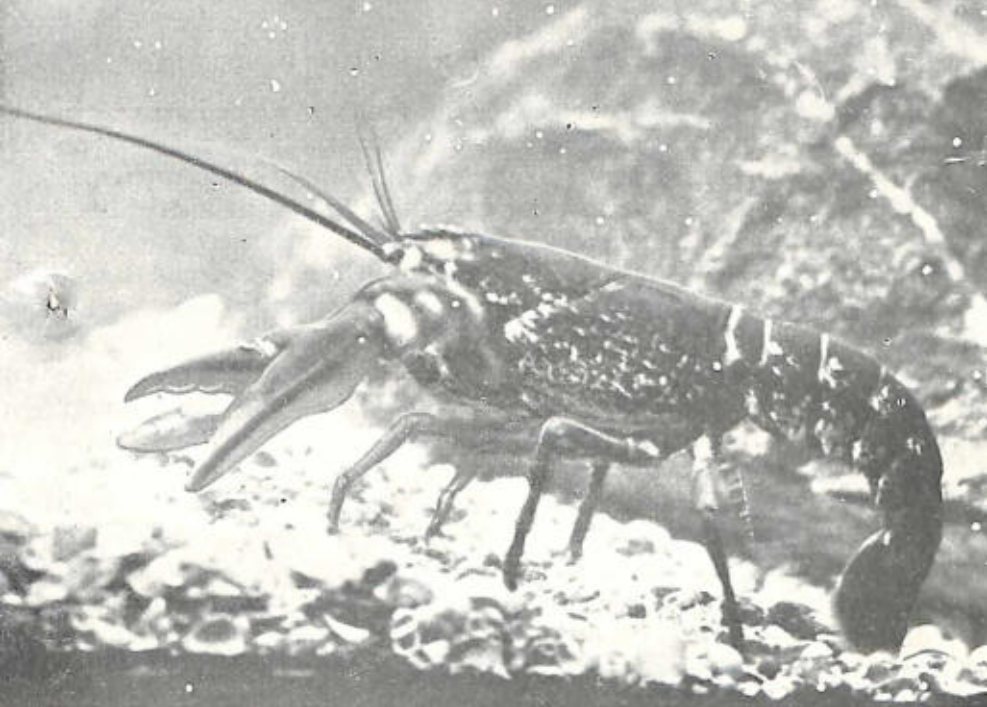
OPPOSITE: *Many strange shells can be found on the seashore, some of them inhabited by queer little creatures.*

surprise a big Crab, one of the kind called "Edible Crabs," Crabs which may be eaten. He will lift up a great pair of sharp front claws, and look very fierce, as much as to say, "I know you would like to eat me, but I won't allow it!" Just now out the sea front we saw the fishermen's crab-pots or creels which they were getting ready with bait of haddock or skate or other fish. For Crabs the fish must be fresh—Lobsters never mind if the bait is stale! We saw that the creels were round baskets, and just inside the opening of each basket was a little arrangement of osiers like a mouse-trap, through which the Crab could get in, but once inside it cannot get out, for the osiers will spring back and bar the way.

The Crab can spend a long time on land without suffering, for he can carry a certain amount of water in his gills, though some Crabs can live longer out of water than others. Some very humble relations—a kind of Shrimp—carry their gills in their legs, and their Latin name means gill-footed, since it is by means of their legs that they breathe!

BELOW: *This picture shows the different parts of the Crab, with its fierce claws and peculiar eyes. Fishermen use haddock as bait to catch it.*





*The Lobster is always on the look-out for the greedy creels that are ready to snatch him from his watery home.*

But all Crabs, even the Land Crabs, must visit the sea at least once a year, for they have to leave their eggs in the ocean. Their babies live in the sea, and swim about, rather after the manner of the gnat larvæ which you see in a bucket of dirty water out of doors in the summer. The baby Crab, called a Zoea, has a long tail, two great eyes rather like those on a diver's helmet, it carries a long spike or horn, and it does not look in the least like the grown-up Crab into which it will grow in time. But the grown-up Crab *has* a tail, though the Common Crab's tail is not easy to see unless you turn him over on his back, and then you may spy his little tail tucked up under his body.

Lobsters and Crabs go on growing through most of their lives, but their shells are very hard and strong and will not give way or widen at the same time, so what will happen when the creature grows too big for its coat? Well, it sheds its coat from time to time, even throwing

off the covering of the claws, and grows another, which is cast off in the same way when it becomes too small in its turn, and so it goes on till the creature has come to its full growth. You may chance to come on a Crab's cast-off covering, and may think at first sight that it is a live Crab, so perfectly does it keep its shape. A Lobster even throws off the footstalks of his eyes, and other parts which you would hardly expect to be changed, and indeed he has some difficulty in getting rid of his old skin.

When the creature has cast its old coat, and before it has grown the new one, it is very soft and helpless, and hides away in some cranny in a rock or other shelter. While it is in this soft state, which lasts about a month, it is not fit for cooking and eating.

In our walk along the seashore we may come across a curious Crab called the Hermit Crab. He has a soft tail, not curled up underneath the body as we saw in the Common Crab, but trailing behind and not covered with a shell of his own. So as he wants his tail to be protected he looks for the shell of some other creature, such as a Whelk shell, and takes up his abode in it. He has a pair of pincers at the end of the tail, with which he holds on so firmly to the inside of the shell that it is very difficult to pull him out. He can curl himself round neatly inside it, and sometimes he holds up a large claw to cover the opening.

It is amusing to see a Hermit Crab choosing its shell. It takes one in its claws, twirls it round and round very quickly, balances it as if to try its weight, probes it with its long horns (*antennæ*) and, if it does not quite please, Mr. Hermit throws it away. If there are a good many shells from which to choose, it may try one after another till at last a satisfactory one is found. It will then twirl it round till its tail falls into the opening, and then march up and down to make quite sure that the shell fits, or it may whisk itself into the shell as if shot out of a gun. But Mr. Hermit Crab seems to be ready to try anything which is at all like a shell: a specimen is shown in an American Museum which had made its home in the bowl of an old clay pipe.

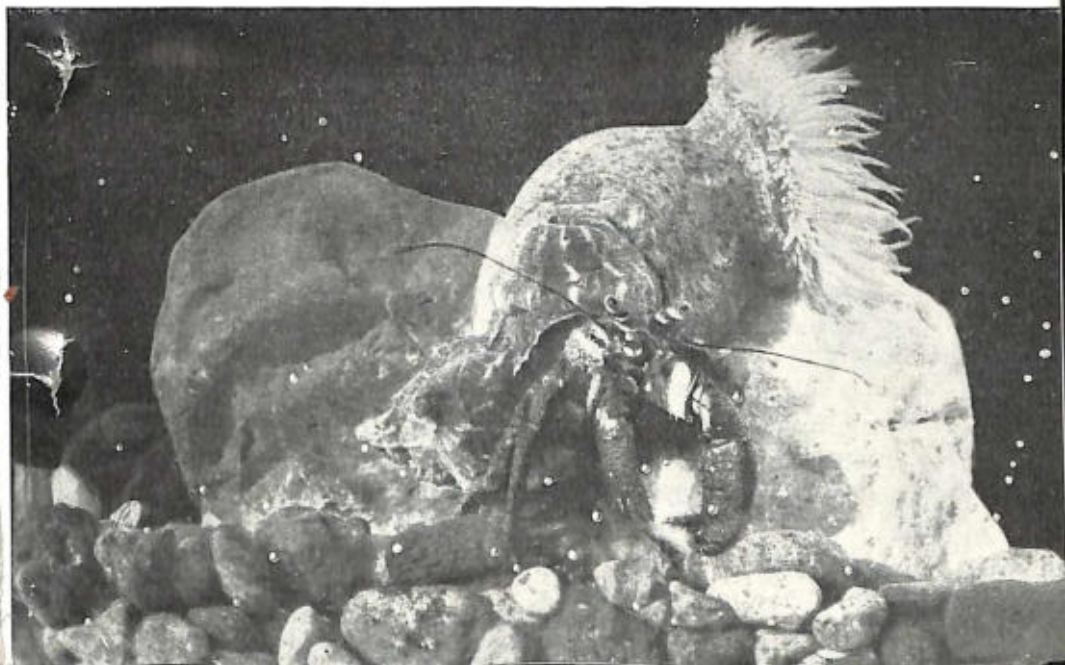
The Hermit Crab is a great fighter, and you may see two fighting in deadly combat over some shell which both want: they fight to the death, and when one is killed the other eats the dead body!

If you want to see a Hermit Crab without his shell, you will not

be able to draw him out of it very easily. But if you pick him up, shell and all, and drop him into the middle of an open Sea Anemone, he will quickly crawl out of the shell when he feels the Anemone's little fingers begin to curl themselves around him. There is, however, one kind of Hermit Crab which enters into an odd sort of partnership with a Sea Anemone, and carries it about on his shell; the Anemone would no doubt sting any fish which tried to get at the Hermit, and in return gets free travel on the Hermit's shell. But what is to happen if the Hermit wishes to change houses? Well, it is said that the Hermit will take the Anemone in his pincers and place it on the roof of his new house. Sometimes the Hermit Crab's whelk shell may be covered with the tiny creatures called Sea Firs.

It is not very easy to keep Hermit Crabs alive for long in an aquarium, but the smaller kinds of common Crabs are very hardy, and can be kept in flat dishes with stones raised partly out of the water. If you collect a few specimens of much the same colour from the same shore pool, and put them in separate dishes with differently coloured surroundings—say red seaweed in one, green seaweed in another, dark

**BELOW:** *The Hermit Crab and the Anemone join forces to the benefit of both. The Anemone travels free, hides the crab, and protects his shell.*



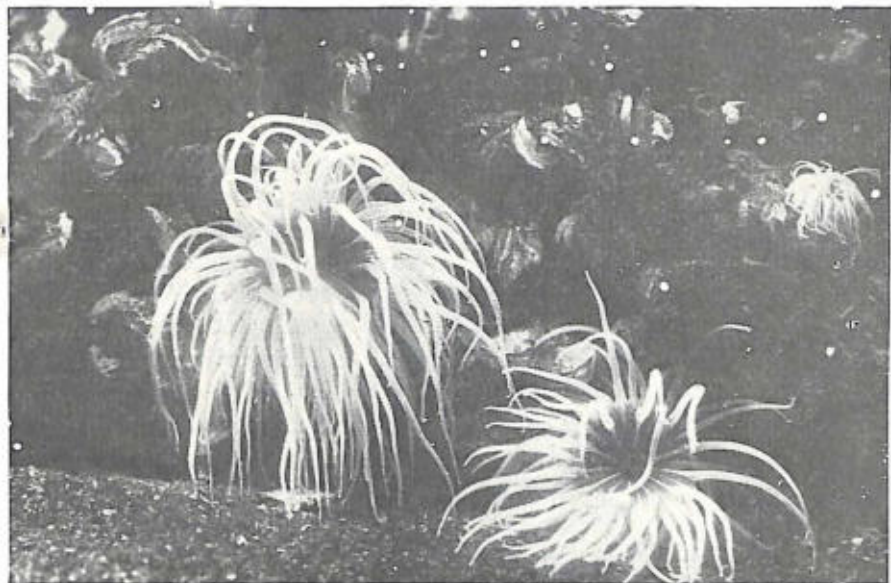
shale in a third, you will find your little Crabs changing colour to match the objects surrounding them.

Lobsters and Crabs, and other "crustaceans," as the family is called to which they belong, need not mind much if they have an injured limb, for they can throw it off and grow another. Lobsters seem to be very nervous animals, for a loud noise such as a clap of thunder or the firing of a gun is enough to make them throw off their great claws—those claws which furnish such excellent food in a boiled Lobster.

So far we have been looking chiefly at animals which are very curious but certainly not beautiful. Now let us see if we can find some beautiful creatures among those small rocks. We have seen that a Hermit Crab will carry a Sea Anemone on the top of his shell. Here are some lovely Sea Anemones. We shall know the Smooth Anemone, or Beadlet, which may be red, green, brown, or orange, by the little blue beads showing at the base of its tentacles (or little fingers), which are really the stinging cells. It will not sting you or me, but it will sting fish and other little creatures coming too near.

Here is another Anemone which I fear has no English name, but its Latin name is *Crassicornis*, or "thick-horned," so we can call it Crass for short. Crass has short, thick tentacles, of gorgeous colours, and the base of each tentacle has a dark line across it. We might have overlooked him if he had not chosen to show himself spread out, as sometimes he sinks into the sand and only a little mass of sand and broken shell is to be seen on the surface. Crass is very greedy and can even swallow small Crabs, dragging them into his mouth in spite of their struggles. For Anemones have a wonderful arrangement of tiny hairs or threads, scattered about their bodies and chiefly on their tentacles: these tiny hairs are coiled round and round like the mainspring of a watch, and when the tentacles are touched and pressed in, the hairs uncoil and shoot out, the tentacles then close around the unfortunate Crab or other prey, and the mouth sucks it in and devours it.

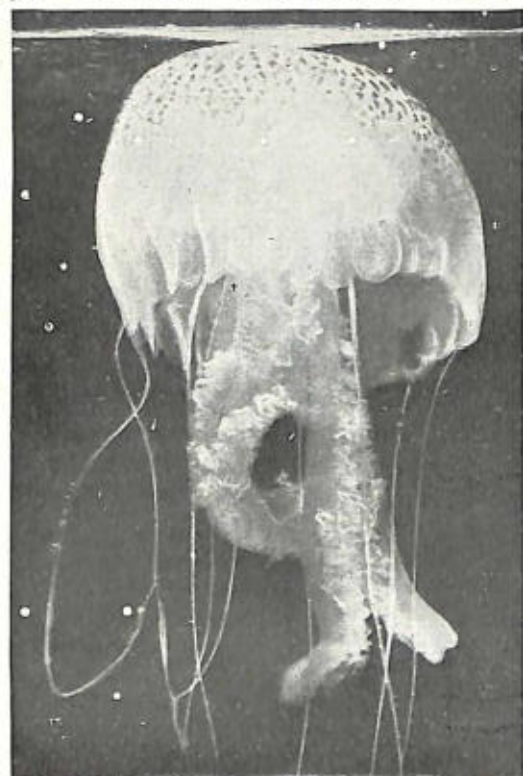
It is quite easy to keep the more hardy kind of Sea Anemones in an aquarium if you are able to provide them with sea water. The Smooth Anemone and the Cave-dwelling Anemone both do well, and so does the pretty and common *Anthea*. But you must be careful in taking them off the rocks, for if you tear away the sucking part by which they



*The Sea-Anemone, a flower-like creature, which lives in rockpools, is not so harmless as it appears, as the small fish know to their sorrow.*

stick to a stone or rock the creatures may quickly die. The best plan is to slip the thumb nail or an ivory paper-knife under the base and peel it off slowly and gradually.

Some near relations of the Anemones are these Jellyfish which we see here and there on the sand or in the rock pools. If we look at this Jellyfish in a pool of sea water we see that it has spread out its threadlike tentacles, but on the sand it looks merely like a lump of jelly. On a sandy shore at Morgat in Brittany, I remember counting over one hundred Jellyfish one afternoon, and on looking for them the next morning I found that almost all had disappeared. Jellyfish are very low down in the animal scale, and really very little more than sea water with some life in it, and if they lie for a long time on the shore they may just melt away. There is the story of a farmer who ordered his carts down to the shore and carried away several cart loads of Jellyfish which he hoped to use as manure on his fields, only to find next morning that they had all disappeared just leaving a few threads.



*The curious Jellyfish, which hardly seems alive but is yet able to fend for itself.*

called Acalepha, or Sea Nettles, which is a very good name for them, as many have poisoned stings. Some shine at night like glow worms and light up the waters.

Perhaps after our walk on the shore we shall go home to tea and enjoy a plate of Shrimps. Shrimps, Prawns, and Crayfish are brothers of the Lobsters. You will not know what a lovely little creature a Prawn really is if you only know it when it is boiled for eating. The live Prawn has beautiful tints on its partly transparent body, and bright, glowing eyes. The little Prawns, called Aesop Prawns, which we find in rock pools in the summer, are not good for eating: the edible Prawns

Among many other cousins of the Jellyfish there are some which are called Comb Bearers, or Comb Jellies, which often come into our own seas. They are furnished with rows and rows of "cilia," or sort of hairs with toothed edges, flashing out all the colours of the rainbow as they twist and turn and roll over and over in the water. One called Venus Girdle is like a long ribbon which rolls up and unrolls itself as it swims, and in the Mediterranean is sometimes five feet long, though only about two feet broad, with a rather small mouth in the middle of the body.

These and many other curious creatures like them belong to a family

live some little way out from the shore, and are caught in a shrimping net, or by dredging.

Well, it will soon be time to go home to our shrimp tea, but there are still one or two curious objects which we might think about for a minute. Do you see a little jet of water coming up out of the sand? What can be squirting out water? If you kneel down and look very closely you may be able to find two very small tubes just showing above the sand, and that means that a Razor Shell is hiding there. Can we catch him and examine him? Not unless we happen to have a handful of salt handy, to throw over the tubes, which will make him come out angrily to inquire, What is intruding on his burrow? If you are very quick and manage to catch him you will find that he is long and narrow. The two sides of his shell fold together like the two sides of a book, but there is an opening at the two ends to allow the little siphons or tubes to protrude at the upper end, and a foot at the lower end. He uses this foot or sucker for burrowing quickly, and digging out sand, or he can roll it into a ball which steadies him and helps him to give a forward leap.

**BELOW:** *The Starfish, though often found in shallow waters and clinging to rock, likes to make its home at a depth of ten fathoms.*



# NATURE'S PLAYGROUND

*Book Two*

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## AN UNDERGROUND LARDER

*'Tis the soul's springtime yet  
 And from December's snows,  
 With hope on summer set,  
 She blossoms as the rose.  
 As worm which finds its wings,  
 As leaf from bud set free,  
 As bird that soars and sings,  
 So shall the spirit be.*

M.C.L.

WHEN we go along the lanes or through the woods or round our gardens on this fine spring day, we shall see signs that something has been going on underground throughout the winter. What is it? Well, here in our gardens yellow and mauve and white Crocuses are shooting up. What has been happening here? And how does Crocus manage to come up so early in the year? If we look at a Crocus which has been dug up we may find the answer. Do you see that it has a fat swelling at the end of its stem, looking rather like a little potato? This is a kind of bulb, called a corm, and the corm is a larder where the Crocus has been storing up food through the winter: so now it can send up its well-nourished flowers in good time in the early spring.

And here is "the fair maid of February," the Snowdrop, "little bell of the snow," as the Germans call it. If you have planted Snowdrops you remember their tiny bulbs, which also are part of the underground stem, swollen out and holding food for the plant, and also the little bud out of which the flower grows.

Some time ago we talked about that queer plant, the Arum, or Lords and Ladies. You may remember that the Arums have tubers, or underground stems, full of the starchy food which nourishes the young plant. It is said that though Arum berries are poisonous, the

OPPOSITE: After the cold and dark days of winter the brave little snowdrop is first to show its dainty hanging head. Then we know that spring is not very far away.

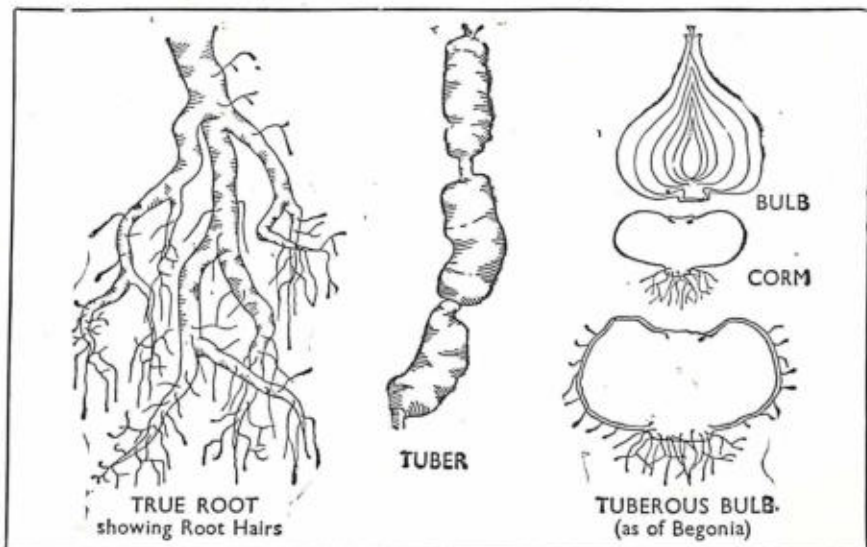
powder in the tubers can be cooked and eaten if the sharp disagreeable flavour can first be boiled away. But there is an amusing recipe for treating a "saucy guest" in a book written by one William Coles in 1656. The book is on *The Art of Simpling*, which means curing people by "simples" or medicinal herbs. He says "the fresh root of Cuckoo Pint" (Arum) "cut small and mixed with a sallet makes excellent sport with a saucy sparkling guest and drives him, from overmuch boldness (as will the powder strewn on any dainty bit), for within a while it will so burn and prick his mouth and throat that he shall not be able to eat any more, nor scarce speak for pain. To take away the stinging give the party so served new milk or fresh butter." It is as well that the practical joker is told how he may afterwards relieve the pain of "the party so served!"



*The Yellow Flag, or Iris, is a lovely flower that grows from a "rhizome," or underground stem.*

You know that Potatoes are tubers—that is to say, underground stems, or rather branches—not roots, as many think. You can see that the Potato is a branch by looking at its "eyes," which are really buds, and if a Potato is taken out of the ground and, instead of being cooked, is cut into bits, and each bit which has an eye is planted, a fresh plant will come up.

The Iris, or Flag, which is a first cousin of the Crocus, has a stout underground stem called a "rhizome," which runs along under the ground and sends up shoots which



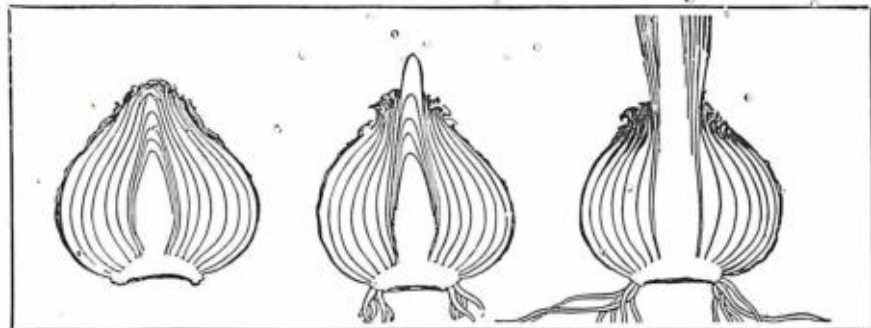
*The above diagrams show the types of roots from which plants grow. It would be an interesting task to make out a list of the plants you know and find out the different types of roots they have.*

have fed on the stores laid up in the stem. Members of the Iris family can live on year after year without making seed.

"Solomon's Seal," which you may have seen in gardens, but which is very rare otherwise, has a rhizome covered with round scars, left where stems of former years have been thrown off in autumn. Some old botanists said that the wise Solomon who "spoke of plants from the Cedar of Lebanon to the hyssop on the wall" had left the mark of his seal where these round scars are to be seen, and so they gave it the name of Solomon's Seal: and the same name is given to it in French, Italian, and Spanish. And the old herbalists believed that the marks were signs that the plant could "seal" or heal wounds.

Another early spring flower, the Wood Anemone, has creeping rootstocks, with a strong network of fibres, which spread themselves a long way under the surface of the ground.

Have you noticed that the greater number of early spring flowers are yellow or white? Yellow Celandines, Yellow Crocus, White Crocus,



*A bulb is here seen cut down the middle, to show you how the roots and the leaves grow out of the fleshy body of the bulb.*

white Wind Flower (Wood Anemone), Yellow Aconites, Yellow Colts-foot, Yellow Primroses, White Snowdrops, Yellow Daffodils "that come before the swallow dares and take the winds of March with beauty." It has been suggested that insects can see the yellow and white flowers easily against the rather dark background of early spring, and so are attracted to visit them and help to set the seed. We will think more another time about insects and flowers exchanging civilities.

I think that any of you who planted bulbs in pots indoors last autumn must be rejoicing now in the sight of Daffodils and Hyacinths blooming in your houses or school. But if some of you do not quite know how to set about "forcing" bulbs, as it is called, may I give you a few hints.

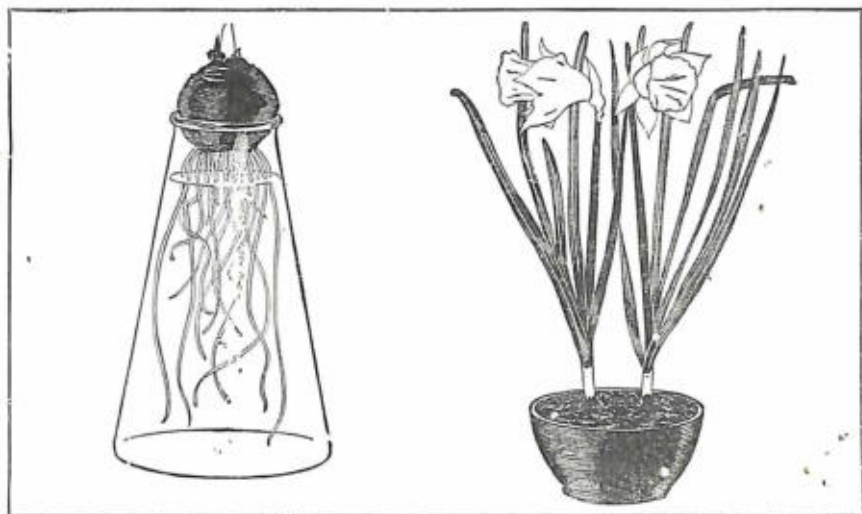
At the end of August or beginning of September plant your Narcissus or Hyacinth bulb in a pot of earth or fibre, with the nose of the bulb just showing above the surface. If you plant in an ordinary flower-pot with a hole and "corks" at the bottom you can use earth. If in a bowl of fibre, drainage will not be necessary. Keep the pot or bowl first of all in a dark place, but do not shut it up in an airless cupboard.

In about a fortnight look to see if the earth or fibre needs water. If it is a Hyacinth do not let any water touch the bulb, or the little buds may come up brown and the plant may be spoilt. Look at it again in another fortnight, and now possibly you may see a tiny yellowy-green shoot showing itself on the top of your bulb.

Leave it ten days or so, and then give it a little more light, and in another four or five days bring it into the sunniest place you can find for it. By now if the plant is doing well your shoot will probably have grown up half an inch, and you may see some little green leaves tightly folded into each other, and in the very middle of these leaves you will see the tiny beginning of a Hyacinth flower: if the plant is a Daffodil or some other Narcissus you will see the green leaves forming, but the flower will come later. Be careful never to let the earth get dry, but try not to water too much, or the plant may rot.

After the flowers have died, you can unpot the bulbs, and when summer comes you can put them out to dry thoroughly in the sun, and in autumn, about October, they can be planted out in your garden. It is interesting to notice that in about two years' time the big Hyacinth bulb will have shrunk to the size of a Bluebell bulb, and the flowers will come out very small in proportion.

An interesting experiment is to grow a Hyacinth in a bulb glass. Fill the glass with water with a small quantity of charcoal to keep



*The first picture shows a bulb growing in a jar of water. The roots strike down to the water. On the right is a bowl of daffodils growing in fibre.*

the water sweet. Place the bulb in the cup of the glass, letting the water just touch the bottom of the bulb. Keep the glass for a time in the dark, as in the case of the bulbs in pots. After a time you will see the long white roots coming out from the bulb, and the little



*It is wonderful to think that a small acorn gives birth to a massive Oak tree. Above is a photograph showing the seedling springing from the acorn.*

is a near relation of Lilies, Hyacinths, Daffodils, Narcissi, and Tulips, for Onions and Garlic are members of the beautiful Lily family. We may be disappointed sometimes on seeing at a distance some pretty white flowers with leaves very much like those of the Lily of the Valley, and on coming nearer discovering by the smell that our beautiful Lily is Garlic. An old name for Garlic is Ramsons or

bud appearing at the top. Be careful not to bring the plant into the full light till a fair amount of roots are to be seen. The plant is able to grow in this way without any food from soil or fibre because it feeds on the store laid up in the bulb.

An Acorn can be planted in water in an acorn glass (acorn glasses are sold in some glass and china shops) and when the baby Oak tree comes out and has grown enough, it can be transplanted into soil in some part of your garden. I have sat under a shady Oak grown from an acorn which began life in a vase of water thirty years before.

A very well-known bulb is an Onion, and this useful vegetable with its somewhat unpleasant smell

Ramsins, and it was thought to be very wholesome, so that a very old proverb advises :

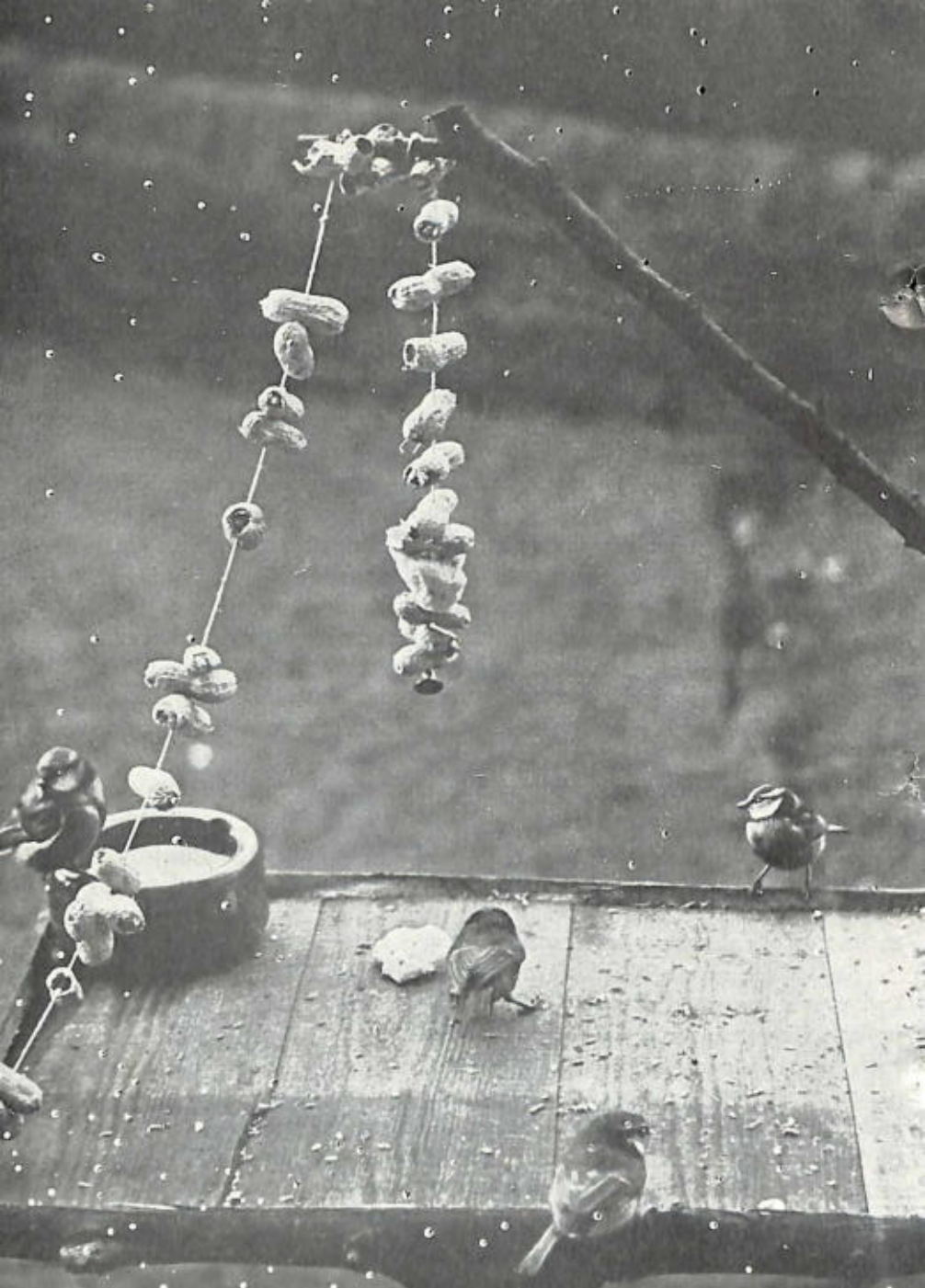
“Eat Leekes in Lide (March) and Ramsins in May,  
And all the year after physitians may play.”

Wild Tulips are very rare, though a yellow kind, smaller than any garden Tulip, has been found growing in chalk pits in England. The first cultivated Tulips planted in England were sent from Vienna about the end of the sixteenth century.

Now in spring we see many buds on the trees and bushes and in the hedgerows. It is worth while to examine some and see how carefully they are “packed.” If you are going on a journey, and taking a box or a bag with you, you give some thought to the best way of packing your things: you have to fit them in neatly, so that no space is wasted, but at the same time nothing must be crumpled or damaged. Well, in a flower bud, say a Narcissus, you find a number of baby petal leaves folded neatly and tightly together, kept safe and warm from rain and cold. And in a leaf bud, of an Ash Tree or a Horse Chestnut for instance, you find the same kind of thing, the leaves folded up and closely packed, till the time comes for them to open out.

In some plants the leaves in the bud are twisted around each other like a corkscrew, in some they are plaited, in others overlapping like the tiles on a roof, in some folded like a sheet of notepaper, in others folded like a fan. Ferns have their baby leaves, fronds as they are called, curled inwards till the summer comes, and it is time for them to uncurl themselves once more.

And while we are thinking of buds, bulbs, tubers, and roots, may I give you one word of warning? It is of course a good thing to pull up mischievous weeds, but if you go out picking beautiful flowers, such as Primroses, or Bluebells (which are really wild Hyacinths), please be careful not to pull them up by the roots, for that is an unkind and short-sighted thing to do. The root should be left in the ground in the hope that more flowers may come out, to give pleasure to others as those you have picked give pleasure to you.



## CHAPTER TWO

### WINGED VISITORS

*The little bird sits at his door in the sun,  
Atilt like a blossom among the leaves,  
And lets his illumined being o'errun  
With the deluge of summer it receives,  
His mate feels the eggs beneath her wings  
And the heart in her dumb breast flutters and sings.  
He sings to the wide world and she to her nest  
In the nice ear of Nature which song is the best?*

LOWELL

I EXPECT that any of you who live in the country like to look for birds' nests in the hedgerows, but if you feel you must steal some eggs, in cases where egg-robbing is not forbidden by your county authority, please do not take more than one from each nest. It is really more interesting to watch the nests if you can do so without disturbing the poor little mother birds, or to attract some of the birds to come and nest in your garden by providing them with nest boxes.

Nest boxes can be bought from certain shops, but if you are a clever carpenter you may be able to make a simple box yourself. One naturalist tells us that he makes his nest-boxes 5 inches square and 9 inches high: there is a sloping roof coming well over the front to keep off the rain, and the roof is hinged, so that it can be lifted in order to look at the birds inside. It is a little difficult to know exactly how large to make the entrance hole, for if made too large Sparrows will come and take possession, and if a Sparrow gets into a box already tenanted by a Tit, he may kill it, or worry the pair so much that no eggs will be laid. But if the hole is too small Tits may be discouraged from going in.

OPPOSITE: *You may assure yourself of regular bird visitors if you put up a bird table outside and string up some nuts. The tits are especially interesting to watch.*



*The Spotted Flycatchers are here seen at home. The hen bird sits quietly on her nest, while the cock keeps watch for insects that will serve as food for both.*

Another naturalist makes his boxes with roofs which can be turned round: with the gable end facing one way the hole is large enough to admit a robin or a Flycatcher: when turned the other way the hole is closed to  $1\frac{1}{8}$  inch and only Tits, Nuthatches, Wrens, and Tree Creepers can get in.

You can treat the outside of your home-made nesting-box with boiled oil or creosote to make it weather-proof. If you give it creosote do not apply this while the birds are roosting, but take the box down in August, coat it with creosote, then after it has stood for a few hours, give it a coat of boiled oil over the creosote. Do not hang up the box again till the dressing is quite dry. Of course you will be careful to hang your box well out of the reach of Cats.

We can put materials for the nest, such as feathers, bits of cotton wool, dried grass, etc., near the boxes, but it is useless to line the boxes ready for the birds; they like to do their own packing.

The perky little Chaffinch—or Pink, as he is sometimes called from his cry of "pink! pink!"—showing off the white bars on his wings as he flies down the garden path in front of us, makes a beautiful little nest. He chooses many different sorts of places for nesting—sometimes the fork of a tree, sometimes a hedge, or the ivy against a wall. The nest is made of moss, grass and wool webbed around with cobweb, lined with hair, sometimes plastered over with lichen, to make it look like its surroundings, so that it may be the better hidden. You may

sometimes induce the Chaffinches to come to an open-fronted nest-box, especially if you can hang it in an orchard or a Beech plantation. Mrs. Chaffinch lays from four to six eggs, greenish blue and spotted, as a rule, with deep reddish brown.

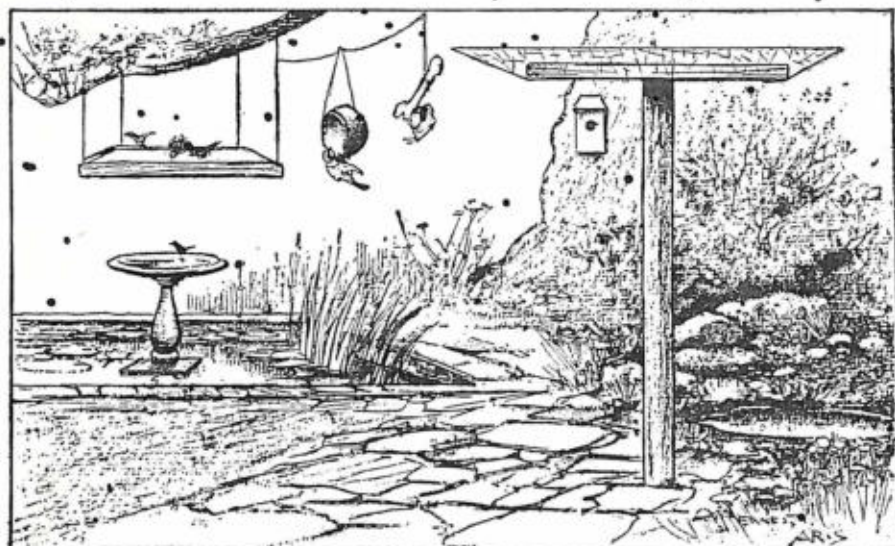
Robin Redbreast is a very sociable little person as far as human beings are concerned, though he is always ready to fight with other birds. Mrs. Robin *may* like to come into your nesting-box, but as likely as not she may choose some other quite unexpected spot for her nest: a half-broken flower-pot, an old kettle thrown away in a corner, a workman's tool-chest, a shelf in a greenhouse. She is a very fast builder. A workman who had left his coat on the ground at nine one morning picked it up three hours later and found a complete Robin's nest in the armhole!

Robin's nest is chiefly moss with a lining of horse hair or some similar material. Often it is finished by the end of February or early in March, but as a rule the five or six reddish buff eggs are not laid till about a month later.

The little brown Wren may choose to come to your nest-box, or

*Mr. Robin has caught a worm and will soon deal with it. He is a fierce fighter, and is generally seen in the winter hopping about alone or with his mate.*





*A few of the bird-feeding devices are shown above. A bone or a half-coconut will attract the tits, while the chaffinches love a little hempseed scattered on a tray or board.*

on the other hand she may refuse to have anything to do with it: or she may build a nest for herself just underneath it! This "little bird with a large song," as it has been called, will sing very loudly and quickly in the early spring, with a trill or shake at the end of the song. When one bird has finished, another may begin to sing an answer from a neighbouring shrub, to be answered in turn by the first. They do not interrupt each other, but sing exactly as if they were following a musical score at a concert, each taking its proper part at the right moment.

If you can induce Jenny Wren and her spouse to come into your nesting-box, you will find their nursery arrangements very interesting to watch. Your best chance is to place the box in a thicket, if possible facing north, and attached to the trunk of a bush or tree. A bird lover, who watched a Wren very closely when building, said that the nest was begun at seven o'clock in the morning of the 30th of May, when the hen bird placed a decaying lime leaf in the cleft of a Spanish Juniper. There were times that day when she brought in bundles of

leaves four, five and six times in the space of ten minutes. When she was more careful in the choice of materials she might be away eight or ten minutes. But the whole of the outside part of the nest was finished in the course of the day, the dry leaves being felted together with moss. That first day, the cock bird took no part in building, but cheered on his mate by constantly singing to her. The next day both birds worked at the nest, beginning at three-thirty in the morning and the whole was finished by June 8.

When finished the nest was a closely-knit ball of dried leaves and moss, lined with moss and feathers, domed over, with a small entrance hole at the side. If a Wren's nest is built on a mossy bank, the outside is generally made of moss; under the roots of a tree of twigs; in a haystack of hay, and so on. Jenny lays from five to twelve eggs, white, with a few red spots. The birds build a number of other nests, which are known as "cocks' nests," unlined, and only used for roosting. The young birds stay with their parents for some time after they are hatched, and fly about with them from place to place, often sitting and roosting in the "cocks' nests."

The tiniest of all British birds, the Goldcrest, or Golden Crested Wren, as it is, often called, is not really a Wren, but belongs to the Warbler family. Its Latin name, "Regulus,"



*The Wren will build her nest in curious places. Here is one snugly built inside a coconut.*

or little king, is given because it has a yellow crest like a little crown on its head, which it can lift up or put down at will. It builds a beautiful little cup-shaped nest made of moss, leaves, Fir cones, etc., woven together with wool and cobwebs, often hung from the end of the bough of a Fir tree.

The Goldcrest is not very likely to come to a nesting-box. Yet a lady once told the writer of a Natural History book how she had had a strange party in a large aviary—a jackdaw, a magpie, two skylarks, a goldfinch and a robin. She left the door open all day and supplied plenty of food for her party. In a very cold winter (1853) a number of very hungry wild birds—sometimes nearly 200—came to the aviary for food, and amongst them two Golden Crested Wrens. Though so small, these little Goldcrests lorded it over the other birds.

If a Jackdaw was feasting on a piece of meat holding it down with one foot, the wicked little thief would jump on to his head and attack his eye. The poor puzzled Jackdaw would lift his foot to try to scratch off whatever was troubling him and instantly Goldcrest would pounce down on the meat and make off with it. If Jack followed, Goldcrest would jump on to his back, where he knew he would be safe.

Here is the legend which tells how the Goldcrest got its crown. The birds of forest, field and seashore met to elect a king. A wise old Owl said that the crown should be given to the bird which could fly to the greatest height. A signal was given, the birds flew up. In a few minutes some fell to the ground, but others went on till only the Eagle, the Kestrel and the Swift were left. At long last the Kestrel and the Swift gave in, leaving the Golden Eagle still soaring, who thought he had won the crown. But when he came down to claim it, there was a fluttering among the feathers on his back, and out flew a Golden Crested Wren. It had gone up with him, hidden in his feathers, and had flown a few feet above him and down again on to his back! And so the Goldcrest became king of birdland, and was given his golden crown.

It is quite likely that the Blue Tits will come to your nesting-box, and when once they have begun sitting, you can safely look into the box and see what they are about. The Coal Tit and the Great Tit are less sociable and less likely to come to your box if it is



*The nest of the Long-Tailed Tit is most cunningly built, as you will read on this page. Here the parents are seen bringing food to their young in the nest.*

anywhere near your window, but they may be attracted by a box placed at a height of about ten feet on a smooth-barked tree.

The Great Tit lays from eight to twelve eggs, white spotted, with red. The Blue Tit (also called Tom Tit) and the Coal Tit lay from eight to ten small eggs of much the same colour as the Great Tit's.

Perhaps the most beautiful of all our English birds' nests is the nest of the Long Tailed Tit, which does not often come to our gardens, but flies about the hedges, banks and woods. The nest is shaped rather like an egg, and built of moss, hair, a little wool, and the cocoon webs of Spiders, all fastened together with cobwebs or the silken hammocks of caterpillars. Over the outside the little bird spreads silvery grey lichens, so that it is difficult to tell which is nest and which is tree.

The nest is lined with soft feathers—seven hundred have been counted in a single nest. These make a soft bed for the whitish eggs spotted with pink, which are never fewer than eight and sometimes number twelve or more. The entrance to the nest is through a hole in the top, and sometimes there is another hole near the bottom, as if to let in a little more air for the little birds to breathe when they are hatched.



## LAKE AND MARSH DWELLERS

*Hark! hark! the lark at heaven's gate sings,  
 And Phoebus gins arise,  
 His steeds to water at those springs  
 On chalic'd flowers that lies:  
 And winking Mary-buds begin  
 To ope their golden eyes:  
 With everything that pretty bin:  
 My lady sweet, arise.*

SHAKESPEARE

WE were speaking about the Flag—or, if we like to call it by its pretty Latin name, the Iris, which means Rainbow. You know that it likes marshy, damp places. In these beautiful flowers, the Yellow Iris, and the Blue or German Iris, we find the petals and the leaves of the “calyx” (the sort of case or envelope which holds the flower, and which is green in so many plants) are all brightly coloured, and the stigmas, which look rather like extra petals, are delicately coloured also. The seed box of the German Iris is brightly coloured inside. Bees are much attracted by these bright colours to visit the Iris, and so they carry the pollen about from one Iris to another.

Here is another water-loving plant, the Water Plantain, or Thrumwort, famous in old times as a supposed cure for the bite of a mad dog; but how far it was really a cure I do not know. In a very old book of Medical Botany I have read, “Plantane has been alleged to be a cure for the bite of the rattlesnake, but for this there is probably but little foundation.” Water Plantains, however, belong to a different family, though the large bright-green egg-shaped leaves of the Greater Water Plantain are very much like those of the Common Plantain. As well as these large leaves, it has long, narrow leaves which remain under the water.

OPPOSITE: *The Flowering Rush grows in ditches on marshy ground. It bears rose-pink flowers in clusters. You may only see this plant in the South, however, as it is rare in Northern England and Scotland.*

The Greater Water Plantain has pale rose-coloured flowers with only three petals, very frail and delicate and falling quickly if you try to gather them. Another water-plant, the Arrowhead, is very like it in having three-petalled white flowers, and also in having some leaves above the water and some underneath. You can tell Arrowhead very easily by its pointed arrow-shaped leaves rising straight and stiff out of the water. The leaves under the water are strap or ribbon-shaped, and sometimes a yard or more in length.

Some botanists think that these ribbon-shaped leaves under the water are useful to the plant by helping to nourish it as they drink in water easily. Others say that they are simply weak and flimsy from being ill-nourished, so you can hold what opinion you like on the matter! But at any rate it seems certain that the stiff upright leaves can hold their own well if the plant is surrounded by a strong current of water.

If we could dive to the bottom of the river and find the rootstock of the Arrowhead, we should see that it has tubers, like little potatoes: and it is said that the Chinese enjoy eating them, and that they are a little like Arrowroot, which is the tuber of a root growing in the West Indies.

A pretty little water-plant, which floats on ponds and stagnant waters, is the Frogbit, with its satiny-white, rather crumpled flowers, and glossy, green, rounded leaves. If it is planted it grows freely, and will make a pleasing show in garden pools or lakes. It sends out long runners, which give off tufts of floating leaves, and its

*In wet, boggy places the Butterwort sends up its blossom, and traps flies, which are digested by the flower.*



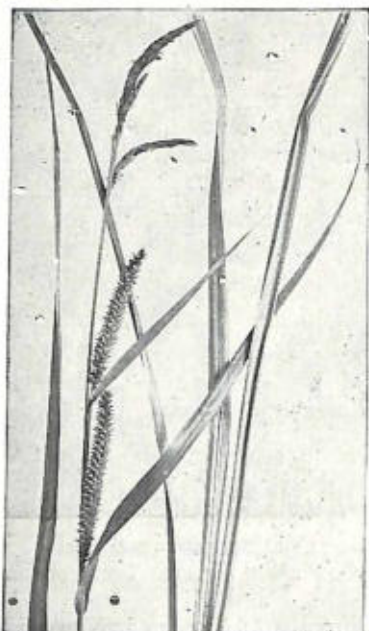


*Marsh Marigolds make a beautiful spread of golden colour in marshy ground during the springtime. Their contrasting leaves are of an especially rich green shade.*

roots hang down in the water. In autumn buds form at the end of the shoots and sink to the bottom while the rest of the plant dies away, and when spring comes back they rise to the surface and blossom into new plants.

There is a rather curious and handsome plant, which you may never have seen, for it is very rare in England, the Vallarsia, or Fringed Buckbean, sometimes called the Fringed Waterlily. It has large yellow flowers, and it has a very curious long stem, which in the flowering season is raised some way above the water, to hold up the flower till the seed is set: when the flowering season is over it sinks under the water again, to wait there till the season for flowering comes round once more.

It is interesting to notice how water plants can sometimes change the character of the place in which they grow. For instance, big strong plants may die down each autumn and raise the mud at the bottom of the water very slowly but surely, and so the edge of the pool is made shallower, and other plants which like a damp shore will take root. And so year by year the mud rises nearer and nearer



*The Lesser River Sedge, shown above, is found in ditches.*

to the surface of the water, and more plants will spring up. Marsh Marigolds or Marybuds, like great golden Buttercups (or Mareblobs, as the children call them), Water Mints, Lady's Smock, Spearwort, Dock, Butterbur, Brooklime, Forget-Me-Not, Dropwort. Soon smaller sedges will follow—rushes, Meadowsweet, Willow herb. And so by degrees what was once water may become marshy land.

The common rushes, which we find everywhere near rivers and streams, were formerly spread on the floors in houses and churches before carpets came into general use. At Grassmere in Westmorland a very ancient festival called the "Rush Bearing" is held in August on the nearest Saturday to St. Oswald's Day, when rushes and rush emblems (such as "Moses in the Bulrushes") are carried in procession

by children into the church, and the floor of the church is strewn with rushes.

In an account of Thomas à Beckett, published in 1528, the writer says, "He was manfull in his household, for his hall was everie daye in somer season strewed with greene rushes, and in winter with clene hay, for to save the knyghtes' clothes that sate on the floor, for defaulte of place to sit on."

With great good fortune you may possibly come across the lovely pink flowers of the Flowering Rush, but it is somewhat rare.

A little time ago we thought about the various ways in which seeds are scattered, but we did not mention those of water plants. The seeds of many of the water plants float along, as you may guess, in the water. Some fruits, such as those of Water Plantains and Bur Reeds, have a kind of covering or case holding a great deal of air

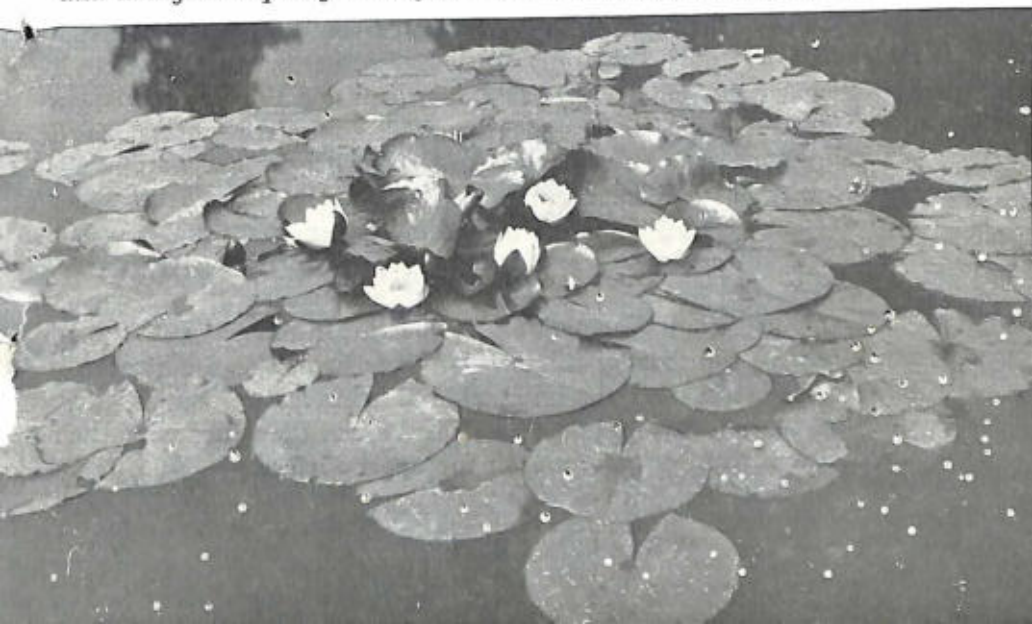
which makes them light and easy to float. The fruit of the Water Sedge is shut up in a neat little box or bag called a utricle: the space between the utricle and the fruit is filled with air, and so the bag forms a kind of bladder which is blown about, from bank to bank or marsh to marsh. The Iris has a bright green "capsule" or seed-box with three cells crowded with seeds: after a time the capsule dries up and looks like a piece of crumpled paper or parchment, and the seed falls out into the water.

While we are thinking of water plants we must not forget the queen of them all, the White Water Lily, which we might call the Lady of the Lake, or by her Indian name Cumuda, the Delight of the Waters. Her snowy white petals surround the golden crown of yellow stamens with the tall fat pistil in the middle. She is much visited by beetles and flies which come for her honey, and no doubt fertilise her seed by carrying the pollen about, which she scatters very freely.

The Water Lilies are cultivated in many parks and gardens, where specimens of various colours are to be seen.

In South America there is a very grand kind called the Victoria Regia. A specimen may be seen in a great tank in Kew Gardens, in

*BELOW: Here are Water Lilies, their broad leaves lying on the still-water and their white flowers opening to the light. The Water Lily is Queen of the water plants.*



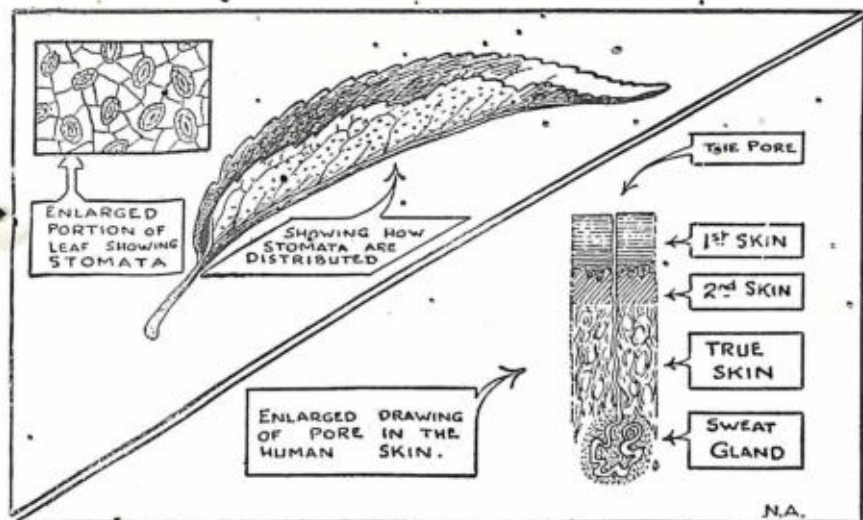
a house which is very much heated. The flower passes from pure white to rose and pink, and may be as much as 15 inches across. Its gigantic leaves, green above and crimson underneath, may measure anything from six to ten or twelve feet across, and they are so strong that a little child can sit on one without sinking. In its native state the leaves form good roosting places for water birds. Its seeds are eaten under the name of water maize, as are also the seeds of the Lotus, the sacred Water Lily of the East. Lotus flowers, as the emblems of India, were embroidered on the Queen's Coronation robe.

There is an American Lotus which has pale yellow flowers four to ten inches across, and great round ribbed leaves, smooth above and hairy underneath: these leaves may be raised above the water, or float on the top; or may be sunk quite underneath the water. Both leaves and flowers contain air cells.

As the flower and leaves of the Water Lily are so large and broad they can take in plenty of gases from the air above and plenty of water from beneath to feed and nourish them.

If you look through a strong microscope at the leaf of almost any plant you will see that it has a great many little breathing holes or mouths called stomates. These take in carbon dioxide gas, made up of carbon and oxygen, on which it feeds. It is said that 100,000 of these little mouths have been counted on the leaf of an apple tree, and over a million on a lime tree leaf! When the carbon dioxide gets through the little mouths into the cells of the leaf while the sun is shining it breaks up, the carbon goes to feed the plant and the oxygen escapes back into the air and helps to keep animals alive. For you and I and all animals must breathe oxygen to live. This, by the way, is the reason why if you are keeping sticklebacks or other little water creatures in a jar, you should put some water plant, such as hair weed, into the water, so that it may give out oxygen to keep your pets alive.

Well, this carbon dioxide is always present in the air, so that land plants are surrounded by this part of their food, and the breathing holes are generally on the under side of their leaves. But in those water plants which, like the Water Lily, touch the water with their leaves, the breathing holes are on the upper surface.



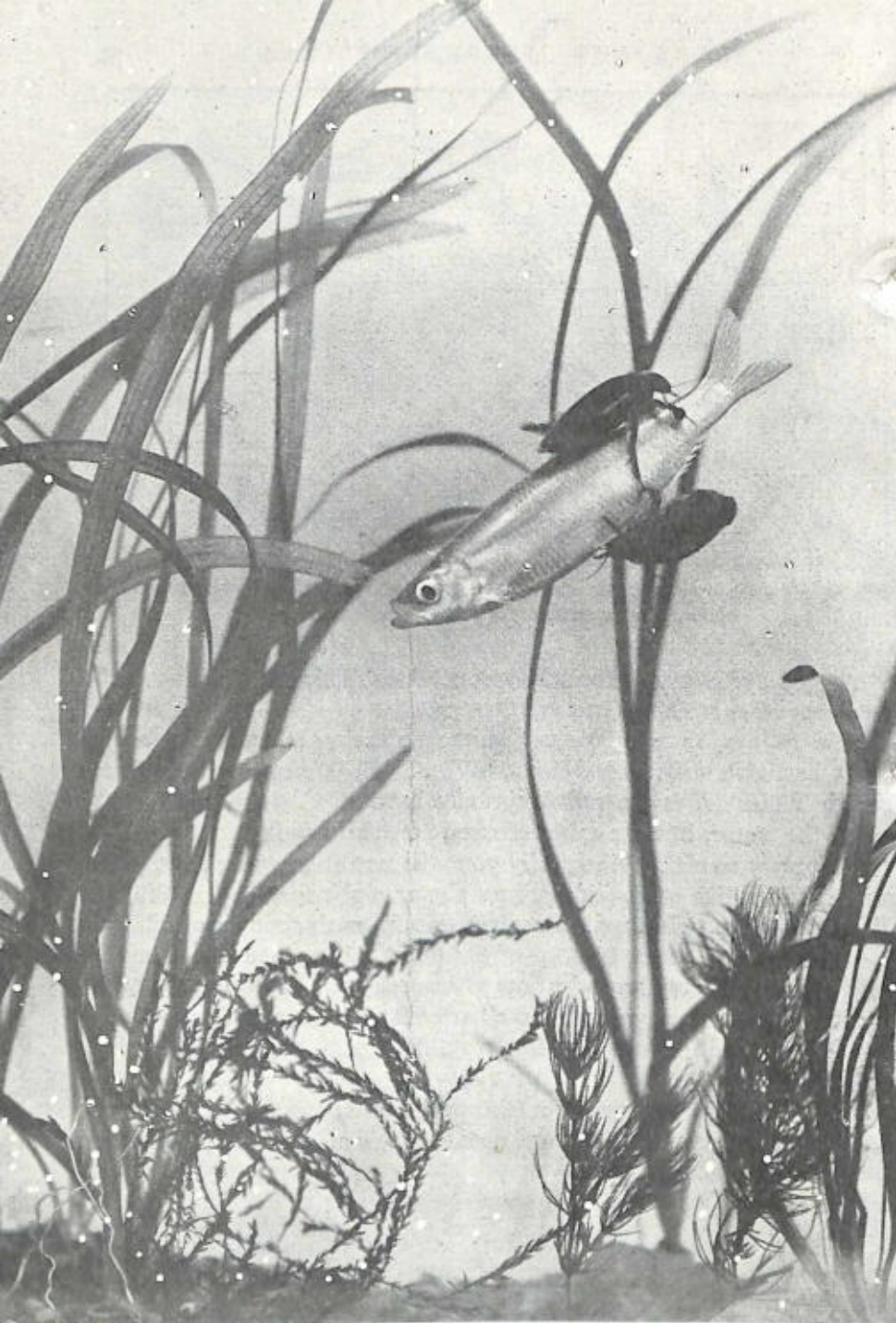
*The upper drawing shows the stomates (or stomata) of a leaf, while the lower picture gives a section of a pore in the human skin.*

A grey dye is made from the stems of the White Water Lily, and the roots of some kinds are good to eat.

The Yellow Water Lily is not quite so pleasing as its white sister, for it has a very disagreeable smell. In Norfolk and elsewhere, the Yellow Water Lilies are called "brandy bottles." Its flowers do not touch the water, but are raised above it on their stalks.

If you try to pick a Water Lily you will not find it very easy. The round rubber-like stalks, sometimes six or eight feet in length, are like long cables, winding themselves out from the roots, which are fixed in the mud at the bottom of the pond. When you try to catch hold of the stalk and draw the flower towards you, it may duck under the water and come up again at a little distance away. These stalks are crossed and recrossed with large chambers or "canals" filled with air.

Almost before the sun sets, the petals close up, and the flower sinks under the water, to come up again when the sun is high in the sky the next day.



## FIERCE WATER GIANTS AND LIVING LAMPS

'Tis a woodland enchanted!—  
There, in warm August gloaming,  
With quick, silent brightenings,  
From meadow-lands roaming,  
The firefly twinkles,  
His fitful heat-lightnings.

JAMES RUSSELL LOWELL

WHEN I was a child I was much amused by seeing at Madame Tuissaud's Exhibition a waxwork figure of a celebrated giant holding on the palm of his hand the figure of a famous little dwarf called General Tom Thumb. And I have just been looking at a picture of another sort of giant, the West African Goliath Beetle, with a little English beetle, the Seven-spot Ladybird, placed near him to show the difference in size.

But even the Ladybird is by no means the smallest beetle. There are some beetles which have been given the very cumbersome name of *Trichopterygidoe*, which means hairy wings! The name is much longer than the insect itself, for the largest is, only one thirty-sixth of an inch in length, and the smallest not quite the hundredth of an inch, and could easily crawl through the eye of a fine needle. They are found under leaf mould.



The West African Goliath Beetle mentioned on this page is here seen with a Ladybird below him.

OPPOSITE: Some beetles are cannibals. Others prey on defenceless creatures greater than themselves. Here two Water Beetles have fastened themselves on a Bitterling.

The Goliath Beetle is a stout striking-looking giant, chiefly black and white in colour. His back looks rather like a black slate on which some one has drawn patterns in white chalk. He is  $4\frac{1}{2}$  inches long and 2 inches broad. The larva (grub) makes an enormous cocoon.

We have two kinds of Ladybird in England, the Two Spot and the Seven Spot. They are very useful in one way, as they feed on the mischievous scale insects and Aphides ("Green Blight").

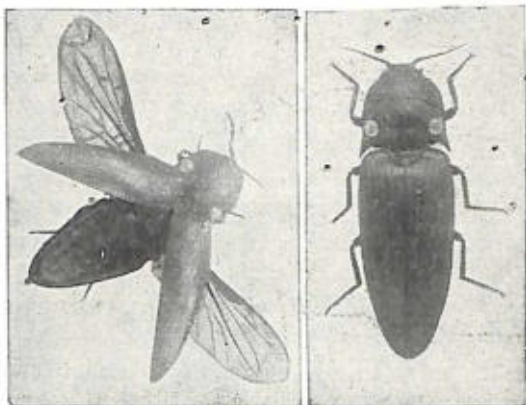
In 1880 it happened that by some accident a certain kind of scale insect was taken from Australia to California. It spread, and soon ruined the orange and lemon trees; in a single year, where 8000 car-loads of oranges had been counted on, there were only 600. Then a clever man called Mr. Koebele went out to Australia to see if anything could be done, and there he found a certain brilliant red Ladybird, which preys upon scale insects. He caused a large number to be carefully packed and sent to California. They soon settled down in their new home, and ever since that day they have kept the scale insects in check. It is probable that Ladybirds have a noxious taste, and that if once a bird had tried to eat one he would not try a second time, and would perhaps then be warned off by the bright red colour.

Do you know the Click or Skipjack Beetles? They have very short legs, so that if they happen to fall on their plump backs on a flat surface they cannot right themselves except by jumping. The insect will lie still for a few moments, then arch its body, resting on the end of its abdomen (or "tail") and the back of its head, lifting up its thorax (or chest), then suddenly turn right round. There is a curious sort of spring under the thorax, and when the Beetle makes these movements, the spring jerks it up into the air, with a sharp clicking sound, and the insect comes down again generally on its feet.

It is amusing to put a Click Beetle down on its back on a plate or some other smooth surface. It will make a very high jump, but as there is nothing for it to cling to when it comes down, it will probably roll over on its back again. Then it seems to lose its temper, and it jumps over and over again very quickly, still rolling over on its back. At last it turns sulky and lies still on its back, until some kind person comes to the rescue and puts it on its feet once more. These Beetles have large wings, and will often fly to some upright green

stem, and cling to it so closely, with folded wings just below the seed vessels, that it is difficult to see the insect against the stem.

The larvæ of the Click Beetles are the well-known mischievous wireworms. Many foreign members of the family are brilliantly coloured, and many give out light at night. The beautiful Firefly of Brazil, the Cucujo, is one, and another South American Firefly is called the Railway Beetle, as it gives out a strong red light from its extremities and a green light glows along the sides of its body. An old writer, Peter Martyr, gives this quaint account of hunting for the Cucujo—



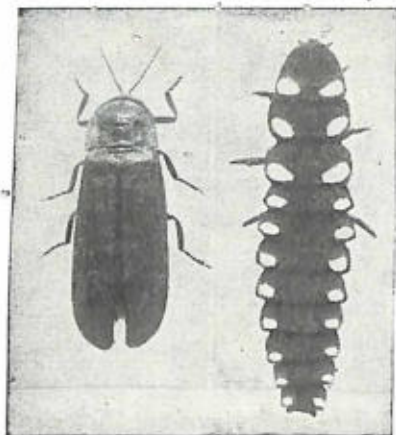
*On the left is a South American Click Beetle, known as a Firefly, with its wings spread and the wingcase stretched. On the right its wings are tucked away. The two dots shine in the dark.*

“Whoso wanteth cucuij, goeth out of the house in the first twilight of the night, carrying a burning firebrande in his hande, and ascendeth the next hillock, that the cucuij may see it, and hee swingeth the firebrande about, calling cucuius aloud, and beateth the ayre with often calling and crying out, *cucuié, cucuié*. Many simple people suppose that the cucuij, delighted with that noise, come flying and flocking together to the bellowing sound of him that calleth them, for they come with a speedy and headlong course. But I rather think that the cucuij makes haste to the brightness of the firebrande because swarmes of gnattes fly into every light, which the cucuij eat in the very ayre, as the martlets and swallows do. Some cucuius sometimes followeth the firebrande, and lighteth on the ground: then is he easily taken, as travellers may take a beetle, if they have need thereof, walking with his wings shut.”

Our only British light-giving beetle is the Glowworm (a centipedè, which gives out light, is not a beetle). You may have seen the Glow-

worm lighting up her green-blue lamp on a warm summer evening among the leaves, especially in damp places. I say "her," because, though Mr. Glowworm can give out light, Mrs. Glowworm shines

much more brightly. Mr. Glowworm has large wings, the upper sheath covering the whole of his body, but Mrs. Glowworm is wingless.



*Here are the male and female Glowworms. Note that the female has no wings. Her attractive "lights" are seen along each side of her long body.*

The Latin name for the Beetle tribe, "Coleoptera," means Sheath-winged. Beetles, like most insects except flies, gnats and other members of the "Diptera" or two-winged family, have four wings. Their upper or fore wings are like horny or leathery cases for the hinder wings, and when the beetles are not flying, their hinder wings are folded up under the "elytra," as the upper wings are called. There are some small beetles called Cocktail or

Rove Beetles, which have a curious way of folding their large beautiful wings, packing them away by means of their "tails" which they bend over for the purpose.

One of the Rove Beetle family is the extremely ugly, dull-black Beetle called the Devil's Coach Horse. He turns up his long tail (abdomen) and looks very fierce and angry if he is disturbed, and from this tail he gives out a fluid with a horrible smell. But though so ugly and fierce and disagreeable, he cannot really do us any harm, and indeed he is useful, as both the beetle and the larva (maggot) feed eagerly on all kinds of mischievous insects. In fact, the larva is sometimes a cannibal and will feed on its own kind.

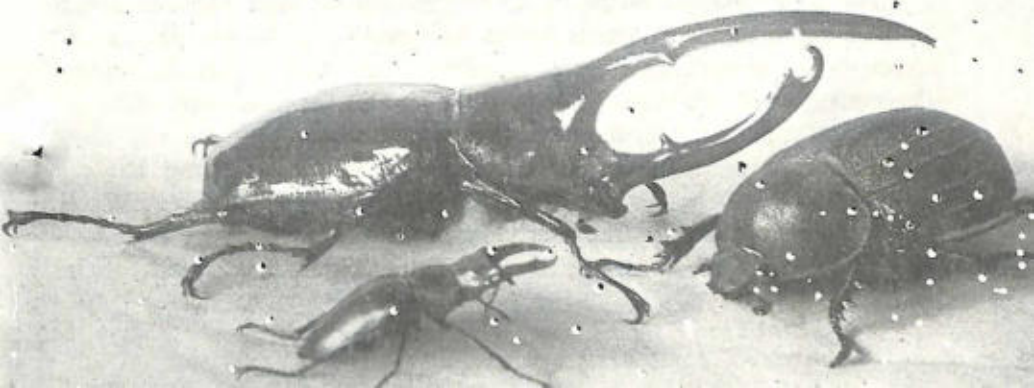
You know that insects go through four stages: first the egg, second the larva, which we often call the maggot or grub, which comes out of the egg. Then third, the pupa or chrysalis. Lastly, the imago, or perfect insect, such as a butterfly.

The Devil's Coach Horse Beetle lays large eggs in proportion to its size. When the larva is full-fed it digs itself into the ground, and changes into a pupa. The pupa is different from most Beetle pupæ as its wings project some way from the wing sheaths and are folded over the breast. A relation of the Devil's Coach Horse, called the Hairy Emus, is thickly covered with long yellowish hairs, and when it flies it looks exactly like a humble bee.

Our largest British Beetle is the Stag Beetle, also called the Horn Bug. It is sometimes nearly three inches long, but it is very much smaller than the Goliath Beetle, which we thought about just now, or another giant, the Hercules Beetle, of South America, though it is related to these foreigners. The Stag Beetle has been given this name because the great jaws of the male look rather like the horns of a Stag. In the Stag Beetle's family the jaws are often half as long again as the head and body together. How strange we should look if our jaws were half the length of our bodies!

Its larva lives in rotten wood, especially of oak and willow, and is very mischievous, as it eats into living as well as dead wood, and sometimes into the roots of the trees. And the beetle feeds on juice

*Our largest British Beetle, the Stag Beetle, seems quite a small creature when compared with the male and female Hercules Beetles of South America.*



which it gets by probing into twigs and fruits. Another harmful beetle is the Birch Rolling Weevil, which rolls up the leaves of Beech trees and screws them into little funnels, where she lays her eggs, thus providing food and shelter for the young when they come out.

Some very large beetles are the Carabus or Ground Beetles, and some large water beetles are related to the Carabus.

Water Beetles are fine handsome creatures. They must be a terror to the smaller folk in a pond, for both the Beetles and their larvæ eat up any which they come across. In fact, sometimes, like cannibals, they will even eat each other if they are shut up together in a bowl! So if you have an aquarium, beware of putting them into it in company with other creatures. I once put a Water Beetle larva into a bowl with some Tadpoles, and next morning found every tadpole had been killed.

The Water Beetles have three wonderful pairs of legs. The front pair are provided with tiny suckers, with which they can clasp and hold fast their prey. The second pair have strong curved claws with which they can walk about or climb up water plants. And the third pair are like broad, flat oars, making them able to row themselves about. Added to all this, they have a strong pair of wings for flying at will, generally at night.

These Beetles breathe air just as land insects do. So they have breathing holes (called spiracles) down both sides of their bodies, and their wing cases fit tightly over these holes to prevent water from getting in. When they want to dive under the water, they must carry a little air with them, just as mountain climbers or airmen going up to great heights carry a supply of oxygen.

The Water Beetles swim up to the surface of the water, and turn themselves head downwards and tail upwards, so as to take in air through the breathing hole at the end of the tail. Then they open their wings a little way in order that the air bubbles may cling to their hairy bodies. And when they have stored enough air, they close their wings again, and dive quite happily, carrying the air bubbles between their backs and their wing cases. The Great Water Beetle carries a supply like a silvery breastplate. His very ugly and greedy larva, sometimes called the Water Tiger, comes up to the



*Here is the largest British Water Beetle. He is the Silver Beetle, and by means of a sharp spine on the underside of his body he can wound creatures that attack him.*

surface, from time to time, to get in fresh air in the same way as do the larvæ of Gnats. A naturalist who watched a Great Water Beetle carefully said that it took breath once in every eight minutes twenty seconds, and remained poised taking it in for fifty-four seconds.

One kind of mother Water Beetle lays her eggs in a little silken bag. This she spins, lying on her back, with silk from her own body; and she weaves the ends together, so as to close it up tightly in order that no water may get inside. Some beetles tie their littlearks on to the water weed with a silken rope, and others let them drift on the water.

In many ponds we may see the little Whirligig Beetle, twirling round and round like a tectotum. If you can manage to catch him for a minute, you may get him quiet enough to allow you to look at his wonderful eyes. Then you will see that they are water telescopes, each eye divided into two parts. With the upper halves he can look upwards, and with the lower halves downwards into the water. Thus he can keep a sharp lookout against dangers from above and below.

We have mentioned only a few members of the Beetle family, but you may discover many more for yourselves if you are on the watch for them.



BEAUTIFUL WINGS AND A  
GOOD MOTHER

*The burnished dragon-fly is thine attendant,  
And tilts against the field,  
And down the listed sunbeam shines resplendent  
With steel-blue mail and shield.*

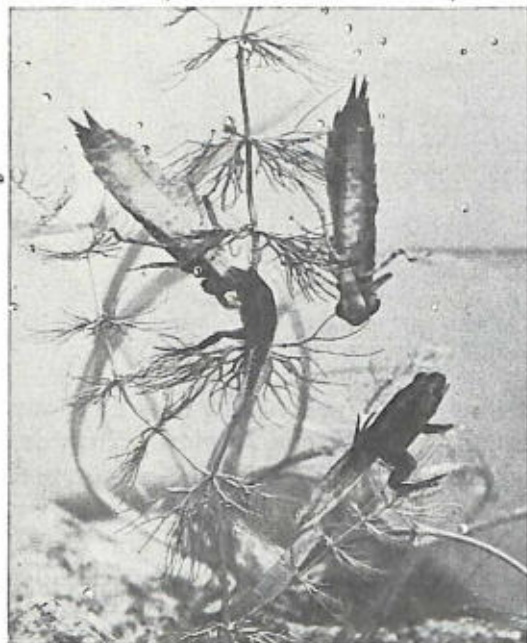
LONGFELLOW—*To the Iris*

WE were speaking about Beetles' wings, and we saw how the hinder wings are folded under the upper, called the elytra. Now let us think of some insects with wings which are specially beautiful—the Dragon Flies—belonging to a family called Neuroptera, or Nerve Wings. You may have seen and admired them flying about in the sunshine on this summer day. And perhaps some one said, "Ah, there goes a Horse Stinger!" which is quite unfair, as they have no sting! The name may have been given because they were seen hunting the flies buzzing round a horse's head.

Though they do not sting, they are great hunters, and in that way may fairly be called "dragons." Their great beautiful wings carry them in all directions. They fly backwards, forwards, and wheel sideways, and sometimes cover long distances. A Dragon Fly has been seen alighting on a ship three hundred miles distant from the nearest land. Besides these great wings they have very large eyes to help them in the chase.

Insects have very wonderful eyes, made up of little six-sided windows or eyelets, like the cells of a honeycomb. A Dragon Fly is said to have about twelve thousand of these eyelets in each eye. As well as these huge eyes, which are called "compound," because they are made up of a number of tiny windows, they also have three little "simple" eyes in front of the large ones. Probably they can see their

OPPOSITE: *The newly-born Dragon Fly resting and drying its wings after breaking forth from its chrysalis. The empty chrysalis, or "nymph," is seen on the left.*



*The larvæ of the Dragon Fly are fierce killers and are very greedy. Here is one eating a tadpole, while another gets ready for the grim attack.*

prey at some distance with the compound eyes, and would use the simple eyes for peering closely into their food.

Dragon Flies catch their food in the air, and while they are flying they bring their slim, weak legs forward under the mouth. Each leg has a fringe of hairs, and it is possible that these hairs form a kind of net to help in catching the prey; but naturalists are not agreed on this point.

They are certainly fierce hunters, and one large Dragon Fly has been known to eat forty House Flies in two hours.

There are about forty-six different kinds of British Dragon Flies, and altogether two thousand kinds in different parts of the world have been described. You know their many brilliant colours: blue, green, yellow, red. The colours fade quickly after death.

Mrs. Dragon Fly lays her eggs on a leaf or stem of some water plant, and in three or four weeks out comes the very ugly, queer-looking, dingy larva, which has no wings, and swims about in a jerky fashion. If you catch two or three specimens and put them in a glass jar with a little fine sand at the bottom, you will notice that every time one moves forward the sand at the bottom of the jar is shot backwards, and this will help you to understand its jerky movements. And you will find that it has a kind of tail at the end of its body, made of several thin flakes which open and allow the water to

pass in and out: the creature takes in oxygen out of the water to breathe, and then squirts the water back again, and the squirting movement pushes it along.

Both the larva and the pupa are as fierce and greedy as the full-grown Dragon Fly. They bury themselves in the mud at the bottom of the pond, looking out for their prey with their great eyes, and then steal upon it very quietly, as a cat stalks a mouse, and seize on soft water insects, tadpoles, and even small fish.

The larva, and also the pupa, has a very curious mouth called the "mask." The lower lip is made up of four pieces. The first two are used as pincers or forceps, and the two others are jointed and form a sort of arm, which can be shot out at will for a distance of about an inch to catch the food, which is then lifted up over the face, and the creature devours it with its strong jaws.

After nearly a year of waiting, or even more, one day, often in early July, the pupa shows signs of wings, and soon it climbs up a water plant and sits there out of the water till the sun and air dry its skin. Then suddenly this outer skin splits, the creature wriggles, and works itself out of its old coat, which is left hanging on to the

BELOW: *You might think that there were two Dragon Fly nymphs in the picture. But one is only the outgrown skin which the nymph has discarded, to appear in a brand-new "suit." The insect above is waiting for its new coat to dry.*



weed by the claws, and after waiting for a few hours till it is quite dry, and the many folds of the wings have been shaken out, the "perfect insect" flies off to enjoy its new life in the sunshine.

You remember how Tennyson describes it:

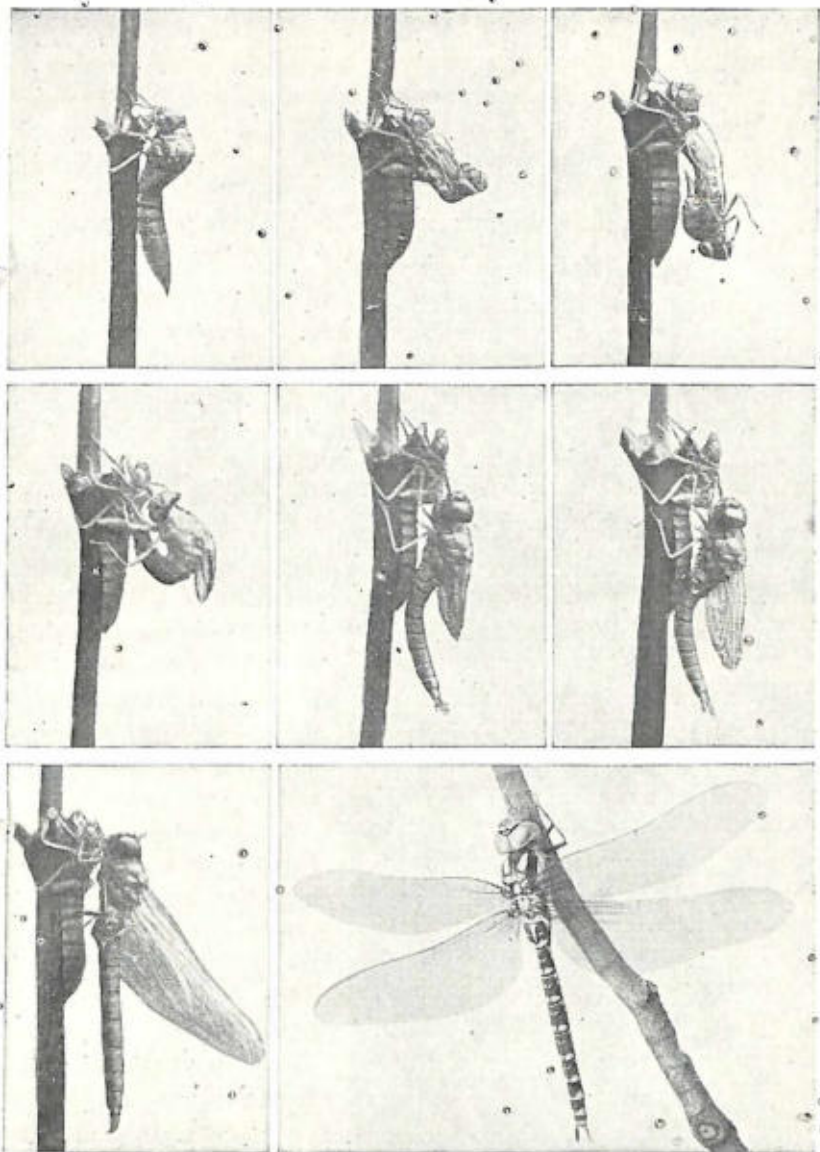
"An inner impulse rent the veil  
Of his old husk: from head to tail  
Came out clear plates of sapphire mail.  
He dried his wings: like gauze they grew:  
Thro' crofts and pastures wet with dew  
A living flash of light he flew."

Dragon Fly larvæ and pupæ are interesting creatures to keep in an aquarium, if you are able to provide them with tadpoles and water insects as food.

In a book written about a hundred years ago, called *Entomology in Sport and in Earnest*, I found this curious prophecy of an aeroplane. Two boys, Eugenius and Sylvius, are talking to each other, and Eugenius says, "If I were a millionaire, and did not care much about losing my money, I should amuse myself by trying to make a flying-machine on the exact model of a Dragonfly: the wings to be made of oiled silk, and nervures inflated with air: the passengers to sit in the body of the vehicle, the stoker between the wings, which he would keep in constant vibration by means of steam, or whatever power was found sufficient." "I think," answers Sylvius, "the machine would fly away, in a metaphorical sense, with your money, but I don't imagine that it would achieve any other flight except in the realms of Fancy!"

The pretty little May Fly, a near relation of the Dragon Fly, lives for about two years as larva and pupa, hiding under stones at the bottom of the water, or burrowing in the mud: then it casts its skin and dances out as a winged insect, with a tail made up of three long hairs or filaments, lives for a few hours, sometimes only a day, drops its little cluster of eggs into the water and then dies.

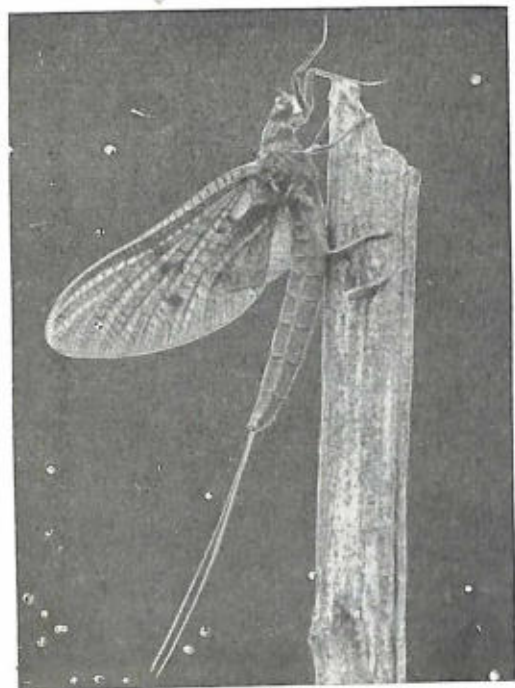
The very mischievous Termites are related to the Dragon Flies. They are often called White Ants, but though in many of their ways



*The Dragon Fly, emerging from its pupal case, behaves like a tiny acrobat, turning and twisting until at last it is free. Then it pauses to rest before flying away. This picture shows it achieving its freedom.*

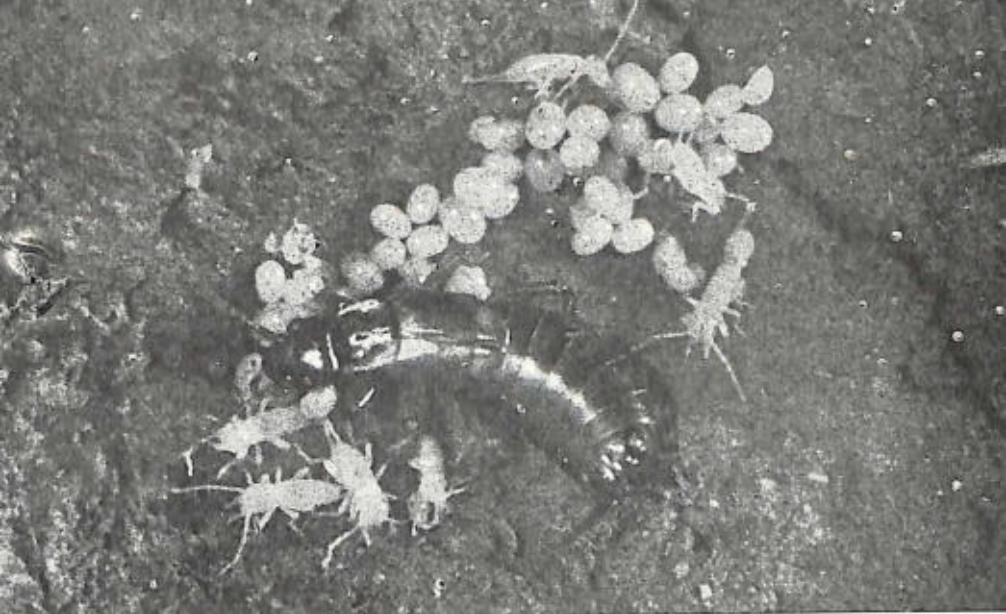
they are like them, they are not Ants. In Africa and other tropical parts of the world they build huge mounds or "ant hills," sometimes sixteen feet high, but while they make these strong dwellings for themselves they are very destructive to the property of human beings.

They have a habit of gnawing the wood inside a wall or a piece of furniture, leaving the outside untouched, so that you may sit down on a chair which looks perfectly solid, and find it give way beneath you, or put your foot on a wooden staircase and see it crumble into dust. No books or papers left near them are safe from their wicked jaws. Though so mischievous, they are very interesting creatures, and you would find it worth while to read more about them if you come across a description of their ways in a book of travels or Natural History.



*After two years as larva and pupa, the delicate little May Fly lives for but a day.*

We have thought about the Dragon Fly's large and beautiful wings. There is another insect of quite a different sort which also has a pair of very pretty gauzy hind wings. I am thinking of the Earwig, which you know is otherwise an ugly insect. It folds its hind wings away, as a Beetle does, under its upper leathery wing cases, and this is done by means of a pair of tweezers or forceps at the end of the tail. The insect bends its tail or abdomen over its back, in order to reach the wings, and then deftly packs them away under the wing cases as you might fold up a fan.



*The Earwig may not be a popular favourite, but she is certainly a good mother, watching over her pale-coloured brood as a hen watches over her chickens.*

The Earwig gets its name from Earwing, probably because its spread wings have somewhat the shape of a human ear. Many people imagine that the poor little Earwig wants to crawl into our ears but this is certainly not the case, and even if it tried to do so I do not think it could get in very far.

The Earwig has one very good quality: she is an excellent mother, and watches over her eggs till they are hatched, and then broods over the larvæ as a hen broods over her chickens. Sometimes if you turn over a large stone you may come upon the little family party which have crouched underneath it, and see the mother Earwig taking care of her young.

The disagreeable Cockroaches, often called "Black Beetles," are related to the Earwigs.

Our British Earwigs have several relations overseas. One fine specimen is found in South America with very large delicate wings, on which glitter all the colours of the rainbow very much as they appear on a soap bubble when it floats in the air.



SUN LOVERS AND STRANGE  
MONSTERS

*Now the noonday quiet holds the hill,  
The grasshopper is silent in the grass,  
The lizard, with his shadow on the stone  
Rests like a shadow, and the cicala sleeps.*

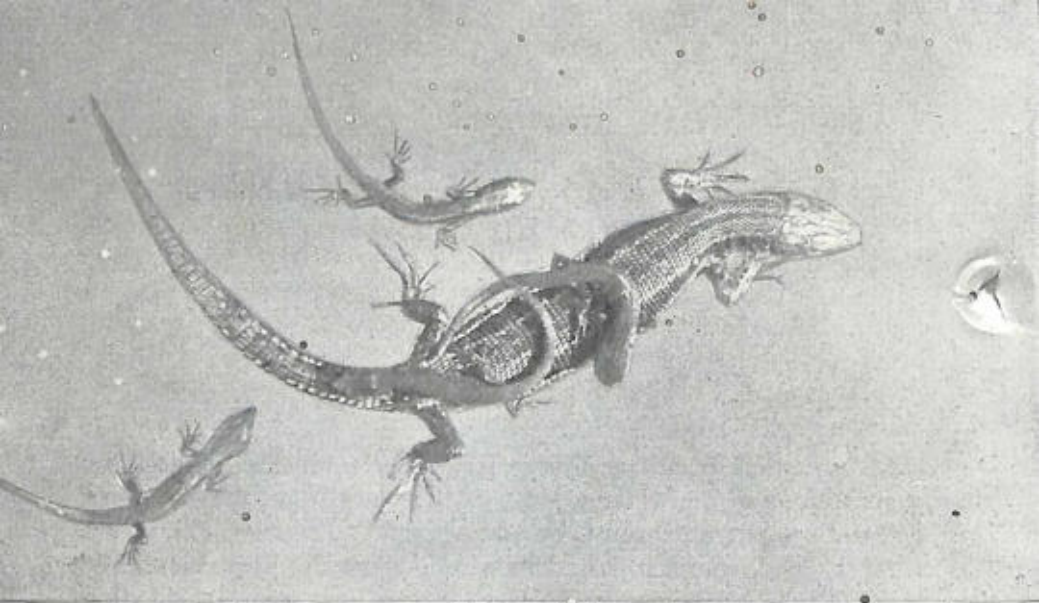
TENNYSON

THERE are some pretty and very lively little reptiles, which are more numerous in the warmer parts of the world than they are with us, but yet are not uncommon in some parts of England. These are Lizards, which love the sun, and in winter generally hide themselves away snugly in some sheltered place, where they spend their time sleeping. No doubt one reason for this "hibernating," as it is called, is that they feed on insects and other small creatures which could not be found in winter.

One of the most common is the Scaly Lizard. It is five or six inches long, brownish above, orange beneath, spotted with black in the male and orange grey in the female. Most Lizards lay eggs and leave them to be hatched by the heat of the sun, but Mrs. Scaly Lizard's eggs are hatched inside her, and then out come about five black babies an inch long.

It is not easy to catch a Lizard, as it darts in and out of grass stalks and gorse bushes or up and down a sunny wall, shooting out its long forked tongue to snap up a fly or other little insect for its dinner. And if you do catch it by its tail, you may have a great surprise, for you may find the tail left in your hand, still jerking and twisting about, and the Lizard himself gone! The fact is that the Lizard's tail snaps off very readily, which makes it easier for him to escape from birds and other enemies, and he soon grows a new one. Indeed sometimes if the tail is only damaged and not broken off, a new one will

OPPOSITE: *The Common Lizard, sun-bathing on a rock, looks an easy prey. But do not grasp his tail, or he may leave it in your hand and escape without it!*



*Mother Lizard enjoying a game with her children. The babies at birth are only an inch long, but they soon grow to their full length of five or six inches.*

begin to grow, and the Lizard may end by having a forked tail, a smaller one growing out from the place where the old wound was made.

The Sand Lizard is larger and much wilder than the Scaly Lizard. It is almost impossible to tame him, and if shut up in a cage he will rush madly about, trying to escape, and then if he finds he cannot get out may refuse food, and die if not set free.

But the Green Lizard, sometimes called the Jersey Lizard, common in many parts of Europe (including the Channel Islands), Africa and Asia, flourishes in ferneries and conservatories, and can easily be tamed, even learning to take food out of its owner's hand. It revels in the sunshine, as if it knew how becoming are the sunbeams when they flash over its emerald back and head!

Another English Lizard, and one that is quite wrongly named, is the Slowworm or Blindworm. It is quite true that it is slow, but it is not a Worm, and it is certainly not blind, having beautiful golden eyes with which it can see perfectly. Its grand Latin name, *Anguis fragilis*, meaning brittle Snake, is not much better, for it is not a Snake;

but it is certainly brittle, for if it is even slightly hit or pressed the tail may snap off, and as the tail is very long, the creature looks as if it were broken in half.

The tail left behind will jump about "on its own," while the Slowworm creeps quietly away and in course of time grows another. A better name for this pretty little reptile would be a legless Lizard, for it is a true Lizard, but without legs. It is perfectly harmless, though often supposed to be poisonous, probably because it looks like a Snake, and will thrust out a broad black tongue with a forked tip. Indeed it is very useful in a garden, as it feeds greedily on Slugs. Slugs, as we know, are slow movers, and the Slowworm finds no occasion to hurry while following its prey in their deliberate progress.

In the Natural History Museum at South Kensington you may see among the huge fossil reptiles some gigantic Fish-Lizards, or "Ichthyosaurs," Lizards which probably lived in the open seas thousands, perhaps millions, of years ago, with powerful tail-fins, pointed heads, and porpoise-like bodies. They must have been very alarming to any smaller sea creatures which came within their reach.

BELOW: *The Slowworm, though it is called a "Worm" and looks like a Snake, is really a Lizard without legs. It feeds on slugs and is a good friend to the gardener.*





*The huge and scaly bulk of the Komodo Dragon recalls to us the age of Giant Reptiles. These monster "Dragons" were discovered in the Dutch East Indies, only about twenty-five years ago, and specimens can now be seen in the London Zoo.*

In Africa and America the fossil bones of still more gigantic Lizards have been found, which the learned people who dig them up call Dinosaurs. Among them were the Atlantosaurus (saurus means Lizard) eighty feet long and thirty feet high, the Brontosaurus, sixty or seventy feet long, with a very long neck and very small brain, and weighing twenty tons, and the Triceratops, about twenty-five feet long, which had a collar of spikes round its neck and carried three horns on its head. Another giant was the Iguanodon, nearly thirty feet long, which seems to have run and sat up on very strong hind legs, using its forearms for tearing down the vegetation on which it fed; and no doubt it had a very large appetite, with such a great body to feed.

Of course we do not come across these terrible monsters now, though there are certain very large Lizards called the Komodo Dragons, to be seen in some islands of the Dutch East Indies. In 1912 the crew of a pearl-fishing boat which visited the island of Komodo brought back an account of strange Lizards, twenty feet long and terribly fierce. Later expeditions brought specimens home, and it was found that they were not more than eight or nine feet in length, but still the largest living Lizards known. Two are now in the London Zoological Gardens, and are quite tame. They have been named Sumba and Sumbawa. A den has been made for them where they can bask

on rocks over electric heaters and under special lamps. They like beef steaks and hens' eggs, but their favourite dish is a pigeon, swallowed at one gulp, feathers and all.

Other very large foreign Lizards are the Monitors. One kind called the White Throated Varan of South Africa is nearly five feet long, and feeds on Crabs, Frogs and other small animals. Another, the Varan of the Nile, spends a great deal of its time in that river, and is much prized because it feeds on the eggs of Crocodiles, and even chases the young Crocodiles, swimming after them with great speed, and devours them if it can catch them before they have taken refuge with their elders.

Another huge foreign Lizard to be seen in the Zoo is a Marine Iguana, which is probably very like the ancient Iguanodon mentioned just now, but of course much smaller, about four feet in length. Its native home is the Galapagos Islands, a group of extinct volcano tops in the Pacific. Here the ugly blackish creatures bask on lava rocks, or swim about in the sea. The specimen in the Zoo is fed on lava seaweed which is sent over for its meals from the west coast of Devonshire.

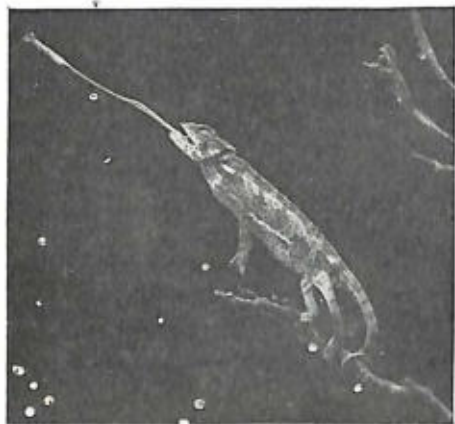
One strange-looking Iguana is the Basilisk. It has a crest on its head, and a kind of fringe like the fins of a fish along its back and head, and large wicked eyes. In old times strange tales were told in our Natural History books about this perfectly harmless Lizard. He was the



*The great black Lizard of the Galapagos Islands faces the camera with a smile.*

King of reptiles, and derived his name of Basilisk, or kinglike, "because he seemeth to be king of serpents, not for his magnitude or greatnesse, for there are many serpents bigger than he, as there be many four-footed bigger than the lyon, but because of his stately face and magnanimous minde."

And when a Basilisk fixed his eye on man or beast they would fall dead. Apparently, too, he would poison the air. "This poyson," says an old writer, "infecteth the air, and the air so infected killeth all living things, and likewise all green things, fruits and plants of



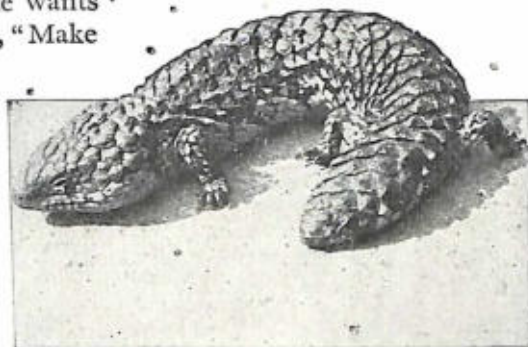
*The long sticky tongue of the Chameleon shoots out like lightning to catch a fly. Its body movements, however, are very slow.*

the earth—the birds of the air fall down dead when they come near his den or lodging." The only creature which could meet the Basilisk was the Cock, which could so terrify him by its shrill crow that he would fly and hide himself away in the desert. So that travellers in Lybia were advised always to take with them some loudly-crowing Cocks to drive away any Basilisk.

No doubt you have heard of the Chameleon, a Tree Lizard famed for being able to change its colour, sometimes becoming green if sitting among green leaves, brown on the brown earth, and so on. When moving along the branch of a tree it lifts one foot very slowly, holds it in the air for a time as if considering what to do next, then puts it slowly forward and grasps the branch with it; next it leisurely unwinds its

long tail, brings it a little forward, and winds it round a fresh portion of the branch; and it repeats the same leisurely performance with each foot in turn. Some of the African natives call it Kinyonga, and when one wants to hurry another he will cry, "Make haste. Don't walk like a Kinyonga!"

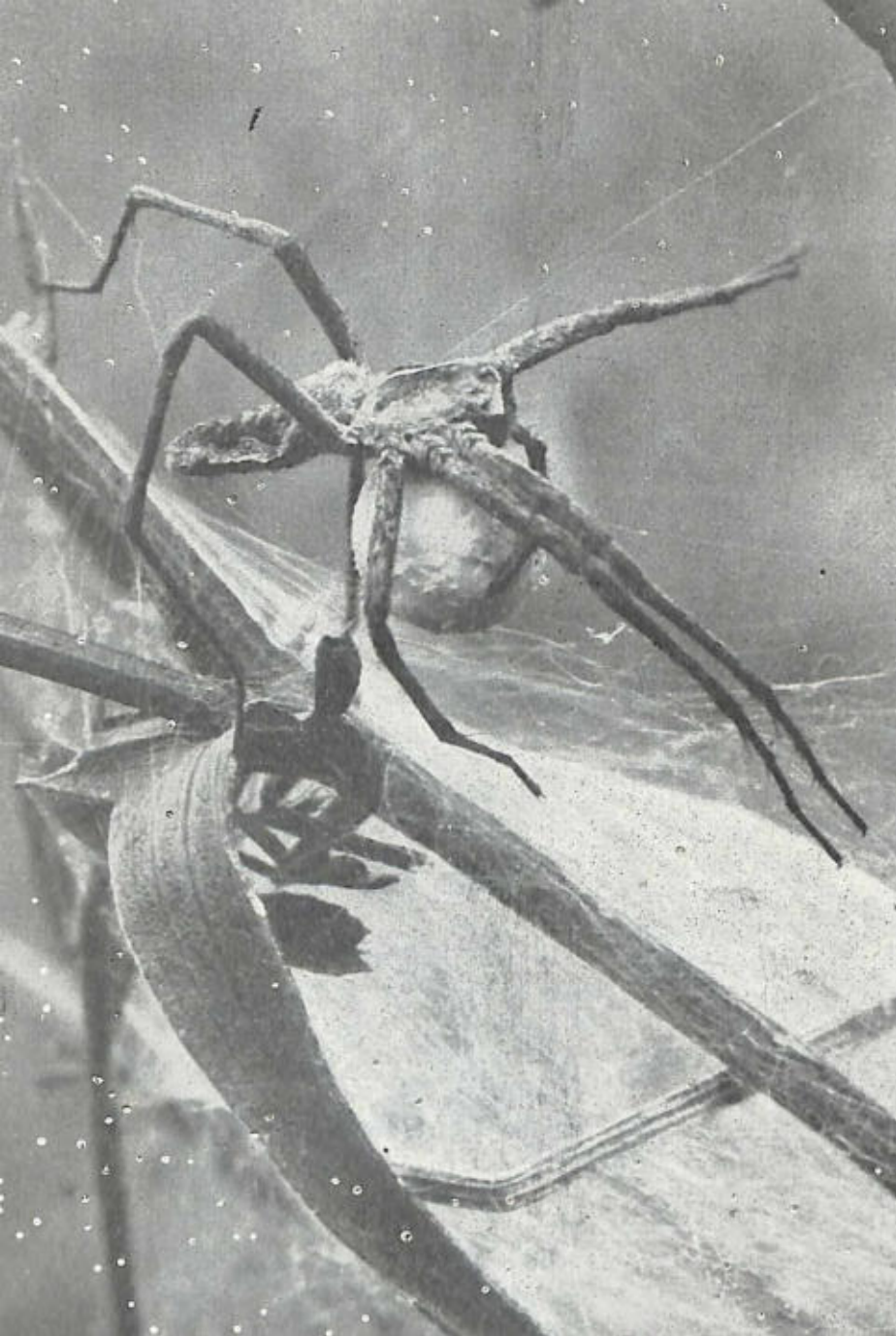
You may wonder how, if he moves so slowly, he manages to hunt for his food. But though his body moves slowly, his very long tongue, with a sticky tip, can be shot out like a flash of lightning, and a fly seems almost to jump into his mouth.



*The blunt tail of the Stump-tailed Lizard makes him look as though he had two heads!*

His great globe-shaped eyes seem to act independently of each other. A naturalist who kept a Chameleon for some time and watched it carefully found that when he took a lighted candle near it at night when it was asleep, the eye turned towards the light opened, and that side of the creature changed colour a little, but the other eye remained shut, and the corresponding side of the animal seemed asleep and remained quiet for several seconds longer.

In Australia, which has been nicknamed Topsy Turvey Land, there is a Lizard called the "Stump-tailed Lizard, which was once thought to have two heads; but the second "head" is really a fat, thick tail. In summer it eats heartily and stores up a large amount of fat in its tail, which nourishes it while it lies asleep and fasting through the winter.



## SPINNERS, WEAVERS AND TRAPPERS

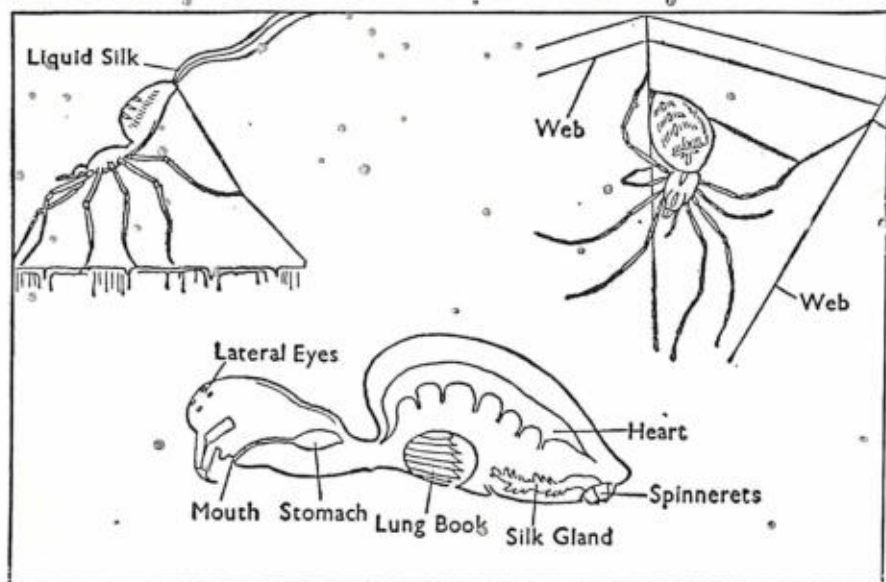
*"Will you walk into my parlour?" said the spider to the fly,  
 "It's the prettiest little parlour that ever you came nigh.  
 The way into my parlour is up a winding stair,  
 And I've many curious things to show you when you're there."*

THERE are many people—perhaps little Miss Muffet was one—who would tell you that a Spider is a "horrid insect." But in the first place, it is not an insect, and in the second place, if we study Spiders I think we shall find that they are interesting rather than horrid. Do you notice any difference between Spiders and insects? Well, you know that insects have six legs; but if you count a Spider's legs you will find that it has eight. Then the head and the chest (which the books call the "thorax") are joined into one piece with no sort of neck or division. Many Spiders have eight eyes, some as many as twelve. And a Spider's mouth is formed in such a way that you will easily guess that it is a "beast of prey!" It has two pairs of mouth-parts for seizing its victims; in one pair there are poison glands from which it can send poison into the insects on which it feeds; the other pair, called the palps, look rather like an extra pair of legs, and the lady Spider's palps have little hooks at the ends, with which she can grasp her victim tightly.

Most insects go through three changes: larva or grub, chrysalis or pupa, imago or perfect insect. But the baby Spiders are just like their mother, except that they are much smaller, but they moult or cast their skins eight or nine times before they are full grown.

Then a Spider has a pair of breathing gills, called its "lung books." Each "book" has about fifty thin little leaflets, side by side like the pages of a book, and the blood flows over them and is purified by the air.

OPPOSITE: *The Wolf Spider is a keen hunter, and once she has seized her prey will hardly ever let it go. She carries her eggs about with her in a cocoon of grey silk.*



*The picture shows you how the Spider builds her house with liquid silk from her "spinnerets." Then, too, on a breezy day she can travel for miles on a cobweb strand.*

You probably know the Garden or Wheel Web Spider. She is sometimes called the Cross Spider, because she has a three-lined yellow cross on the dark band which runs along her green body. How does she make her beautiful web? I say "she," because Mrs. Spider is a much finer and grander person than her humble little husband, and is a much better spinner. Well, how does she manage it?

First, let me tell you that she has inside her many little glands, full of a sort of sticky liquid or fluid, and there are little passages leading from these glands to six spinning machines, or knobs, called spinnerets, at the end of her body. You can picture these spinnerets to yourself fairly well if you think of the "rose" of a watering can, only, instead of the holes in the "rose," you must picture tubes or spinning pools coming out of the spinneret—about six hundred and eighty altogether—and instead of the pipe which carries the water from the can to the "rose" there are hundreds of little tubes carrying the sticky fluid.

The fluid is sprayed out in thousands of fine jets, which fuse together and make a strong thread which soon hardens in the air. You can see for yourself how strong the Spider's threads are if you look at a web after a shower of rain, and notice that they are like little pockets or purses holding great drops of rain which weigh them down but do not break them.

Now our Spider is going to begin to spin. She lets the wind blow her thread over to the opposite bough, and then runs across it and fastens it tightly to the bough: then she drops to a lower twig, and lets out a fresh line, which she carries back to her starting point and makes all firm and taut. Had the wind been blowing the wrong way for her, she would just have fastened the threads around herself, and then swung backwards and forwards till she had hit against a good support. The first suspension bridge has been described as "an engineering feat of which the Spider was the earliest discoverer!"

These first lines form the foundation for the spokes of her wheel, upon which the circular lines are glued. A little silk pad or button forms the hub of the wheel. Now she will begin to use a different kind of silk, covered with a sort of sticky glue. This she carries round and round, letting each thread of silk stick to each spoke of the wheel as she passes, till after an hour's work the web is finished. The fluid which makes the stickiness runs together into beads, in which the poor little Fly gets entangled. The globules look like beautiful



*The Garden Spider, an "Orb Weaver," spins for herself a lovely wheel of gossamer lace.*

pearls if you see them under a strong lens. You can make little globules like these if you cover a piece of fine elastic with gum and draw it tight, when globules of gum will form upon it. What do you think the Spider does with the silk pad which made the hub of the wheel when she was spinning? Well, she eats it, so that it may not be wasted!

Mrs. Spider uses different kinds of silk for different purposes, and she squeezes the silk she needs out of its particular gland, very much as air is squeezed out of a rubber ball with a hole in it.

The Garden Spider is one of the "Orb Weavers," a name given to the Spiders which make cartwheel-shaped webs. There are also the "Sheet Weavers," such as the House Spiders, which make those long sheet webs in the corners of rooms and barns, common enough to cause distress to tidy housewives. These weavers have a kind of fine comb on the last joint but one of their hind legs, and two more plates near their spinnerets, forming a passage for certain sticky fluids which are "carded" or "teased" by the combs into a fine lace-work.

The Orb Weavers and Sheet Weavers have a wonderful sense of touch, though their sight seems to be poor. The Spider hides herself in some cranny, close by the web, with her feet on the lines, and when an insect touches the web, be it ever so slightly, causing it to shake, she answers the signal as we might answer a telephone ring, and hurries forward to grasp her prey and carry it off to her lair.

Sometimes if it is a large insect she trusses it up with her silk, till it looks like a mummy, and then proceeds to suck its blood at leisure. And I am sorry to say that in some cases, if Mrs. Spider happens to be in a bad temper with her little husband, she will even catch *him* and feed on his blood! But there are some kinds of spiders which have been given the name of Benignum (benevolent), as in their case husband and wife live together in peace.

Besides the Orb Weavers and Sheet Weavers there are the jumping or hunting Spiders, which spring on their prey as a cat springs on a mouse. The Zebra Spider, so called because of the black and white stripes on its body, creeps along stealthily till it comes within jumping distance, then lets out a thread to moor itself to a stone or leaf, which acts as a springboard, and then makes a tiger-like leap, and buries

its fangs in the body of its prey. It has been said that if a cat had the same jumping power in proportion to its size it would clear a broad highroad at a bound.

The Zebra Spider has a most amusing way of making love to the lady Spider whom he wishes to attract. He jumps and dances and waltzes in front of her, but if she does not happen to return his affection he may quite possibly end his days on her dinner table. Some one has told how he saw two Spiders belonging to a fierce kind called the Morsitans, each trying to please the same lady Spider, when she jumped upon each in turn and killed him.

Mother Spider takes great care of her eggs. Have you ever thought that you had found a ball of cotton wool sticking to a bush or behind the loose bark on an old tree? You opened it out and found a great number of Spider's eggs, perhaps seven or eight hundred. If you can catch a Garden Spider and keep her for a time in a glass jar, covered with a cardboard or strong paper pierced with air holes, you may perhaps see an interesting sight, such as a naturalist describes who

BELOW: *Some webs serve as bridges, some as fly-traps, some as nurseries for the baby spiders. Below is a silken roof or coverlet spun solely for the spinner's own protection. This clever weaver is bent on keeping out intruders and preserving her eggs.*



kept a Spider and watched her ways. The day after he had put her in a jar he found that she had made a silky pad and on this she was laying her eggs in a golden-coloured half transparent mass. Then she began to blanket them up for winter. She opened her spinnerets and spread out her yellow silk evenly over the eggs.

Next, lowering her spinnerets, she beat the silk down with her hind legs. Then she spun more silk and again beat it down, working with her spinnerets and hind legs turn and turn about for two hours, till she had spun a large ball of silk around the eggs, and then she fastened the ball to the sides of the jar with her silken ropes.

Sometimes instead of eggs we may find that the silken cocoon is a nursery for tiny Spiderlings, which run distractedly hither and thither when we open their dwelling. We may find bits of Beetles or Flies sticking to the cocoon, remains of the Spiders' feasts, and the young Spiders often spin baby webs or pads of silk and stick remains of insects on to them, as if "playing at being mother."

Some Spider mothers are so anxious about the safety of their eggs that they carry their egg bags about with them. There is a Spider called *Pholcus*, with very long legs on which she prances about as if walking on stilts, who carries her eggs in a little silken case in her mouth wherever she goes, and it is to be hoped that she does not find this habit as uncomfortable as it appears to be!

A rather rare Spider called *Atypus* makes an underground tunnel for her eggs, lined with closely-woven white silk, and lays them in a white cocoon at the end of the burrow. An odd thing about *Atypus* is that its eyes are set up on a kind of pedestal or watch tower. But her tunnel is not so cleverly built as the nests of the Trap Door Spiders of the South of France, the West Indies, and other parts of the world. These are closed by perfectly-fitting round trap-doors, with hinges, made of layers of earth and web, and when the door is shut it is very difficult to see the nest, which looks exactly like the earth around it. If you are very fortunate, however, you may chance to see the trap-door pushed open, and the Spider's front legs appear, and then the whole body show itself.

There is a Water Spider which spends a great deal of time under the water, where she makes a nest for herself shaped like a large



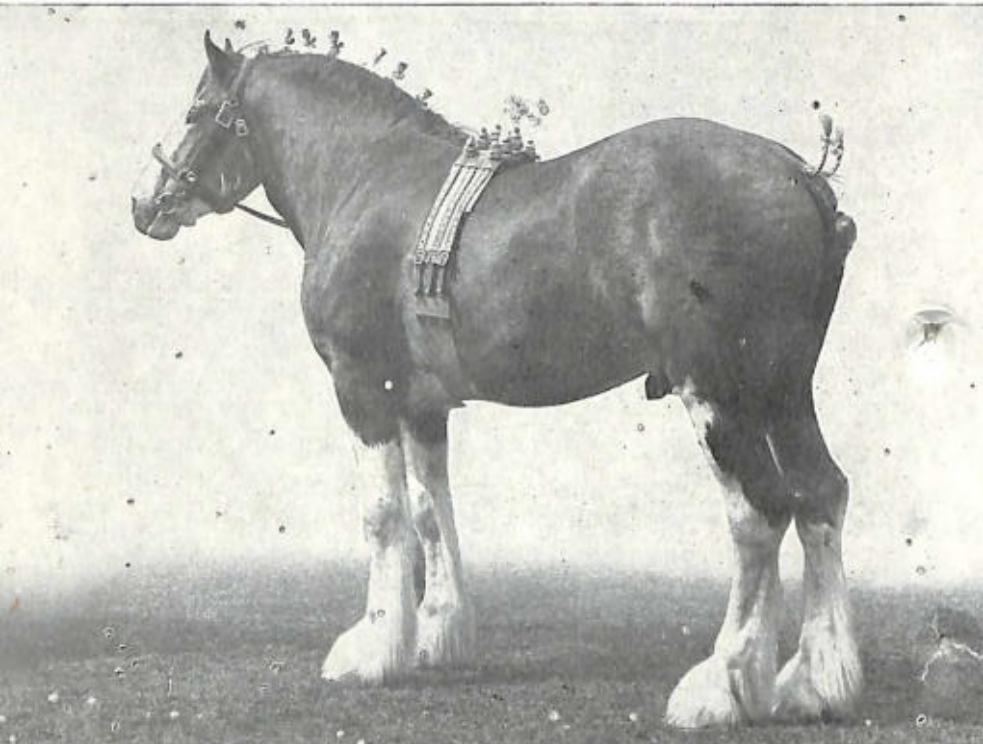
*The Water Spider builds her little bell-shaped nest right under the water, and fills it with air, which she carries from the surface in shiny silver bubbles.*

thimble. As the little diver needs air, she rises to the surface and lifts her abdomen (tail) out of the water, takes in bubbles of air which become entangled in the long hairs on her hind legs, and carries them down to her diving bell: there she kicks the bubbles into the entrance, and goes back for more, till she has brought down enough to fill her water house. She has been called Silver Swimmer, from the shining air bubbles which she carries to her nest. When the time comes for her to lay eggs, she makes her diving bell larger, and her mate (who, unlike most Spiders, is rather bigger than his lady) spins another home for himself nearby. When the little Spiders are grown enough they build air bells for themselves, often using empty snail shells at first, till they have learnt to make thimble-like diving-bells like mother's.

The Water Spider catches water mites and other little insects in her web, as well as insects on land. Spiders are great eaters and drinkers. A Spider has been known to swallow twenty-six times its own weight of food in a day.



*A charming group of workaday mares and their foals—said to be descended from the War Horses of the Ancient Britons. They are enjoying a leisurely meal.*



*This fine specimen of horse-flesh is a Shire Stallion, the largest of draught horses. His strength and endurance are still of great value in transport.*

## SOME GOOD FRIENDS

*O'er the range and down the gully, across the river bed,  
We are riding on the tracks of the cattle that have fled,  
And the rattle and the crashing of our horses' hoofs ring out,  
And the cheery sound we answer with our long-repeated shout*

*Coee—Coo-ee—Co-ee!*

*From "An Australian Bushranger's Song"*

WE have talked a good deal lately about some small wild animals. Let us think now of some larger tame ones which we may really count among our best friends: I mean Horses and Donkeys.

Though we still use Horses a great deal for farm and dray work, they are not of the same importance now as they were before motor-cars were invented. You would be much surprised if you could suddenly find yourself in the London of forty years ago. You would see the streets filled with carriages and Horses, a well-groomed pair in the shafts of a smart brougham, omnibuses drawn by strong Horses, and you would hear people in all directions whistling for hansom cabs. And going back—say a hundred and fifty years, in the days before trains were invented—few people could have gone far from home without the help of a Horse. You may have seen many pictures of stage coaches with their four Horses; and very long and cold the journeys must sometimes have been. A great-grandmother of mine was travelling in Warwickshire in a family coach one winter's day when the ground was deep in snow. The carriage gave a great lurch, and the coachman, turning on the box, said, "Don't be frightened, ma'am, it is only a wall we have driven over!"

Let us think of the way a Horse is made. He does not climb like a Squirrel or dig like a Mole or carry things in his arms as a man does, but he wants to gallop and jump. Now, men have collar-bones, which give freedom to their arms and hands, and climbing and digging animals also have collar-bones, which give freedom to their forelegs and feet. But if a horse had a collar-bone it would easily

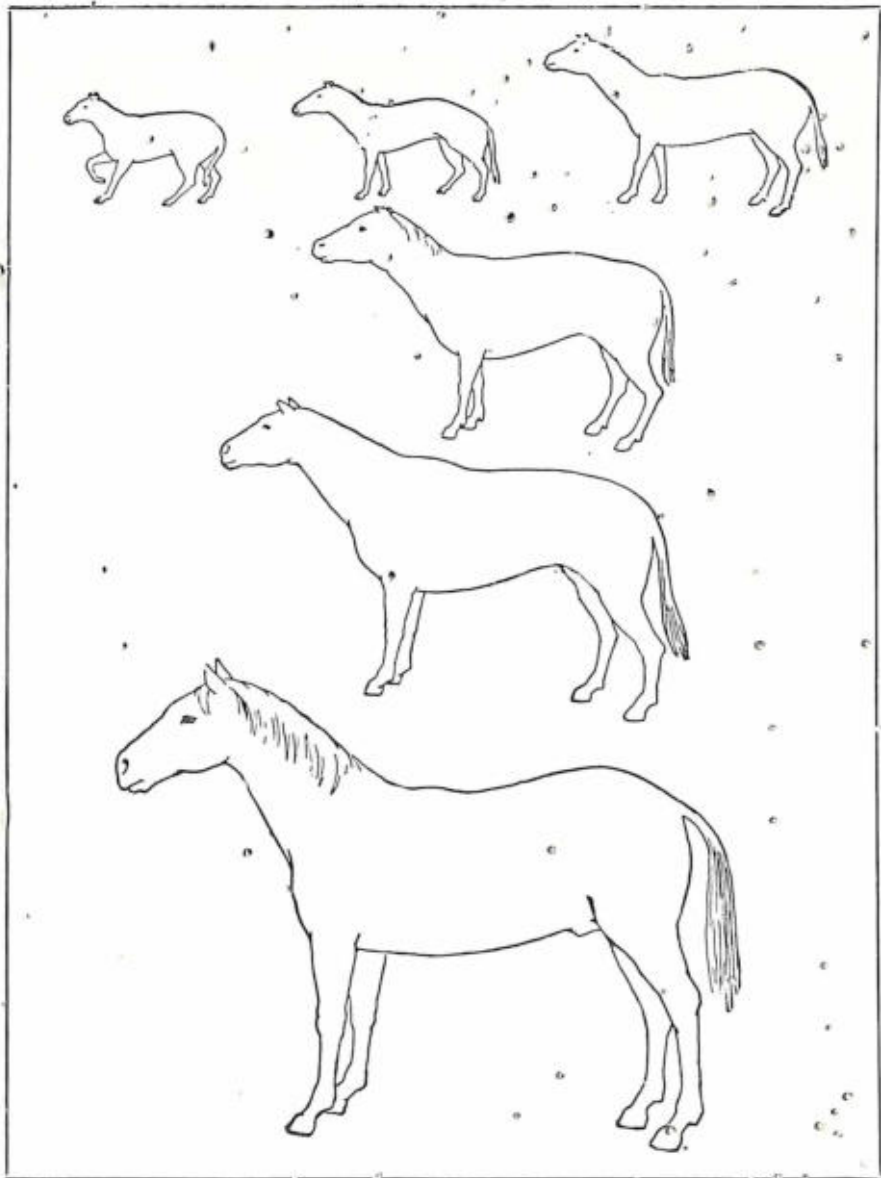


*This pretty little creature, not unlike an Antelope, is the Eohippus, early ancestor of the Horse. It had several toes on each foot, and was no larger than a fox.*

be broken when he threw the weight of his body forward, so he has none. In the lower part of our arms there are two bones, one working over the other, which give free play to our wrists; but in the lower part of a Horse's leg these two bones are joined into one solid bone, giving the leg its great strength.

If you have watched a blacksmith shoeing a Horse you may have noticed how beautifully the foot is made. It takes the place of a man's toe, only, of course, is much larger. It partly rests on a sort of elastic cushion called the frog, and this is protected and made firm by the horny case or hoof. The hoof is elastic and spreads out a little every time that the foot is placed on the ground when the Horse is walking, trotting or galloping, so that the frog presses on to the earth; when he lifts his foot the frog squeezes itself together again and becomes hollow. A Horse has two soles, and the inner sole is full of veins and nerves like the "quick" under our nails.

We wonder when Horses were first used by man. Some think that wild Horses were first tamed in Central Asia, and afterwards passed into Egypt. But where did the first Horses live, and what were they like? Naturalists tell us that probably the very first ancestor or



*The outline drawings show you how the Horse developed, through a period covering many millions of years, from the tiny Eohippus to the Horse as we know it to-day.*



*New Forest Ponies run wild for most of the year, but at certain seasons they are rounded up by men on horse-back, and some are captured and tamed for light work.*

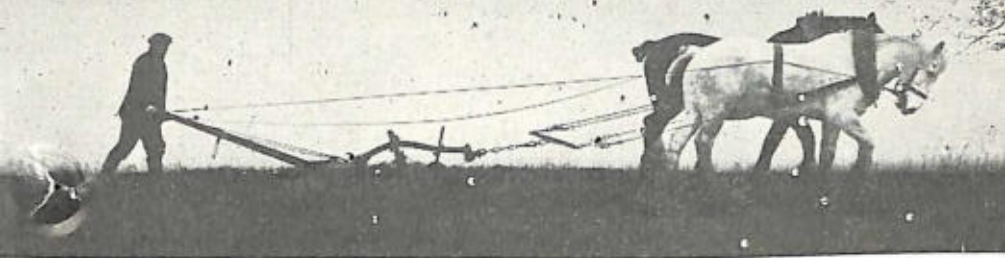
great-great-grandfather of the Horse in the Old World was an animal with three toes on each foot, about the size of a Fox; and in America the bones have been found of an animal which may have been somewhat like a Horse, but having four or five toes. These early ancestors were probably dun-coloured or brown.

No doubt in those days the land was soft and in many places marshy, and short legs with three or four toes on each foot would have been better suited to it than long legs with single hoofs.

Fossil bones of small Horses have been found in Devonshire along with the bones of Reindeer, Stags, Bears, Lions, Hyænas, Beaver, Rhinoceroses, and Elephant. Strange that all those animals may have wandered about our forests thousands of years ago, instead of living shut up in the Zoological Gardens or at Whipsnade!

In very early ages men may have hunted and caught wild Horses and killed them for food, before they thought of taming and riding or driving them. In a cave dwelling discovered at Salutr , not far from Lyons in France, where not more than six families could have found house room, there were two walls made entirely of the bones of young Horses, probably forest dwellers, one wall a hundred and fifty feet long, and ten feet high, the other forty feet long and five feet high, and the discoverers calculated that there must have been about forty thousand bones in the two walls.

Wild Horses still wander about the Gobi Desert in Mongolia. When the Domesday Book was written large droves wandered wild in the forests of Britain. Perhaps the race grew smaller later for lack



*The ploughman and his sturdy team make a pleasant picture in springtime. Horses may be driven from the roads, but on the farm there is work for them still.*

of sufficient fodder: and probably from them are descended the New Forest and Exmoor Ponies of the present day. The smallest British Ponies are the Shetland, which are much used in mines as pit Ponies. We still speak of a "racing stud." The Anglo-Saxon word "stud" meant a drove of wild Horses.

We read in history that a great Horse fair was held at Beaucaire in 832. And Horse fairs were held in Roman and Celtic times; indeed certain towns with names resembling *ventae* are thought to have been given their names from the fairs where Horses were sold, such as Vienna, Vienne, Vannes, Ventimiglia, Venemaere, near Ghent.

Our great Shire Horses probably descend from the chariot horses of the ancient Britons, who used them as War Horses. They were taken into use for farm work in Queen Elizabeth's time, being very strong and also very gentle.

The earliest known representation of a Horse doing farm work is in the famous Bayeux tapestry, where a man is shown driving a Horse with a harrow.

In 1000 we find that the value of a Horse "lost or negligently destroyed" in England was fixed at 30/-, but a man's was only £1, which was also the value of a mare or a colt. A Mule or young Ass was valued at 12/-, an Ox thirty pence, a Cow twenty-four pence, and a Pig eightpence.

Some of the best riders in the world are the Arabs, who make great friends of their beautiful Horses; and sometimes by whispering a word in its ear an Arab can make his steed do what he pleases.



*These pony-like creatures patterned with tiger-stripes are Zebras. Their home is in Africa. Unfortunately they have been hunted until only a few wild herds remain.*

One famous Horse in history is Bucephalus, the favourite of Alexander the Great, which cost £3,500. He knelt down when Alexander mounted, and he lived to be thirty. Alexander built a city called Bucephala in memory of this good Horse.

Horses can be very affectionate and intelligent. My father had a bad fall when hunting and lay insensible on the ground with his foot caught in the stirrup. His favourite mare, "Lady Sale," stood quietly by his side while the field galloped by, till some one came to the rescue, as if realising that if she moved he might have been in great danger from being dragged.

A writer in 1496 gives the following "Fifteen points of a good Horse." He should have three properties of a man, three of a woman, three of a fox, three of a hare, and three of an ass. "Of a man—bold, proud and hardy; of a woman—fair breasted, fair of hair, and easy to move; of a fox—a fair tail, short ears, with a good trot; of a hare—a great eye, a dry head, and well running; of an ass—a big chin, a flat leg, and a good hoof."

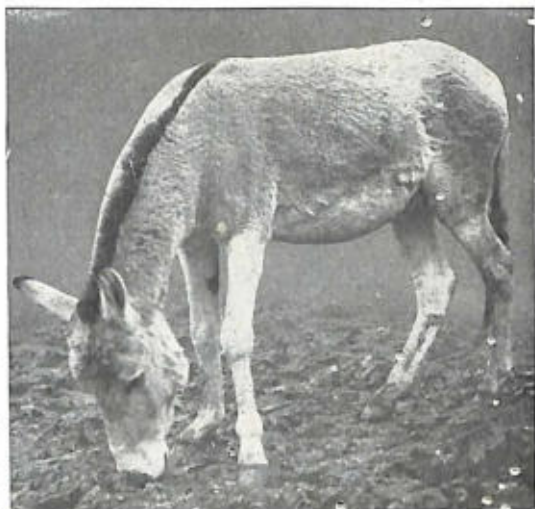
Another very good friend is the patient Donkey—very patient, but also very obstinate at times! Our tame Donkey comes from the Wild Ass of the desert, a very beautiful animal, not much like the poor old shaggy creature in a coster's cart. The Wild Ass is larger than our friend Neddy, and his general colour is grey. The race of Wild Ass known as the Nubian lives in N.E. Africa, and the Somali race ranges from Somaliland to the Red Sea.

A traveller who tamed a Wild Ass noticed that she would often pass two days without drinking, and when she did drink she seemed to like salt water best. She would eat a handful of salt, or salt sprinkled on bread. She was very fond of raw cucumber, but would not eat thistles. She followed any persons who were kind to her, but if any one tried to lead her against her will she would show all the obstinacy of a Donkey.

The Donkey's long hollowed-out hoofs with sharp rims make it very sure-footed, and it is very useful as a pack animal in hilly country. Mules, which are even more obstinate and difficult to manage by those who are not used to them, are also very useful in country which is mountainous.

I have ridden Donkeys in mountain excursions on the French Riviera. It is useless to try to guide them with a rein, as they know so much better than their riders where to plant their feet. These Donkeys and Mules always if possible keep to the extreme edge of the hill path away from the rock, as they are accustomed to carry packs, and wish to avoid hitting their burden against the overhanging rocks.

Donkeys have other relations besides Mules. Amongst them are the Kiang of Tibet, which has been described as having "hoofs like flint and lungs as strong as bellows," the Zebra or Horse-tiger of South Africa, the Quagga, so-called from its qua-cha! which is an animal somewhat between a Horse and a Zebra, and a kind of wild Ass called an Onager;



*Were you to meet the Onager of the Asian deserts, you might easily mistake him for the Donkey of our own seaside sands!*



## MORE GOOD FRIENDS

*All animals are living hieroglyphs—  
The dashing dog and stealthy-stepping cat,  
Hawk, bull, and all that breathe, mean something more  
To the true eye than their shapes show: for all  
Were made in love, and made to be loved.*

BAILEY

AMONG other good friends we can number Dogs and Cats. Our Dog, who is such a faithful friend, and delights to scamper around us when we invite him to come for a walk, and Puss, who lies comfortably curled up by the fire, had very fierce ancestors thousands of years ago. For the dog comes from wild Wolfhounds, and is related also to Foxes and Jackals and Hyenas, and Pussy numbers among her relations Lions, Tigers, Leopards, Jaguars, and other fierce creatures.

If you go to the Zoological Gardens and ask for the Lion House you may be directed to a notice board pointing "To the Great Cats." There you will find the strong cages of the Lions, Tigers and Leopards. Perhaps some of them will be licking their great paws and washing their faces just as Pussy does when she is lying on your hearth rug.

There are two old favourites at the Zoo—the Lion and Lioness, Jock and Juno. At one time Jock was said to care very little for his wife, and when her litters of cubs were born he was parted from her for a time while the cubs were still young, but lately he has changed his character. When two little cubs were born in May, 1937, instead of being greedy as formerly and trying to get the largest piece of meat for himself at feeding time, he began to carry Juno's portion to her in the inner den before eating his own meat, and he mounted guard so well over the newly-born babies that visitors could see very little of them.

*Dogs are not only faithful friends, but they are often wonderful helpers of man. The beautiful animal shown opposite is Oscar, the leader of the sledge team that accompanied the late Sir Ernest Shackleton on his Antarctic expedition.*

When did men first begin to tame Dogs and Cats? We know nothing for certain, but it is probable that very long ago men began to tame and train Dogs to help in hunting. And it is known that in Egypt, curiously enough, Cats, and apparently Dogs also, were looked on as sacred animals more than a thousand years before Christ. There is an ancient temple dedicated to a cat, said to date from 1500 B.C., and behind this temple are pits containing a number of Cat mummies. When a Cat, or even a kitten, died, the people were forced to mourn, and to shave their eyebrows as a sign of woe, and the dead Cat was carefully embalmed. We can see Cat mummies in the British Museum. Figures of Dogs appear in the friezes on old Egyptian temples.

Have you ever thought how different kinds of Dogs have certain



qualities which make them good friends and companions to human beings? Most Dogs are very faithful to kind masters. Mastiffs and Sheepdogs are wonderfully trustworthy if they are set to watch and guard. Hounds have very keen scent and are always ready to chase. Spaniels and Pointers are anxious to seek and find. Some Dogs have a very keen sense of smell, others have very sharp hearing; Deerhounds, Greyhounds and Lurchers hunt by sight, some hunt quickly, and others which run more slowly may show great courage in holding

*The Spaniel in the picture has adopted a family of Badger cubs, and is keeping a watchful eye on them as they crawl about.*



*Pointers and Retrievers waiting to follow "the guns." Both are good sporting breeds, and kindly and companionable as well. The Pointer came originally from Spain.*

wild beasts at bay. Eskimo Dogs, which howl like Wolves and do not bark, draw their masters' sleighs over snow and ice. In Belgium and Switzerland large Dogs are harnessed to little carts for delivering milk.

Among the largest Dogs which are shown at Dog shows are Bloodhounds, Borzois, Bull Mastiffs, Deerhounds, Great Danes, Irish Wolfhounds, Newfoundlands, Old English Sheepdogs, and St. Bernards. And at the other end of the scale may be numbered the little Maltese Dogs, Mexican Lapdogs, and other tiny pets.

The race of St. Bernard Dogs is famous as having been trained by the monks of St. Bernard's Hospice, in Switzerland, to search out travellers overtaken by snowstorms, and to warn the monks by giving a deep and powerful bay, so that their kind owners may hasten to help the sufferers. You may have seen pictures of these good Dogs with little flasks of cordials or spirits tied to their necks.

I have read an amusing story of a Pointer, who was a great coward at heart, though if he met another Dog who was a stranger to him he would pretend to be very fierce and brave. One day a little Terrier belonging to a butcher sprang out upon him, and gave him such a fright that he ran away as fast as his legs would carry him. Now this Pointer was friends with a Bull Terrier, to whom he evidently confided his grief, and his wish that his enemy should be punished; for one

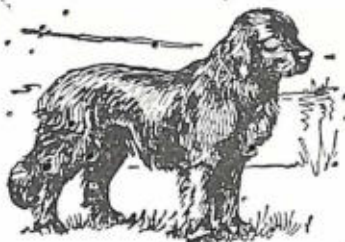
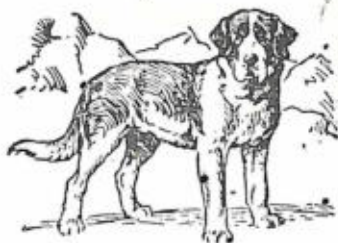
day the Pointer and the Bull Terrier trotted along together past the butcher's shambles, and when the little Terrier again rushed out to attack the Pointer he quickly retreated behind his friend, and the friend sprang upon the little Dog and rolled him over and over, while the Pointer looked on, barking with joy and triumph.

No doubt you have heard or read many anecdotes of Dogs, but here is one which was told me by a friend. Her father had a Dog called *Jemmy*, who used to go to his bed every morning. If the master failed to get up at once he would fetch his slippers. If this was of no use, he would carry his spectacles carefully to the bed and place them before him. One day the master, who was a clergyman, was going to visit a sick person, so he gave orders that the Dog should be left shut up in his bedroom. There was an old-fashioned bell in the room which could be rung by pulling a long bell-rope. Presently, to his surprise, he found the Dog bounding after him. On returning home he was told, "Your bell rang loudly, and when I opened the door, *Jemmy* rushed past me and was out of doors before I could stop him." *Jemmy* had seized the rope in his mouth and rung the bell!

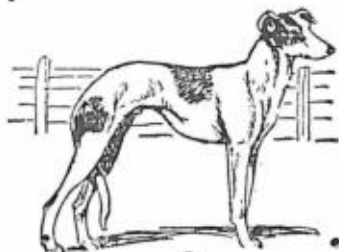
If we watch a Cat and a Dog feeding we may notice that the Dog seizes his food and gulps it down very quickly, but the Cat is much more deliberate and takes a much longer time over her meal. Is there any reason for this? Well, the Dog, gentle and tame as he may be, is descended from the Wild Dogs which hunted in packs, and which would all fall on their prey together, and gobble it up as quickly as they could, each trying to get a share before another could take it from him. But *Pussy* comes from Lions and Tigers and other wild beasts which hunt in solitude, and they drag off their prey into some safe retreat and devour it at leisure.

The only Wild Dog which now exists and is a true dog and not simply a distant relation, is the *Dingo* or *Warragal* of Australia. These Dogs hunt in packs, and give great trouble to sheep farmers. But if a native finds a litter of *Dingo* puppies in a hollow tree, he will carry them home and train them up to be very useful Sheep Dogs. A *Dingo* does not bark.

A Wild Cat is a terribly fierce creature, heavier, bigger and stronger than our domestic Cats. It lives in a hollow tree or some hole in a



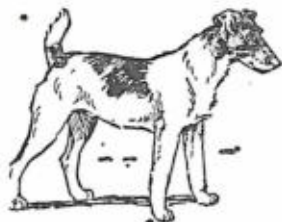
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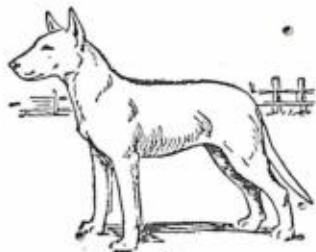
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6



7



8

Some of the larger types of British Dogs: 1, St. Bernard. 2, Newfoundland. 3, Greyhound. 4, Collie. 5, Fox Terrier. 6, Bull Terrier. 7, Mastiff. 8, Bulldog.



*The British Wild Cat, large and very fierce, is nearly extinct, though it may still be seen occasionally among the mountains.*

rock, and preys on Hares, Rabbits, Squirrels, Poultry, and so on. There are not many left now in Britain, but occasionally one is seen in the Scottish Highlands and the mountainous parts of Wals or the Lake Country.

A Cat has five toes on each front paw and four on each hind paw. She has a little soft cushion under each toe, and she has a larger pad on the sole of the foot. Thus she can steal noiselessly on her prey. Also when she jumps from a high wall or tree the pad breaks the fall and she comes down unhurt.

Have you noticed how graceful she is in all her movements? A Cat seems

always to move in curves and never makes an awkward or ugly movement. This is partly because she has a very free shoulder joint and can move her foreleg and turn it about easily in all directions.

It is thought that a Cat's whiskers are very sensitive—they warn her if anything is in the way when she prowls about in the dark. And at night, too, the pupils of her eyes, which are like narrow slits in the daytime, open wide and make her able to see well in the dusk.

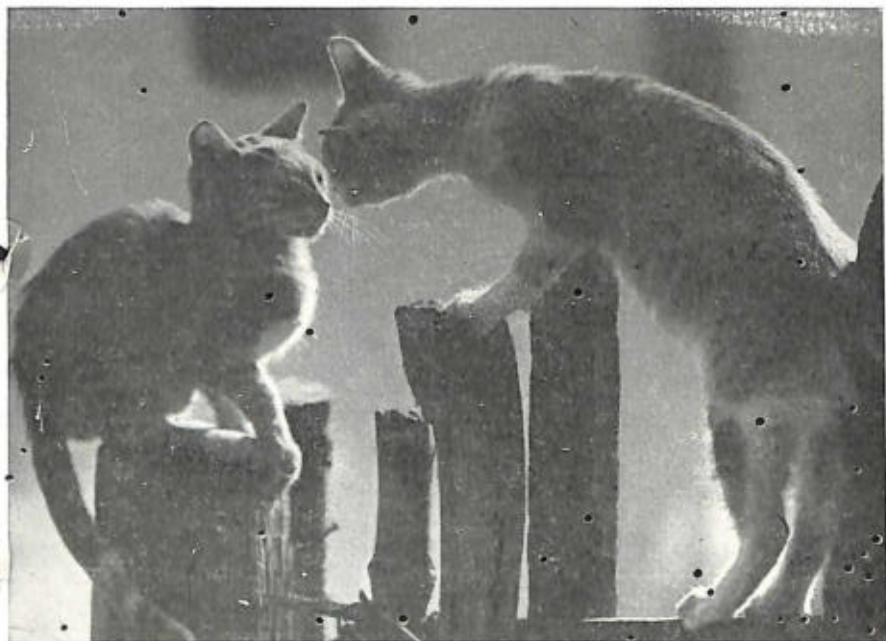
A Cat's tongue, like the tongues of Lions and Tigers, though smooth beneath, is covered on the surface with a number of sharp hairs. These are rather like very tiny claws pointing backwards, and with these she can grasp and tear her prey.

As a rule, a Cat's affection for its owner is more uncertain than a Dog's, and it is sometimes said that they care more for places than for human beings. But some can show great affection. A friend of

mine had a Cat who came to her every morning before she got up. On one occasion she was much puzzled because her mistress did not rise at the usual time, as she was feeling ill, so Pussy rushed out into my friend's garden, caught and killed a bird, brought it carefully in her mouth, and laid it on the bed, thinking it would comfort her!

A friend told me of a Cat at her home, called Tip, who used to go out every night hunting with his Cat friends. One night the cook locked him up downstairs, to his great annoyance. Next morning some little bits of dead rabbit were found on the doorstep, left there for him by his rabbit-hunting friends!

The name "Tabby" was given to Cats with stripes and markings, because *tabby* originally meant "watered silk." Short-haired Cats come from an African or European stock, and the long-haired kind from the East.



*"What do you say to a stroll in the moonlight?" Cats are very graceful creatures, and even this backyard tableau on a broken fence has its element of beauty.*

# NATURE'S PLAYGROUND

## *Book Three*

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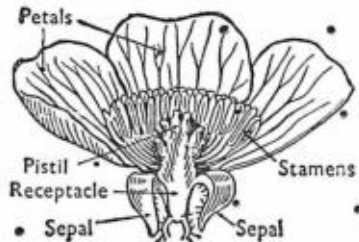


## SCENT AND COLOUR

*Take of English flowers these—  
 Spring's full-faced primroses,  
 Summer's wild wide-hearted rose,  
 Autumn's wall-flower of the close,  
 And, thy darkness to illumine,  
 Winter's bee-thronged ivy-bloom.  
 Seek and serve them where they bide  
 From Candlemas to Christmas-tide.*

RUDYARD KIPLING

LET us think to-day about the different parts of a flower. If you look at a Buttercup you see the "corolla," as the botany books call it, or little crown, made up of five yellow petals. Then you see that the corolla has a case or envelope of little green leaves round it, called the "calyx" or flower cup, and the leaves of the calyx are called sepals. In the middle of the Buttercup you see a number of threads or stalks with broader tips; these are the "stamens," and they hold the pollen dust which makes the seed grow, and their broad tips are called anthers.

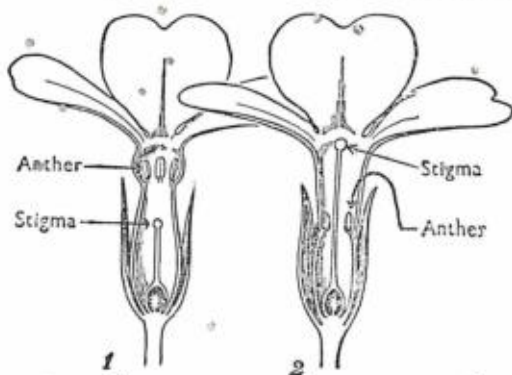


*This interesting diagram shows the different parts of the Buttercup.*

If you put up a Buttercup against your face your nose will be powdered with the yellow pollen dust! In the middle of the stamens is a little green knob, which is the "pistil," with tiny yellow stalks coming out of it called "stigmas." Inside the pistil is the seed box, where when the right time comes the seed will ripen.

*Imagine the world without flowers and trees. Think of the scene opposite, if the natural beauties were taken away. A path and a brick wall only would remain.  
 Nature clothes the earth with beauty with its flowers and greenery.*

A complete flower like a Buttercup has calyx, petals, stamens, and pistil; but there are many flowers which have no calyx and no petals: perhaps you can think of some? The stamens which hold the pollen, and the pistil which holds the future seed, are the most important



1. *Thrum-eyed Primrose*, with anthers placed high.  
2. *Pin-eyed Primrose*, with stigma above anthers.

parts of the flower—more important even than the more showy petals—because fresh flowers will come from them.

Now before the seed can ripen it has to be touched by the pollen dust which travels down the stamens to the pistil. As a rule the seed is better and stronger if it is touched (fertilised as it is called) by pollen from another

flower, than if it is fertilised by its own pollen. This is where, in many cases, insects come in. Bees, Butterflies, Moths, and other insects, carry about the pollen of many flowers from one bloom to another, though in other cases it is carried by the wind, and in the case of some water plants, by the water. Certain flowers are shaped to fit them for the visits of insects.

The Arum or Cuckoo Pint is fertilised by little flies, which are kept prisoners till the stamens ripen and shed pollen upon them, and are then set free to carry the pollen to another Arum.

A very good flower to study is a Primrose, or a Cowslip or Oxlip. If you look into a number of Primrose or Cowslip plants you will see that the flowers in some of the plants are thrum-eyed. That is, the stamens stand high up in the tube of the flower with the anthers holding the pollen showing at the top. In other plants they are pin-eyed; that is, the pistil stands up above the stamens. You can see its little round top like the head of a pin at the top of the tube, with the stamens like little bags hanging half-way down the tube beneath it.

Now the Bee comes humming along, and if he first visits a thrum-eyed plant, and sends his long tongue down the tube to get the honey, the pollen dust from the stamens will stick to the upper part of his tongue. As long as he goes on visiting thrum-eyed flowers he will collect more and more pollen, without leaving any on the pistils which are far away down the tubes. But when he next visits a pin-eyed plant he will rub off the pollen from its thrum-eyed neighbour on to the knob of the pistil. At the same time he will collect fresh pollen below it on the tip of his tongue, to be rubbed off easily on to the next short-styled Primrose (or Cowslip) visited. So the pin-eyed blossom will be pollinated by the thrum-eyed and the thrum-eyed by the pin-eyed.

But, you may ask, what will happen if the Bee chooses to go off to a different flower instead of another Primrose? The answer is, that as a rule a Bee or a Butterfly is faithful to the same kind of flower for a whole day. If a Humble Bee, for instance, starts the day by visiting a Foxglove he will probably keep to Foxgloves for the rest of the day.

Speaking of Foxgloves, it is interesting to notice that botanists tell us that they can only be fertilised by Humble Bees, for only a Humble Bee is large and fat enough to touch the anthers and the stigmas with his back when he creeps into the bell-shaped flowers.

Again, there are some flowers which can only be fertilised by Butterflies and Moths. For instance, the Butterfly Orchid cannot be

*The beautiful Foxglove has wide, trumpet-like flowers growing on a very long, straight stem.*



pollinated by Bees, as they cannot easily send their tongues along its long slender spur, and it is found that, where the Butterflies and Moths which visit this Orchid have become scarce, the flower no longer flourishes.

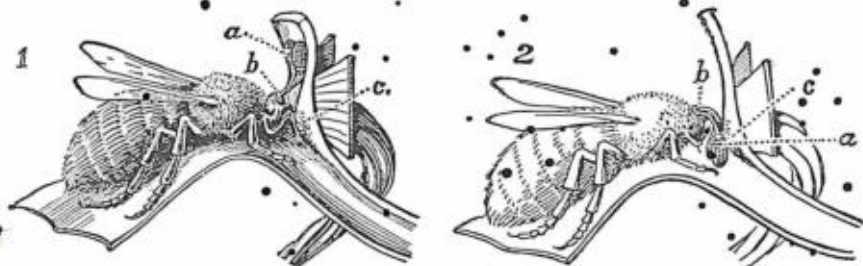
Another interesting flower to study is the common White Dead Nettle, which is to be found almost anywhere in the country, or even on a bit of waste land in the middle of a town. If you pull it to pieces you will find that it has four stamens, with black and yellow anthers on their white stalks. These hold the pollen, and you will notice that two are long and two short. Now here is the pistil—a white stalk with a forked tip or stigma, hanging over below the stamens.

In front of the tube of the flower you see a sort of broad lip which makes a nice little platform for the Bee to stand on—perhaps a Humble Bee—when he comes looking for honey. The honey is at the bottom of the tube, and over the honey pot there is a fringe of hairs, which prevents tiny insects from creeping in, for small insects would be of no use in carrying about the pollen in this sort of flower. Dead Nettle also has a little hood, which is like an umbrella to keep off rain.

The Bee settles on the platform, and pokes in his long tongue to get at the honey. His head will touch the forked hanging tip of the pistil first and cover it with the pollen brought from another Dead Nettle. Then as he pushes his way in, his back will be brushed with pollen from the anthers, and off he will fly to leave it on the stigma in the next Dead Nettle which he visits.

There is a different arrangement again to be found in the Dog Violet. Let us look at its five petals. We shall find that one petal is longer than the others and it is drawn out into a sort of spur. The spur is hollow, and it is partly covered over at its opening by some tufts of hairs, partly by the top of the pistil. Now for the five stamens which hold the pollen in their anthers. The two lower stamens have long spurs also, and they fit neatly into the spur of the petal.

Here come the Bees, knowing that there is some nice sweet honey for them at the end of those spurs. There is a sort of little box between the stamens and the pistil which catches the pollen. And as the violet hangs its head, the pollen, which is very dry and crumbly, easily falls from the anthers of the stamens into this little box.



In the first diagram the Bee is seen withdrawing from an Orchis, and taking pollen (a) away with him. In the second diagram he is entering another Orchis and leaving pollen on the stigma at (c). In this way the flowers are fertilised.

The Bee pokes his tongue into the long spurs to find the honey, and in so doing he is sure to run his head against the top of the pistil—the stigma—on its thin shaky stalk. He knocks open the little box, and some of the pollen will fall on to his head. Then when he goes off to another visit he will leave some of the pollen on its pistil. Borage, which is much visited by Bees, is made nearly on the same plan.

Violets, and certain other plants, such as Wood Sorrel, Henbit, and Touch-me-not Balsam, have some tiny flowers looking rather like unopened buds, as well as their ordinary flowers. In these tiny flowers, which are called by a long name, "cleistogamic," the stamens are placed so that their pollen grains send tubes straight down on to the stigma, and do not need the help of insects to fertilise them. Generally these sort of plants have very few pollen grains compared with plants with no cleistogamic flower. Thus a single cleistogamic flower of Wood Sorrel has about 400 grains, and a single flower-head of Dandelion is said to have 365,000!

Later in the year we might look at the Wild Geranium or Meadow Crane's Bill. It is interesting, by the way, to recall that a botanist called Sprengel, who was the first to find out that insects help to fertilise flowers, began his studies with the Geranium. It has five great showy purplish petals, which I suppose are like coloured advertisements calling to the insects "Come and get my honey!". The honey is in five little honey pots near the bottom of the stamens, and over them are little umbrellas of hairs to keep the rain off.

Our Geranium has ten stamens, and five are taller than the others. If our flower is still young we shall find that the five little tops—stigmas—of the pistil are all shut up tight together, for the pistil is not yet ready for the pollen.

In this young flower which has only just opened, the stamens are all lying flat on the petals. But in a Geranium which has been open rather longer we shall find the five outside stamens standing up and letting their pollen drop. Later they will lie down flat again and the five inside stamens will stand up and shed their pollen. At last when all the pollen has been shed, the tops of the stamens—anthers—will drop off, and at last the pistil will open and unfurl its stigmas.

Now we see how useful the insects will be. Flying from one flower to another, they are sure to carry the pollen from some younger Geranium where only the pollen is ripe, to another older flower where the pistil is ready for it.

The Meadow Crane's Bill has a little brother which I dare say you know well—Herb Robert. He is much smaller than his big relation. He has no little umbrella hairs to protect his honey, as he is less open and exposed to the wet, and his honey bags are enough protected by the stamens and pistil. This flower has a disagreeable smell, especially when pressed, and is much visited by flies which do not object to smells which to us are disagreeable. After the flower has faded, the middle part which holds the seed lengthens out into a kind of rod or pillar, and when the seeds are ripe they are jerked out from the base of the rod to a surprising distance, as if shot out from a pop-gun.

We generally find that flowers which open at night are white, but have a scent which attracts insects, such as the White Lychnis. A near relation of the White Lychnis, Ragged Robin, has no scent, but his bright red colour doubtless attracts insects to visit him.

We have already thought about the bright colours of the Iris or Flag, and how in the Yellow Iris and the Blue or German Iris the leaves of the calyx as well as the petals are all brightly coloured. The stigmas are delicately coloured also, and the seed box of the Blue Iris is brightly coloured inside, so that altogether Iris may be said to take great pains to invite visits from the Bees!

We may notice that "wind fertilised" flowers, that is, flowers the pollen of which is carried by the wind, and not by insects, are less brightly coloured and have no sweet smells. The flowers, for instance, of many of the forest trees, such as the catkins of the Oak and the Birch, are green and unscented and comparatively small. But the flowers which are fertilised or pollinated by insects often have bright colours, and strong or sweet smells, which attract the Bees and Butterflies and other insects. Insects, as we have already seen, have very wonderful eyes, and they also have a very keen sense of smell.

There is a difference also in the pollen found in the insect-pollinated and the wind-pollinated flowers. In the flowers visited by insects the pollen grains often have rough surfaces with tiny points or other means of fastening on easily to the insects' hairy bodies. But the pollen grains in wind-fertilised flowers are generally very light and often round, so that the wind catches them and blows them about.

In some flowers the pollen is curious. If you touch a Twayblade Orchid however gently, with a feather or a blade of grass, you may see a thick sticky fluid oozing out from the middle of the flower. When the insect goes into the flower, this sticky stuff covers the insect's head and glues the pollen to it, to be carried off to another flower.

You remember that Dandelions and Daisies belong to the great Composite family, each member being made up of a number of little florets on one stalk? The visits of an insect to a composite are likely to take effect, as on alighting it touches several florets at once. Probably this is why the composite family is so flourishing.



*Here is a Red Admiral Butterfly sucking nectar from a flower. When it flies away it will carry pollen to fertilise another blossom.*



## TONGUES IN TREES

*A song of Enchantment I sang me there,  
In a green-green wood, by waters fair,  
Just as the words came up to me  
I sang it under the wild wood tree.*

*Widdershins turned I, singing it low,  
Watching the wild birds come and go:  
No cloud in the deep dark blue to be seen  
Under the thick-thatched branches green.*

WALTER DE LA MARE

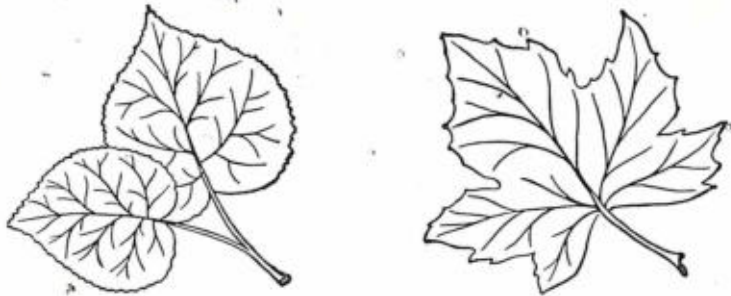
TREES are interesting at any time of the year. In spring we may watch the baby leaf buds unfolding, and the catkins hanging from some of the trees and the tiny flowers on the twigs of others. In summer we can study the various shapes of the leaves and the clever way in which they arrange themselves so as to catch the light. Then in autumn there are the wonderful changing colours of the foliage, while winter is the best time for learning the different shapes of the boughs and the various kinds of bark. And this study can be carried on even in large towns in public gardens and parks.

A well-known tree which flourishes in London parks is the Lime, of which there are three kinds—the Common, the Broad Leaved, and the White. The last is so called from the silvery underside of its leaves. When the leaves of the Lime are quite uncurled we may feel that summer has arrived. The heart-shaped leaves are very delicate and transparent and deeply ribbed. They are among the first to show signs of becoming brown and discoloured, but while they are still fresh they are really very beautiful.

Later on we find pretty golden-white buds hanging in clusters called "cymes." These later open out into the cream-coloured flowers

OPPOSITE: *Trees are noble things. This avenue of Lime trees, or Lindens, lines the famous Queen Elizabeth Walk at Ashbridge. The blossom is sweet-scented.*

around which the Bees come buzzing, for the Lime is one of the few forest trees which invite insects to visit their flowers. When the flowers have faded we shall see the little globe-shaped fruits hanging from the stalks.



*On the left is a drawing showing the leaves of the Lime, while on the right the leaf of the Plane is seen.*

In old books and poems the Lime is often called the Linde or Linden. The word means pliant, and the tree was evidently so called because cordage and other useful things were made from its pliant easily-worked bast.

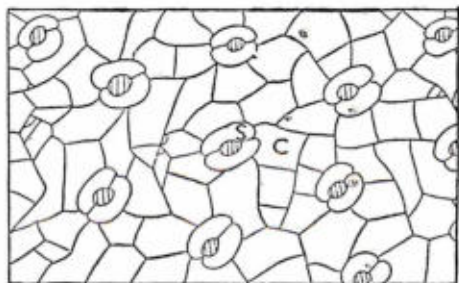
Another tree which is very common in towns is the Plane. There are two sorts, the Oriental, sometimes called the London Plane, and the Occidental or Western. The bark is constantly peeling off and renewing itself, so that the tree is able to breathe freely in smoke-laden air. The Plane keeps its leaf buds carefully hidden away in a little hollow in the leaf stalk where it fits as a finger fits into a thimble.

When the leaf falls off in the autumn the new bud is covered over by two little caps, which split open in the spring, thus making room for the young leaves to push their way out. When the baby leaves first come out they are covered with nice little coats of brown fur. The seeds are held in little hairy balls, so like buttons that in some parts of the United States the tree is called Button Wood. These fall to the ground in autumn and break, and the seeds, covered with cosy coats of down, are carried away by the wind.

The ancient Romans were very fond of their Plane trees, and their writers have told us a good deal about them. Pliny says, "There is

now in Lycia a famous Plane, on the public road, near a very cold fountain. It is in itself a forest; its branches are as large and thick as trees, and cover an immense extent of ground with their shade. The trunk is 81 feet in circumference, is hollow, and has inside numerous stones, covered with moss. The tree was such a favourite with Licinius Mucianus, Governor of the Province, that he thought it worth while to hand down to posterity that he had eaten in this hollow tree or grotto with eighteen persons, who had for couches or cushions to recline on, only the leaves of the tree: that the thickness of the foliage sheltered them from a heavy shower of rain: and that he enjoyed more pleasure during his repast in this tree than he had ever done in his most magnificent marble saloon."

Perhaps you remember that when we were talking about the Water-lily, we said how the leaves of plants are covered with little mouths, called stomates, or breathing holes. If you looked, through a strong microscope, at a small piece of a leaf, prepared and mounted, you would see that it is made up of little cells, with these breathing holes scattered about over them. It is said that 100,000 of these little mouths have been counted on one ordinary leaf of an apple tree, and over 1,000,000 on a leaf of a lime tree!



*Under a very powerful microscope a leaf would show its cells and breathing pores (stomata). C—cells. S—stomata.*

We said that these little cells take in a gas called carbon dioxide, made up of carbon and oxygen. When this gas gets into the cells, while the sun is shining, it breaks up. The carbon mixes with the fluid sucked up by the roots, and goes to feed the plant or tree, while the oxygen escapes back into the air, and helps to keep animals and human beings alive.

But if these little mouths are to do their work properly, the leaves must have sunlight as well as air, and must be "sunlight catchers." If you look at the many different kinds and shapes of the leaves which

you come across in a country walk, you will see that they are shaped in the way best fitted to catch both air and sunshine. One interesting point to notice is that leaves seldom overlap; you will almost always find that each leaf on a plant or tree gives its neighbours "elbow room."

If you take different kinds of leaves home to sketch—and if you are fond of sketching you would find this an interesting study—you will see that most leaves have branching ribs, or "veins" as they are called, and that there are at least three different patterns of veining. Some leaves, such as those of the Ivy, are called finger-veined, because their ribs or veins are spread out like the fingers of a hand. Others, such as a Laurel, an Oak, or a Rose leaf, are called feather-veined, because the side ribs are placed along the sides of the middle rib in



*Norway Maple*  
*Sycamore.*

*Box Elder.*  
*Field Maple.*

pairs, so that they have a feather-like look. A few, such as the leaves of grasses and those of Lilies, Daffodils, Flags, and Tulips, are called parallel-veined. In these the ribs run side by side from the bottom to the top, like the lines ruled for cash in an account book.

A large broad leaf, such, for instance, as the round leaf of the Nasturtium in your garden, which is able to spread itself freely to catch the air and sunshine, usually has the spaces between the ribs well filled in with living green stuff. The narrower kind of leaves which have a

greater struggle for air and sunlight are not so well filled.

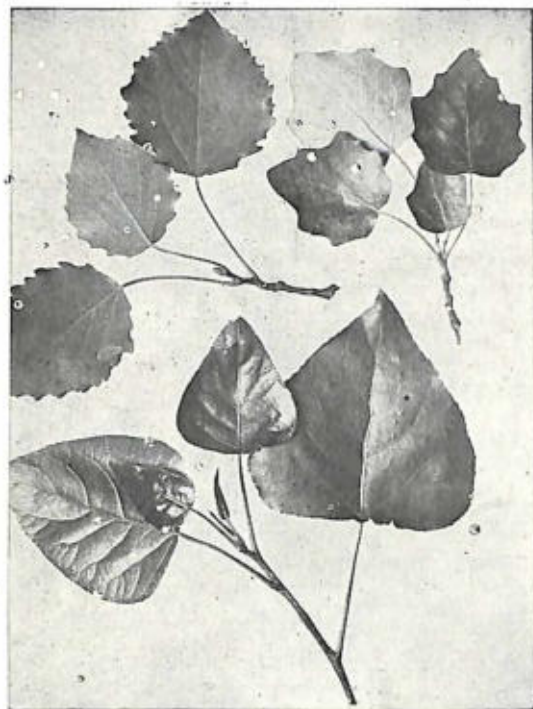
This "leaf green," which shows its green colour in spring and summer, changes when summer is over. In most trees other colouring matters take its place, and make the beautiful golden and crimson and orange colours which we see in autumn. Then the sap begins to run backward into the stem, and the leaves shrivel and fall. But even the dead leaves are useful, for they mix with the soil and help to make it richer for nourishing the roots.



*Spruce*      *Fir.*      *Yew.*  
*Douglas Fir.*   *Lawson*   *Cypress.*   *Scots Pine.*

Of course, there are certain trees, called Evergreen, which do not shed their green leaves in the winter. Such are all the Conifers, or cone-bearing trees, except the Larch and the Deciduous Cypress. It is interesting to notice the different shapes of the leaves and the different ways in which they are grouped in the Conifers. The Spruce has needle-shaped leaves; in the Silver Fir and the Yew they are flat; in the Scots Pine one side of the leaf is a little rounded and the other flat. The leaves of the Cedar are only about an inch long, while the Stone Pines have leaves of five to six inches in length. Pines have their leaves bound together in bundles by a kind of sheath, and firs bear their leaves singly. In the Larch the leaves grow in tufts.

We all know how pretty the Holly trees look when they are covered

*Aspen.**Black Poplar.**White Poplar.*

in the springtime, when the leaves are dressed in their fresh "living green," sometimes just tinged with a red shade.

Quite different is the leaf of the Black Poplar. Here, if you look carefully, you will see that each large leaf stands out by itself, with a good space between it and its neighbours as if to say, "Here I am! Look at me!" Each leaf hangs downwards on a long, thin stalk, so that you see the whole outline. The leaves have no white undersides, like the Whitebeam, or shining upper sides like the Holly, to make them seem to blend with the sky when you look at them.

The case is different with most of the other trees. We have noticed the groupings in some of the Conifers. The groups of leaves are in tufts on the Oak, and in long layers on the Beech, the sun shining

with red berries in a winter when berries are plentiful. But have you ever thought about the Holly leaves? They are very shiny and glossy, so that they glitter and sparkle in the sunlight. When the sun shines on them, each polished thick leaf throws off a bright light; and the many curved and twisted leaves together, lying at all sorts of angles, reflect the light from the sky. Even the prickles which you find so sharp when you are putting up Christmas decorations, have their share in reflecting the light. All this has a beautiful effect, especially

down between them and throwing chequered patterns on the ground. The leaves of the Ash throw lace-like patterns. In the Elm the leaves are massed together, though you can see patches of the sky between, and the Elm leaf being "lopsided"—the leaf blade carried lower down one side of the stalk than the other—each leaf gets its share of light. In the height of summer the groups of leaves are so thick on the Horse Chestnut that the sunlight cannot get through the mass. The Birch has many little peepholes for the sky to peer through. You can see the edges of the Sycamore groups plainly, but less plainly the edges of the willow. In all these trees you do not think so much about each separate leaf, but rather about the whole mass of leafery.

We know the flowers of the Lime tree well, beloved as they are of Bees, as the smell is so pleasant in early summer, but perhaps we have not thought much about the flowers of some other forest trees, which have no sweet smell and no showy petals. Many of the great trees have long hanging catkins or spikes, with the pollen-bearing stamens and little pistils, but no petals to draw our attention. The Oak, Alder, Birch, Hornbeam, Hazel, Beech, Willow, Poplar, Aspen and Sweet Chestnut, all belong to the Catkin family. Do you know all these by sight?

There is so much that might be said about the Oak, that we must leave him for another talk.



Common Elm.

Wych Elm.

Hornbeam.



A MONARCH OF THE WOODS  
AND SOME OTHERS

*My growth is slow  
Up and below.*

*My roots hold fast,  
I shall last, I shall last  
As long as the wild winds know  
They can fling my acorns low.*

*Round me the bracken snaked and curled,  
Higher and higher the fronds unfurled,  
Lording it over the baby tree,  
Biding his time uncaringly.*

*Up and beidw  
My growth was slow.  
I shall last, I shall last  
While my roots hold fast  
And I fling my acorns low.*

## OAK SONG

WE have seen that the Oak is a member of the catkin family. Perhaps we have never thought much about its flowers, as they have no bright showy petals, but they have the pollen-bearing stamens, in long hanging catkins or spikes, and the little pistils at the end of the twigs, where later the acorns, which are the fruit, will appear.

The two chief kinds of British Oak are the sessile-fruited or Red Oak, sometimes called the Flat-leaved Oak, growing chiefly on dry sandy soil; and the pedunculated or White Oak, nicknamed the Wavy-leaved Oak, growing mostly on clay and loam soils. The sessile Oak has no stalks, or very short stalks, on its leaves and acorns, while the pedunculated has stalks from half to one inch long on its leaves and fruits, and the leaves are longer and of a less deep green.

*The formation of an Oak tree is seen (opposite) to full advantage, for the photograph was taken in winter, when the intricate network of branches becomes visible.*

There are other kinds which grow in Great Britain but which have been brought from other countries. Such are the *Ilex* or Evergreen Oak, also called the Holm Oak, or Holly Oak, the Cork Tree, and the North American Red Oak. A very common tree is the Turkey or Moss-cupped Oak, a handsome tree, but its timber is not so good as



*On the left are the leaves of the Oak tree. Compare them with those of the Holm, or Holly Oak on the right, which are much less deeply notched.*

the wood of the British Oak. Altogether there are about three hundred different kinds in the world.

Our own British Oak grows more slowly than any other British tree, spreading its great roots deeply into the ground, and is known to live to an immense age. The poet Dryden writes of it:

“The monarch oak, the patriarch of the trees,  
Shoots rising up, and spreads by slow degrees;  
Three centuries he grows, and three he stays  
Supreme in state, and in three more decays.”

The word Oak is thought to come from the Saxon *aack* or *ak*, and acorn from *ac-cern*, or *oak corn*, as the Saxons may possibly have eaten acorn bread when other food was scarce, though it certainly does not sound inviting! It is said that acorns were eaten in Greece and Italy before the sowing of corn was invented. Chaucer tells of some who “were wont lightlie to skalen their hunger at ever with akehornes of okes.”

Pigs, as you know, are fond of acorns, and in old days acorns were greatly valued on that account. In the seventh century King Ina made “Pannage Laws,” which had to do with the right to keep swine and to fatten them on acorns in certain woods and forests. In “Domesday



*On page 24 you saw an Oak in winter. Compare that photograph with the one above. Here the tree is clothed with its rich foliage.*

Book" there is a record of the number of hogs which each forest could feed; and a note of a man who kept pannage for 200 pigs as part of his lady's dower.

There are a great number of places called in some way after the Oak. Not only does it appear in such names as Okehampton, Oakham, Sevenoaks, but we also find names like Accrington, meaning oakcorn (acorn) town, Acton and Aikbar, an oak town, Oakley, an oak meadow, Moorsholm cum Grivock, the holm on the moors with Grieve's oak, Adel cum Eccup, the noble's town with the oak slope. There is a tiny wood in Warwickshire, probably once part of the Forest of Arden, known from very old times as Echels Wood, or Oak Wood.

Among famous Oaks we may remember the Boscobel Oak in Shropshire which served as a hiding-place, for more than a day, for Charles II., when he fled from his enemies after the Battle of Worcester. The day of his restoration, May 29th, was long observed as Royal Oak Day, or Oak Apple Day, when loyalists wore sprigs of Oak.

At Winchester the famous round table called "King Arthur's Table" is made of oak planks and is eighteen feet across. A hollow Oak, which was the favourite resting-place of a bull, could hold twenty persons inside its trunk. Many years ago an Oak fell in Sheffield Park which was so large that two men on horseback on opposite sides of the fallen trunk could not see the crowns of each other's hats. An Oak tree at Leamington in Warwickshire is supposed to mark the middle of England.

In old times, before steam ships were invented, Oak timber was used for building ships, "the wooden walls of old England." "Hearts of oak are our ships, hearts of oak are our men!" was an old song. Chaucer called the Oak "the father of ships." The timber is very tough and lasting, not easily soaked through and yet not unduly heavy. Beautiful furniture is made of Oak wood, which is well suited for the purpose on account of its wavy markings, or "grain" as the carvers would call it. Ancient Oak chests, well carved, may be very valuable. The rough bark is rich in tannin and is much used in tanning hides by manufacturers of leather.

You may have read in history books how the Druids, the priests of the ancient Britons, treated the Oak as a sacred tree. They took their names from the Celtic word for Oak, "derw," and they wore wreaths of Oak leaves round their brows. They worshipped under Oaks, and kept a fire of Oak timber always burning in honour of a god who seems to have been rather like the Roman Saturn, and once a year all the people lit their fires from this sacred flame. They had a great service when they looked for Mistletoe on the Oak trees. Before they began to search they offered sacrifices in baskets made of Oak twigs, and when they found it they cut it from the Oak tree with a golden knife.

If you think about the shape of an Oak you will see that it is made for strength. The massive trunk holds great branches which spread themselves out on all sides, often with elbow-like bends. Very often the trunk is widest near the ground, narrower higher up, and then it widens again near the part where the branches begin to grow.

Many different sorts of Galls are found on Oak leaves, the work of the little insects called Gall Flies, some of which are real flies and others

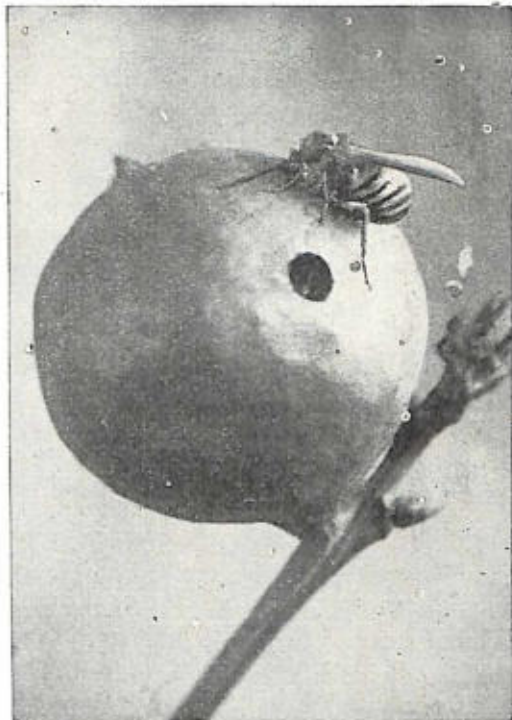
are relations of Bees and Wasps. Oak apples are large galls, and of these certain kinds are used in manufacturing ink. Oak spangles are very common on the undersides of leaves. Then there are articloke galls, marble, cherry, red-streaked, and many others. The violet galls found on Dwarf Oaks have been called "Bitter Apples of Sodom" and "Dead Sea fruits."

Some kinds of ink are made in this way. The galls are first crushed into powder and mixed with finely cut straw. Warm water is then poured over the mixture, and the liquid is drawn off. The tannin in the galls is thus brought out, and left to ferment. The substance exposed to the air is broken up into gallic acid and sugar, and this mixed with salts of iron produces ink.

Did you know that the word "book" comes from the Anglo-Saxon name for the Beech tree?—*box, bece, beoce*—which again is like the German *buchen*—because in very old times tablets of Beech were used for writing upon. Our word "leaves" for the pages of a book

comes from the palm leaves which were made use of in the same way. And "folio," a word for a large volume, is from the Latin *folium*, a leaf.

The Beech has a habit of sending its roots into the surface of the soil and draining it of all its nourishment before trees such as the Oak, which send their roots deeper, can get at the food which they



*Gall Wasp emerging from the Oak Gall, or Oak Apple, in which its larval life was spent.*



*A Beech wood is always a thing of beauty—and every year thousands of people visit the famous Burnham Beeches, relic of an ancient forest in Buckinghamshire.*

need. This seems to be the reason why in a wood where Oak and Beech are planted together, and left untended, the Oaks often die out by degrees, and the Beech trees are left alone in their glory. Grass will not as a rule flourish under a Beech. But on the other hand, its drip destroys weeds, its shade keeps the soil moist, and its heavy crop of leaves, when they fall and decay, makes the soil richer. So that perhaps it deserves the name which has been given it of "Nursing Mother of Forests."

It is rather curious that the Elm tree and the nettle belong to the same family, and you can feel the rough hairs on the midrib of an Elm leaf, very like the hairs of the stinging nettle though they do not sting in the same degree. There are two chief kinds of Elm, the Wych Elm, which is a native of Britain, and the Common or Small-leaved Elm, which as it was brought into England by the Romans may fairly claim to be an English tree! It has smaller

leaves than the Wych Elm, and does not as a rule grow to so great a height.

The bunches of little brownish bell-shaped flowers appear on the branches in March or April, before the leaves, when

“whoever wakes in England  
Sees, some morning, unaware,  
That the lower boughs and the brushwood sheaf  
Round the elm-tree bole are in tiny leaf.”

And you probably know the seeds which lie scattered about the ground in early summer, looking like bumps in the middle of little pieces of thin brown paper. The Elm depends on the wind for scattering both its pollen and its seeds.

The ash has been called the “Venus of the woods,” but I think we might also call it “the Lazy Tree,” for its large leaves are very late in appearing out of the stout black buds, and they fall off early in the autumn. The seeds of the Ash, like those of the Elm, are held in “keys,” or samaras, depending on the wind to scatter them, and each little oblong key, “spinner” as it is sometimes called, has a twist in its sail, which causes it to spin steadily on the wind, and flutter to the ground seed end first.



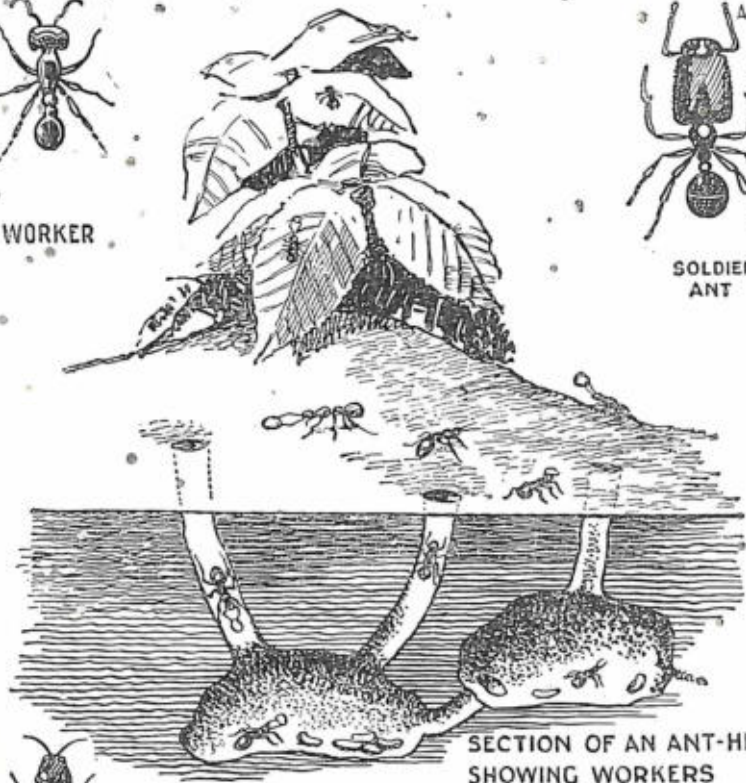
*Above are the fruits of the Oak, Ash, Alder, Lime and Birch. Can you pick them out?*



WORKER



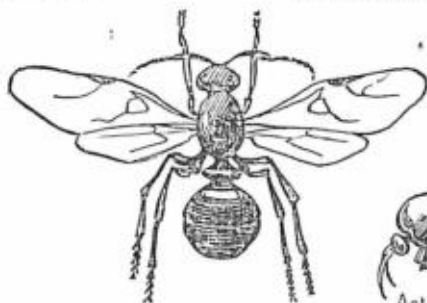
SOLDIER  
ANT



SECTION OF AN ANT-HILL  
SHOWING WORKERS



WINGLESS QUEEN



WINGED FEMALE



MALE

Section of an ant-hill and some of its inhabitants. The Ants are a marvellous race — it is hard to believe that instinct alone can account for their many activities.

## A CROWDED COLONY

*The flush of life may well be seen  
Thrilling back over hills and valleys;  
The cowslip startles in meadows green,  
The buttercup catches the sun in its chalice,  
And there's never a leaf nor a blade too mean  
To be some happy creature's palace.*

LOWELL

THERE is a very large family which has been studied and written about through the ages, from the days of Aristotle, who lived in 300 B.C., to the present time. Naturalists have constantly been finding out new things about the Ants—for that is the family I mean—and who knows but what you may discover something for yourselves which has not yet been found out about them?

All Ants are "social" creatures, that is to say, the different kinds live together in companies in a common nest, and there is no solitary kind of Ant living by itself.

A naturalist called Réaumur, in the seventeenth century, first had the idea of collecting Ants in cases, which he called "pounce boxes" (pounce was a powder used in old days for scattering over paper to dry the ink), that he might study them at leisure. If you care to imitate him, perhaps the best plan is to keep some Ants in a box with glass sides, or a bell glass, with earth at the bottom. Your case should be kept in the dark when you are not wishing to observe your "pets." You should supply them with bits of stick, fir needles, etc., with which to build, and a little honey or other sweet juice for their food. Their mouths are fitted for sucking juices from flowers and fruits.

An Ant hill is the home of the queens, who lay eggs, and who may live for twelve or fifteen years, the "workers," which live from three to six years, and the male Ants, which only live five or six weeks.

The Queen Ant lays a great number of tiny white eggs, and as fast as they are laid the busy workers pick them up and carry them

off to the special room set apart for the eggs. When the little soft white grubs, or "larvæ," are hatched, the Ant nurses take the greatest care of them. They feed them and lick them all over and carry them up to the top of the nest in the day-time so that they may have all the warmth and air possible. When the grubs are fully grown, they spin themselves little silken bags or cocoons, (sometimes wrongly called "Ants' eggs"). In these cocoons they turn into "pupæ" and again the kind nurses take great care of them till the perfect insect is ready to come out. Then the nurses snip open the cocoon with their jaws and set the little prisoners free. They help them to stand on their legs, feed them and show them the way about, till in a few days they are strong enough to look after themselves.

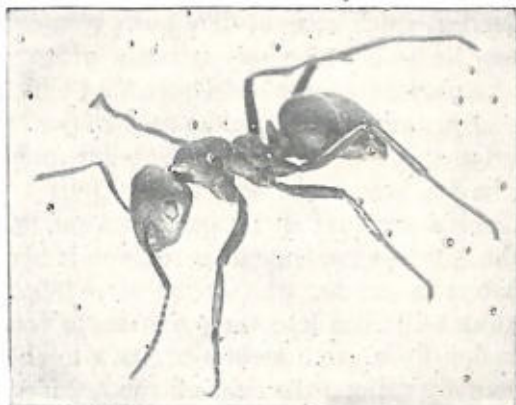


*This little hillock of twigs, straw or pine-needles is the dome of the Ants' nest. The nest itself is mostly underground, where the busy Ants live.*

Sometimes on a still August day you may see thousands of winged Ants flying about in a sort of airy dance. This is their last flight. Some die soon afterwards and the queens go back to their old nest or else start a new one. And then a curious thing happens. The queens no longer need their wings, so the workers snip them off, or else, as often happens, they break them off themselves. They throw them well forward and press the ends against the ground, so snapping them off at the joint.

The workers certainly do work hard! On them depend the upkeep of the

public ways, the cleaning of the nest, the care and cleaning of the eggs and the young: they feed and brush the mothers with the greatest care. They prepare the food, for the grain and bits of leaves or fruit brought into the nest must be chewed and pounded up into mince meat, paste, or broth. They carry a little brush on their first pair of legs with which they are constantly



*The Red Wood Ant makes raids on the nests of other Ant tribes and carries off "slaves."*

combing; brushing and polishing themselves. They are very active and lively, and naturalists who have watched carefully have seen them playing games together, and pretending to fight, but without shooting out the venomous poison with which they attack their enemies in real warfare.

One of the commonest of our English Ants is the Wood Ant, sometimes called the Horse Ant (perhaps because it is larger than some other kinds) or Hill Ant. It makes its round hilly nest of dry leaves and bits of wood or straw or pine needles. The hillock which we see is only the outside envelope of the nest. It reaches far down below the ground, and is full of cleverly-made avenues and passages and rooms and tunnels. All the passages lead to a large room in the middle, higher than the others, standing on pillars of earth. This is a sort of drawing-room where the Ants meet together.

The openings, or gates if we like to call them so, are carefully guarded. If some other insect, say a Wasp—or Ants from another nest—should try to get in, the sentries at the door drive them away, or even kill them. If the sentries cannot manage this by themselves, they rush back into the nest and give the alarm. Then thousands of the rightful inmates march out, like an army of soldiers, to fight and drive off the enemy. Curiously enough, however, there are certain

Beetles which seem to live quite comfortably with the Ants in their nest. Ants are also very friendly with those tiresome little plant lice or Aphides (often called Green Fly) which spoil the roses.

Ants keep these Aphides as if they were cows and "milk" them to get the sweet stuff called honeydew on which the Ants like to feed. The Ant strokes the body of the Aphid with its little antennæ and the Aphid seems to enjoy being stroked and lets out the sweet syrup, which the Ant laps up, and either feeds on it herself, or carries it to the little babies in another part of the nest. The Yellow Ant and some other kinds will even lead their Aphides to fresh pastures. The *Lasius* Ant makes little earth stables or tents to shelter her "cattle." This Ant actually collects the eggs of the Aphides and rears their young with her own babies.

Ants living in the same nest are very good to each other. If an Ant finds some rich food he will often go and call his companions to share it. If an Ant is wounded, the next Ant who finds it will often carry it home carefully in its jaws.

In some parts of England we may see the Red Ant, which is one of the slave-making kinds. It invades the nests of other Ants and carries off their pupæ, and when the pupæ turn into perfect insects they become slaves to their captors.

But they work quite cheerfully for their Red masters, and seem to be devoted to them. Indeed one writer tells a story of some Red Ants which had carried off the cocoons of another kind, called *Pratensis*. Later, the young *Pratensis* slaves were out foraging when they came across their own mother, their former queen, and they led her to their master's nest to take the place of the Red Queen who had just died.

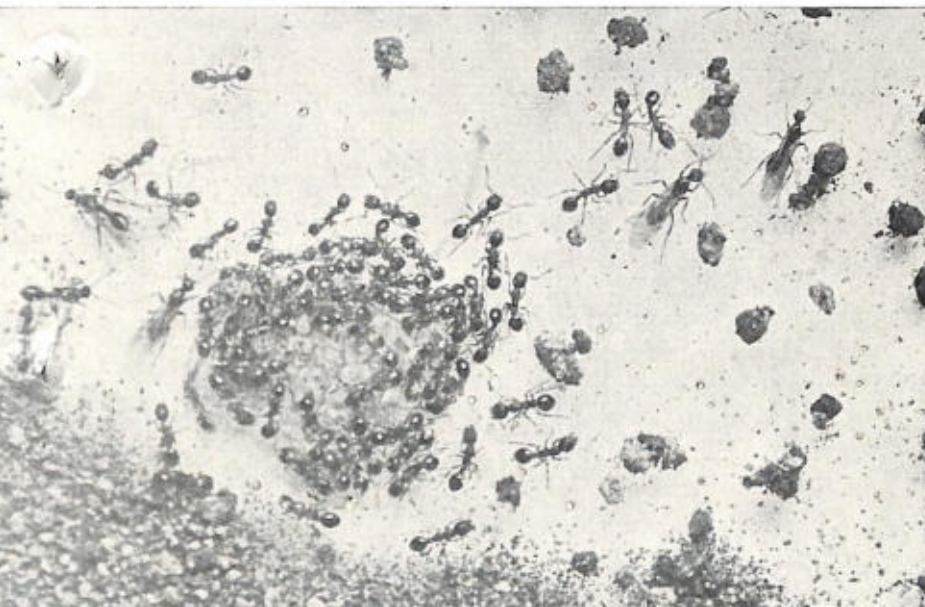
How do Ants talk to each other? Naturalists who have watched very closely are certain that they carry on a conversation by their little feelers, or "antennæ," in the front of their heads, each bent like an elbow. You may see one Ant stop another and tap its friend's feelers with its own feelers. This is its way of talking. Probably they also use their antennæ to feel their way with, as their eyesight is poor.

A famous French naturalist called Huber took an Ant's nest and put it under a bell glass so that he might watch the little people. He

set some of the Ants free, and they settled themselves under a chestnut tree in his garden. Four months later he took the nest under the bell glass into the garden, and a few of the Ants escaped. They met their old friends under the chestnut tree and were greeted with the greatest joy. They caressed each other with their antennæ, they took hold of each other by their jaws as if kissing, and then the whole party went into the nest under the tree. Very soon they came in a crowd to look for the others under the bell glass, and before long these made their escape and the bell glass was empty.

Huber also tells an amusing story of some Ants which he kept in a "formicary" or Ant cage. He had placed the legs of this cage in pans of water, to prevent them from escaping, and as they are very thirsty creatures they lapped the water like dogs. One day he disturbed them at their feast, and most of them fled back to the nest, but a few went on drinking. Upon this one Ant which had returned to the nest came back again to warn his friends. He pushed one with his jaws, hit another on the body and a third on the chest, and so forced these three to go home. But a fourth paid no attention and went on drink-

BELOW: *You may think an Ants' nest looks the picture of confusion! Yet each little creature has his own duty and is going quietly about his business.*



ing. At last the anxious Ant took the greedy one by the legs and gave him a great pull, whereupon the loiterer turned, opened threatening jaws as if in a rage, and coolly returned to his drink. This was more than the well-meaning one could endure. He seized his greedy friend in his jaws and carried him back in triumph to the nest.

• Huber gave up a whole rainy day to watching a "Dusky" Ant. It scooped out a trench in the wet earth about a quarter of an inch deep, kneaded the earth which it had thrown out into little pellets and put the pellets on each side of the trench, making these walls very smooth, so that the trench looked like a tiny railway cutting. Then it found another opening to the nest and sank another path to it, making this new trench run side by side with the first, with a little wall between the two about one-third of an inch high.

If we watch a number of Ants rushing about, we may sometimes think that they seem confused and stupid, as if they did not quite know what to do next, but we shall probably find that they will carry through their purpose in the end. While Bees build their cells and do everything in exactly the same way over and over again by instinct, Ants seem able to think out new plans when necessary, and as one observer puts it, "an idea is not adopted unless it is seen to be a good one."

It is amusing to watch an Ant carrying along a load which is perhaps bigger than itself. It may stumble and fall head over heels and roll down a slope, but it will not give up. It goes back again and again till it has finished the task it set itself to do.

A story is told of the famous Eastern Conqueror Timour, who lived in the sixteenth century. He was once forced to take shelter from his enemies in a ruined building where he sat for some hours sad and discouraged, when he saw an Ant carrying a burden larger than itself—probably a pupa—up a wall. Sixty-nine times the burden fell to the ground and the Ant tried again, and the seventieth time it reached the top of the wall. "This sight," said Timour, "gave me courage, and I have never forgotten the lesson."

• In some countries there are Ants called Leaf Cutter Ants, which bite off fragments of leaves and chew them into a kind of mould or manure on which a fungus will grow to give them a pleasant mushroom dish for supper.



*The Ants in the picture have given themselves a heavy task—to dig a grave for a dead mouse. But they are so clever and industrious that it will not take them long.*

In the tropics there are Ants which we might call farmers, for they surround their nest with a kind of little field in which grows a grass called Needle Grass. They are very fond of the seeds of this grass, and store it up in their granaries. If there is a great deal of rain, and the grains begin to sprout, the Ants carry them into the sun, on fine days, in order to dry them. It is uncertain whether they actually grow this grass, as some think, but it is certain that they deliberately grow and store the seeds, and somehow get rid of all other traces of vegetation.

In short, as one writer has said, Ants build granaries and galleries, storehouses, communal chambers, mushroom nurseries, stables and cellars.

You may have read about the Termites or so-called White Ants, which build enormous nests and do much damage in Africa and elsewhere, undermining houses and swarming over the owner's property. These are not true Ants, but belong to the same family as the Dragon Flies and other lace-winged insects.



*What happens when the Bees swarm? The Queen leaves the hive with her followers, who, when she alights, hang round her in a dense cluster. Here the cluster has divided.*

## A POPULOUS QUEENDOM

*He will watch from dawn to gloom  
The lake-reflected sun illumine  
The yellow bees in the ivy-bloom.*

SHELLEY

WE have thought a good deal about a large colony of Ants—queens, males and workers—and have seen a little of what they do. Now let us think about a Queendom, if we may call it so, a kingdom with a Queen, not a King, and it also has males called drones, and workers. But unlike the Ants, these workers have wings. You will have guessed that I am thinking of a beehive.

In the songs of ancient bards and Druids, Britain was called the Isle of Honey, for its forests were full of wild Bees, and in Anglo-Saxon times and long afterwards mead, a drink made by boiling a drained honeycomb, was largely drunk in England.

We all know that "the little busy Bee" deserves to be called busy, and that a beehive is a very busy place. If we could watch all the Bees and see what they are doing, we should see that each kind has its own special work. Some of the workers fly off into the gardens or fields on a fine summer day. When the worker has found a flower which pleases her, she sends her long tongue down into it, and sucks in the nectar, as the sweet juice in the flower is called. The nectar passes down her throat into her honey bag, where it turns into honey which she carries back to the hive. She will get her little hairy body covered with pollen dust, and she combs the pollen out of her hairs with some stiff bristles like a brush and comb which she carries on her legs. She moistens the pollen with her tongue, and kneads it into a ball, and packs it away in a hollow in her hind legs which is called her bread-basket.

When the workers have carried honey back to the hive, some of it has to be turned into wax for building their honeycombs. This is

done in a very curious way. A couple of Bees place themselves at a little distance from each other and cling to the roof of the hive by their fore feet. Another Bee comes and with its fore claws clings to the hind claws of the first one, and so they continue till two hanging chains of Bees are formed. Then the two bottom Bees make the two chains swing backwards and forwards till they can hook their hinder feet together, to form a hanging festoon. They hang in this way for about twenty-four hours, and during that time the honey in their honey bags is being slowly turned into wax. Thin plates of wax come out from their bodies and the Bees work this up with their jaws till it is fit to be used for building their cells.

A great deal of honey is used up in making a small quantity of wax, and the careful building Bees do not waste any, but build it into six-sided cells. People who understand mathematics and different measurements tell us that these rows of six-sided cells are built up in such a way that the greatest quantity of contents shall go into the smallest possible building material.

BELOW: *The Queen Bee, central figure of the hive, surrounded by her attendants. She is fed and cared for, and except for laying eggs has nothing at all to do.*



But what is the Queen Bee doing meanwhile? She does not go out to suck the flowers, and she does not build. Her work is to lay eggs, and she does this very busily, laying one egg in each little cell which the workers have got ready for her, and in summer-time she may lay as many as two or three thousand eggs in a day.

A crowd of worker Bees act as maids of honour, going about with her and constantly feeding her from a store of honey kept in some of the cells which are used as store-rooms.

The tiny baby Bees are fat white grubs, which cannot look after themselves as caterpillars can. They are fed and tended by the nurse Bees, who feed them at first on a sweet white juice called

Bee milk, and later on with Bee bread, which is honey and pollen mixed. After a little time the nurses give them no more food, and they spin themselves little silken hammocks in which they go to sleep and change into "pupæ." In three weeks' time they have grown their wings and come out as perfect Bees.

Two or three of the nursery cells are larger than the others, and shaped rather like thimbles. These are the royal cells, containing the eggs out of which the little princesses will be hatched. One of these will be a Queen Bee. The nurses feed these little grubs with specially prepared "royal jelly" till they grow bigger and fatter than the worker babies. Now curiously enough, when the little princesses have grown large enough to leave their cells, after waking from their pupæ sleep, they begin to make a shrill piping cry. When the Queen hears this sound she becomes furiously jealous, and rushes to the cells trying



*Section of a honeycomb, much enlarged so that you can see the little white grubs (baby Bees) curled up asleep in their cells.*

to tear them open, and ready to sting the little Bees to death! But when she tries to get to the cells the workers often gather round her and stop the way. When the little princesses try to get out, the Bees plaster up the cells again with fresh wax and so keep them safe.

If the hive is very much crowded, a curious scene follows. The Queen rushes about the hive and all the other Bees become excited too. The workers dash to the store-room and fill their bags with honey, and at last they rush out of the hive with the Queen in the middle. If you are near the hive you may hear a cry, "The Bees are swarming," and you will find yourself in the midst of a great black shower of bees, drunk with honey, and all buzzing as loudly as they can.

Presently the Queen will begin to fly upwards and all her subjects with her. Wherever she settles, on a branch of a tree or elsewhere, they will follow, and hang down in a great black cluster. If a bee-keeper has followed with his "skep," he will shake the branch, and the Bees will fall into it and he will take them to a new hive. But if there is no ready-made hive at hand, some of the Bees will go out as scouts to find a fresh lodging, and when this is found the Queen and her swarm will fly off and start their new home.

Then the Bees will set to work to build a new city. The workers will turn the honey they have brought with them into wax, and build up the honeycombs, some for the Queen to lay her eggs in, and some as store-houses for the honey and pollen which are wanted as food.

Meanwhile the old hive has not been left quite empty. Some workers and drones have stayed behind, and they will want a new Queen. So they break open the cell where the oldest princess was kept a prisoner and set her free to be their Queen. Sad to say, she will kill all the other little princesses with a quick stab of her long curved sting, and so be left free to reign alone!

When winter comes the poor drones will be killed too, for they will be turned out of the hive and left to die.

Besides the Hive or Honey Bees there are many other kinds, among which we may number about 18 different sorts of British Humble or Bumble Bees, and many foreign Bees. Our commonest bumbles are the Earth Bumble Bee and the Stone Bumble Bee. The Earth Bumble Bee is chiefly yellow and yellowish grey in colour; the Stone is a big

black and red hairy creature, the "red-hipped Humble Bee" of Shakespeare, who mentions him several times in his plays.

In early spring the Queen Earth Bumble Bee chooses a deserted mouse hole or a hollow in the ground for her nest. The Stone Bumble may find a cosy niche in a heap of stones. She stores some moss in the hole and under the moss places her wax cell, wax outside and pollen soaked in honey inside.

In this cell she lays some eggs, and closes up the top with wax. She goes on for a time making more cells and laying more eggs. Then the little grubs hatch out from the eggs first laid, and the mother punctures a hole in the cap of the cell and feeds them. Later the larvæ spin themselves silken cocoons, and at last out come the worker Bees. These young workers now set to work to build cells, and feed the larvæ, and store up honey and pollen. The Queen does no more than lay eggs, till at length there may be as many as 400 Bees in the nest.



*What do you think this is?—The much enlarged head of a Humble Bee, showing pollen masses which it has gathered from a flower.*

Emerson calls this Bee "burly dozing Humble Bee," but though he certainly murmurs in a "drowsy tune" on a hot summer day, the worker is far from spending his life dozing. He begins his work about three in the morning of a fine day in summer, and it is said that each nest has a trumpeter who wakes the inmates in good time in the morning.

Many people think that Bumbles have no stings. But this is only because those we see flying about from flower to flower are generally males, which cannot sting; but the females, have large stings, and many of the underground builders, especially the Stone Humble Bees, are very fierce, as you would find if you tried to disturb their nests.

The Wool Carder Humble Bee has a curious way of building her nest. She does not build under the ground, but on it, choosing some

spot where there is a slight hollow. She collects soft material, moss if she can find it, but if not, leaves or grass, fern fronds, etc. One instance has been noticed where some Carders collected bits of horse-hair from a stable, made them into little bundles, and flew off with them to use for nest building.

• Then she draws the material through her legs, carding the fibres much as wool is carded, and with it she builds a little roof or dome as a covering for her eggs and nest. She lines the dome with coarse dark-coloured wax to make it waterproof. The entrance to the nest is at the bottom, and generally through a sort of tunnel.

These Bees are called Social Bees, because, like the Ants, they live

together in colonies. There are others which are called Solitary Bees because they live by themselves. Among these some of the most curious are the Leaf Cutter Bees, of which we have eight British kinds. They are like fat Honey Bees with wide heads. Some nest in old earth-worm burrows, some bore tunnels in rotten wood. Their nests, or cells, are made like thimbles, and when the Bee has made her cell she flies off to a bush or tree—often a rose or a laburnum—and like a little tailor she snips a piece out of a leaf with which to line her nest. She holds on to the edge of the leaf with her feet and cuts out the piece with her jaws, and by some wonderful instinct she knows, without measuring, how to cut out the exact size to fit the cell. In each cell she lays an egg, and places a little cake of honey and pollen for the baby when it comes out.



*The Leaf Cutter Bee tunnels her nest in rotten wood, and lines it delicately with rose or laburnum leaves.*

Other interesting solitary Bees belong to a family of short stoutly-built Bees called *Osmia*. Many use empty snail shells for their nesting, and others are fond of bramble stems from which they hollow out the pith; some may choose a cave in a decayed tree trunk, and some make use of an old nest of a Mason Bee. In these shelters they make their cells. They lay an egg in each cell, to a number round about fifteen, putting a little provision of honey and pollen in each cell, and plugging up each with a tiny wall, which seems to be made out of a crushed leaf with perhaps a little clay added. Then they fly away, and it is curious to think that the mother Bee never sees her larvæ, and the larvæ never see their mother.

The French naturalist Fabre studied the *Osmiæ* very carefully, preparing a quantity of reeds and also glass tubes and paper tubes for them to nest in. He collected a quantity of cocoons, and when the Bees came out he found that they took to these new building sites very kindly. "All, from first to last," he wrote, "are occupied. The *Osmiæ* quarrel for the possession of these crystal palaces hitherto unknown to the race. The reeds and paper tubes likewise do wonderfully . . . the late-comers, finding nothing else free, go and settle in the locks of my table-drawers." It is to be hoped that for the sake of M. Fabre's household the Bees kept to his room and did not fly about the house!

Amongst other curious facts, M. Fabre found out that if an *Osmia* Bee had come out of its cocoon and found that its way out of the cell was blocked by the cocoon of another kind of Bee, it would burst through the strange cocoon and kill the grub inside it. But if its way was blocked by a cocoon of the same kind of Bee, it would wait patiently till that cocoon had burst and the way was clear, and would die rather than hurt its brother.

Our smallest British Bee belongs to the family *Halictus*, and I suppose we might call the *Halictus* half-social and half-solitary, as several families lay their eggs in the same burrow. Each has her own side gallery, but the front door is open to all, and there is a sentinel placed in a small recess behind the door, so that the burrow is rather like a flat where different families have separate floors, but all use the same front door with its door-keeper.

When talking about the little busy Bee, we must not quite forget the



A "close-up" of the Worker Wasp. Her duty is to feed the grubs and help to build the nest.

little busy Wasp, though we may not like him so much. If you have a chance of looking at a wasp's nest without too much danger of being stung, you will find that it is a paper house, with roof, pillars and rooms all complete. For Mother Wasp's nest is not like the Bees' nest; it is made of paper, not wax.

She gets little strips of wood from a tree stump or wooden fence, and chews them into

pulp with a kind of glue from her mouth. With this pulp she builds a little pillar and hangs a roof over it, and under this umbrella she builds paper cells and lays her first eggs. Then she goes on building her nest, always from the top downwards. When her first children are grown up they help her with the building, and with feeding the younger children. A single female Wasp may have a great number of great-great-grandchildren, sometimes, it is said, sixty thousand in one summer!

The cells open downwards, the baby Wasps hang from the ceiling, and the Wasp nurses feed them from below. They do not only feed on honey and pollen, or on stolen jam or fruit. They also hunt for Flies and other insects: even big Butterflies may fall victims. When winter comes most of the Wasps die. Only one or two Queen Wasps lie hidden away in some warm corner, where they sleep the winter through.

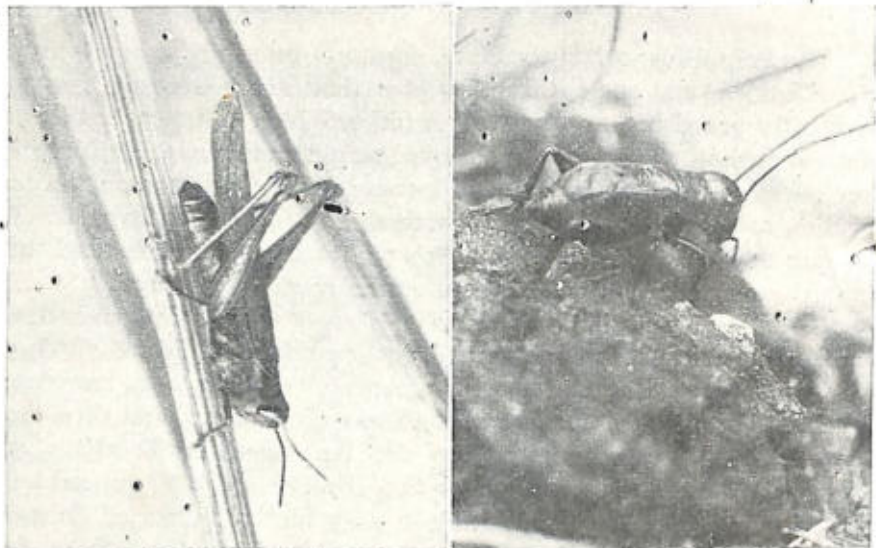
The largest British Wasp, the dreaded Hornet, generally builds her nest in a hollow tree or under thatch. Sometimes if the hollow in the tree gives enough shelter she will not trouble to build any paper walls but will just make her cells in the bark as it stands.

The Pompilius, a Digger Wasp, common on sandy ground, preys upon Spiders, and one naturalist tells us that he has seen two females evidently practising a fight with a large Spider. They settled down face to face on a patch of sand, moved round and round, leaning first on one side, then on the other, lashing around with their flexible bodies, as though giving a stab with their sting. They have always to face the Spider, for, as the Spider's poison fangs are at its head end, any danger which threatens them comes from that quarter.

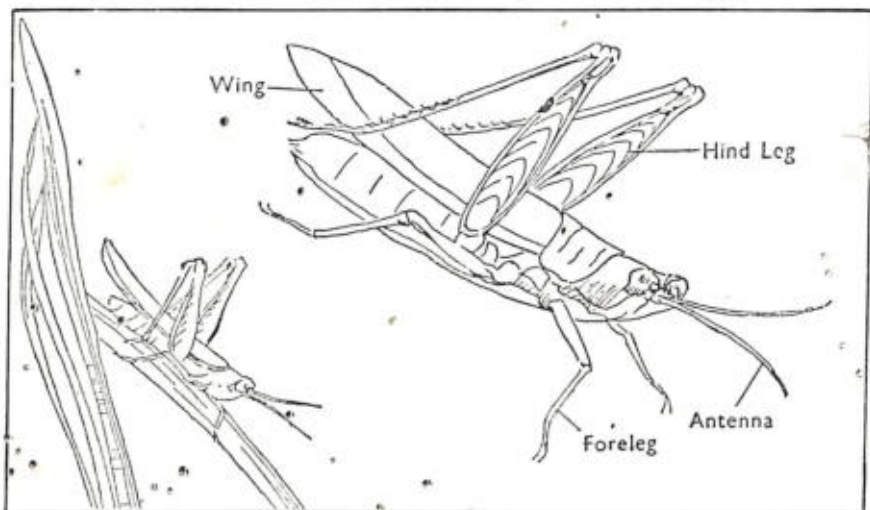
There are several kinds of "Solitary Wasps," which build their nests in tunnels which they burrow in banks or sandpits or old wells. These Wasps pounce on Flies, Caterpillars, Ants, or other insects, and sting them—not to death, but just enough to stupefy them, and then they carry them off to their nests. Here they bury them in the cells where they are going to lay their eggs, so that the little baby Wasps find food ready when they are hatched. You may find numbers of Solitary Wasps working side by side, but each attends to her own affairs, and takes no part in the doings of her neighbour.

BELOW: *A Wasp's nest is made of paper, which the industrious wasps themselves manufacture from wood pulp. Perhaps it was they who first taught us the art of paper-making. Here is a nest opened to show the grubs still in their cells.*





(Left) The Grasshopper, whose merry "song" is produced by his wings and his hind legs; and (right) the big black Field Cricket, who makes his home in logs and under stones. He lives alone, and only comes out at night.



The drawing above shows you the mechanism of the Grasshopper's music. Really he plays on his wings as on a fiddle, with his toothed hind legs for a bow.

## A MUSICAL BOX

*Sunburnt merry cicadas aloft on the shadowy branches  
 Shrilled their ceaseless song; and afar in the bushes of bramble  
 Gaily the tree-frogs chirped, and the crested larks and the finches  
 Sang, and the turtle moaned, and over a flashing water  
 Darted golden bees; all things smelt richly of summer.*

THEOCRITUS. Tr. HOLLAND

THERE are many different ways of singing, calling, whistling and chirping. Some creatures sing with their wings and their legs! They belong to a very old family called the Straight Winged (Orthoptera). A fossil wing of one which sang thousands—perhaps millions—of years ago was found lately in a rock in South America. Have you guessed that I mean the Grasshoppers and Crickets?

These insects have very long legs and can jump long distances, as you will know if you have ever tried to catch one. They do not chirp with their mouths; they make their shrilling noise by rubbing their upper wings together. These wings have very strong ribs or nervures, and they are arched. The right upper wing has a row of notches like those in a file, and when the two wings play upon each other, the notched side rubs against the strong vein in the left wing, and causes the zic-zic-zic sound. There is also a spot at the base of the wings like a shiny piece of talc, which naturalists call the "mirror," and this seems to act as a sounding board. The Greek name for Crickets, *Acheta*, by the way, means "shrill sounding," and for Grasshoppers, *Gryllus*, "a murmurer."

Some members of the Grasshopper family have knobs on the under-side of their long hind legs, and when they draw their legs along the sharp edges of their wing cases, as if they were drawing a bow across a fiddle, they scrape out music with their wings and legs. In the case of almost all members of the family, it is only the gentlemen who are the music-makers; the ladies are silent, no doubt admiring their husbands' performances. An old writer tells of a lady who tried in

vain to get rid of some noisy Crickets out of her house; one day she hired a band, with drums and trumpets, to entertain her guests at a wedding. The Crickets evidently could not endure such rivals, for they were never heard again.

But have they ears with which to hear the music? And can they hear their own voices? Well, Grasshoppers, Crickets, and some Locusts have a curious little drum just above the place where the hind leg joins the chest, and this is supposed to be a kind of ear. An experiment has been tried of putting some male Crickets near a telephone in one room and some females near a receiver in a distant room. When the gentlemen began to chirp the ladies crowded to the receiver to listen!

And have they teeth? A naturalist who managed to dissect with great care a dead specimen of a Great Green Grasshopper found—not in its mouth but in its body—a number of narrow bands, and looking at one through a microscope he found it was made up of very small teeth, just fitted for chewing morsels of the leaves cut off by the jaws. If you put your finger in the way of a Great Green Grasshopper's jaws you will soon find out that it can bite!

All the Grasshoppers and Crickets have very long "horns" (antennæ). The female has a long ovipositor, or egg layer, shaped like a sword, with several blades neatly folded together when not in use. With this sabre she can pierce the soil and shoot out the eggs into the place which she has prepared for them. The Cricket's eggs are wonderful little white cases with lids. When the right moment comes the lid drops on one side, and the tiny Cricket larva pops out like a Jack-in-the-Box.

The House Cricket, or "Cricket on the Hearth," does not seem to be so common now as was once the case. The Field Cricket is stronger and burlier than his domestic relation. Apparently he is somewhat of a hermit, and likes to live alone in the hole he has burrowed for himself in a bank, only meeting his friends at night. If you want to get him out of his burrow you should push a long grass stem into the hole. He will be very cross at being disturbed, and will seize the grass in his jaws and hold on so firmly that you will be able to draw him out before he loosens his hold. This has given rise to the French proverb, "plus sot qu'un grillon," a greater fool than a Cricket.



*The Mole Cricket is the "Moudiewarp" of the insect world—wearing a velvet coat, digging with his useful little "hands" and living for the most part underground.*

The Great Green Grasshopper will devour cheerfully his Cricket relations if he gets the chance, and Crickets are very quarrelsome, and will fight and even kill each other if kept in captivity. The House Cricket is said to have come from Africa.

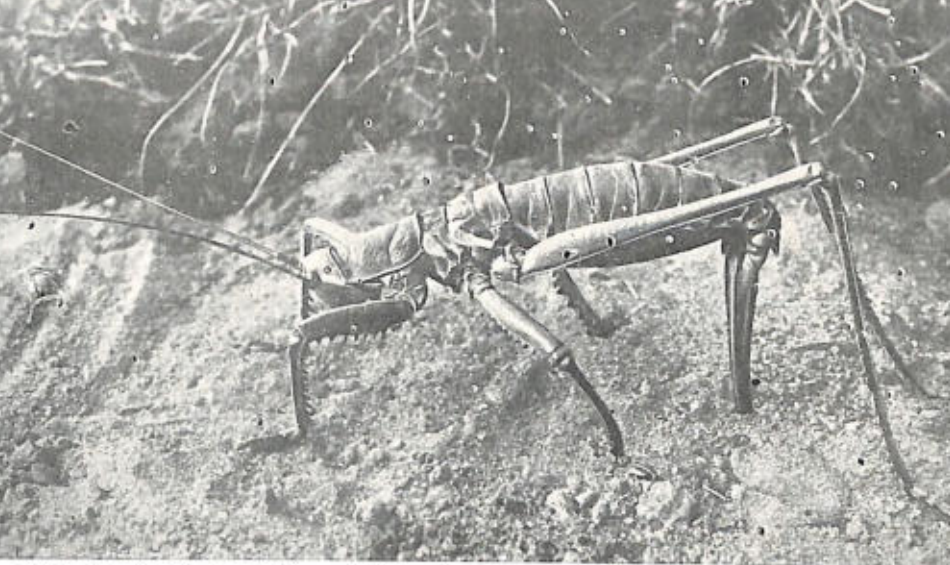
One of the oddest-looking members of the family is the Mole Cricket, quite common in many parts of Europe, but very rare in England. It is a large and sturdy insect, and is well named, as it is very much like a Mole in some ways. It has a soft reddish-brown velvety coat, and its front pair of legs are very large compared with the others, ending in two little hands with long sharp claws, exactly fitted for digging. Like the Mole, it passes most of its life underground, in the tunnels and little cave which it digs out for itself, and here the Mother Mole Cricket lays her eggs. She sometimes lays as many as 400, of a dusky yellow colour, and the roof of the nursery is made so near the surface of the earth that the warmth of the sun can pass through and hatch them.

Like the Mole, too, it is very quarrelsome, and it is like the Field Crickets in being always ready to fight with other male Crickets, and to tear them in pieces and eat them if it is the conqueror. And like the Mole again, it is very greedy. It seems to like vegetable food best, but it is quite ready to eat raw meat if this is offered. The Mole Cricket does not chirp, but its notes are loud, slow and harsh, repeated over and over again, not unlike the cry of an Owl or a Nightjar. In some parts it is called the Chur worm, Eve Chur, or Croaker.

A wicked member of the Grasshopper family is the Locust. There are several kinds of Locusts, but the kind which you may have read about in the Bible and in books of travel is the dreaded Migratory Locust. Fortunately it is hardly ever seen in England, though just occasionally a few have appeared for a short time in our country. In an old book of British Insects there is a coloured plate of a fine specimen of a Migratory Locust, caught and sent to the author from Warwickshire in 1799. About fifty years before that time plagues of Locusts appeared in various parts of Europe. In 1749 Locusts stopped the army

BELOW: *A kind of foliage you will not see in any Botanic Gardens! The "leaves" are locusts, hanging thickly on the branches until the real leafage is eaten up.*





*With her sharp, sword-like ovipositor the Horse-headed Locust digs a hole for her eggs. Her face is oddly like that of a horse—only, of course, in miniature.*

of Charles XII., King of Sweden, as it was retreating after a defeat at Pultowa, a host of them beating against men and horses like a living hailstorm.

But it is chiefly in Asia and Africa that these insects do such terrible damage. Here they will appear in great armies devouring every plant on which they settle, even eating up linen, blankets, and tobacco. The rustling of their wings is like the roaring of the sea, and when the horde comes flying over, the land and sky are darkened as if with a thundercloud. Then when they have caused a famine by devouring the crops, they die in thousands and their dead bodies poison the air, and disease may follow. In fact, there is nothing to be said in their favour, except that many of the natives are quite ready to roast or fry and eat them. If fried with butter and salt they are said to have a pleasant flavour rather like grilled crab. On an old Nineveh sculpture men are shown carrying to a great feast Locusts, tied on to long sticks, as onions are tied on a string.

You may remember a description of the coming of Locusts in the Bible, where the prophet Joel says, "The land is as the Garden of Eden before them, and behind them a desolate wilderness; yea, and nothing

shall escape them; the appearance of them is as the appearance of horses" (a Locust's face is oddly like the face of a miniature horse) "and as horsemen so shall they run. Like chariots on the tops of mountains shall they leap, like the noise of a flame of fire that devoureth the stubble, as a strong people set in battle array—they shall march every one in his ways, and they shall not break their ranks, they shall walk every one on his path." These last words exactly describe the herds of young or "larval" Locusts which in some countries crawl over the ground before their wings are grown, and in South Africa are known as "voet gangers" or "foot-goers." If these young Locusts want to cross a river they will form a bridge of their own bodies, holding on to each other, and those who are behind will push forward eagerly over the bodies of those in front.

Have you read an American story, *What Katy Did?* It begins by telling of some little Locusts which live in North America, and which are called Katydids, for ever calling out the same note from the tops of trees. It sounds like "Katy did, oh, she did, Katy did, she did."

Some very disagreeable and much too common members of the Straight Winged family are Cockroaches, wrongly named Black Beetles. I do not think that we need say much about them, except to remark that their eggs are laid in a very curious way in a sort of egg case or egg purse. The case is a horny covering with sixteen little cells inside it, eight in each half of the case, and in these cells the eggs lie side by side like peas in a pod.

A strange relative of the Locusts, not found in England, is the Praying Mantis, so-called because of his habit of sitting on shrubs for hours together without moving, holding up his long front legs together as if in prayer. Many legends were told about him in old days. A naturalist who lived in the seventeenth century wrote, "This little creature is considered of so divine a nature that to a child who asks it the way it points it out by stretching out one of its legs, and it rarely or never makes a mistake!"

But alas, the Mantis's real reason for holding up his claws in this way is to catch some imprudent Fly, Locust or Spider who comes too near, when, quick as lightning, he seizes it between his legs, which are armed with sharp spines crossing each other, carries it to his

mouth and eats it up. If he wishes to catch a very big insect he begins by terrifying it. He stands upon his four hind legs and opens out his two front legs wide, showing little rows of beads beneath them, black spots with a white dot in the middle, and he spreads out his wings like sails, for he has wings though he does not fly. All this is evidently meant to paralyse the victim with fear, and the poor Grasshopper or Locust just stands stupidly where he is, or even draws slowly nearer as if unable to help himself.

The Mantis has a wonderful appetite. Here is one naturalist's quaintly-worded note: "One Sunday a Green Mantis ate three Grasshoppers each seven-eighth of an inch long, a daddy-longlegs, and then tackled another Mantis, and I was obliged to interfere with them."

As with some other Orthoptera, including Earwigs, they have very pretty hind wings with bright colours, folded away under thick leathery wing cases.

Leaf Insects, which look exactly like the leaves on which they live, and Stick Insects looking just like dried sticks, are members of the family. They are not found in England, but Stick Insects can be bought at naturalists' shops and are quite easy to keep.

BELOW: *You have heard of the Praying Mantis? He is not praying, but preying, on the poor Locust or Grasshopper for whom he stretches his cruel claws! His appetite is difficult to satisfy, and his prey includes Flies and Spiders.*





ABOVE: *The Pheasant on her nest, so well suited to her environment that she is hardly visible in spite of her handsome colouring.* BELOW: *The Red Grouse, plentiful on the high moors of England and Scotland, but not to be found elsewhere.*



SCREECHERS, CACKLERS AND  
GOBBLERS.

*The cock with lively din  
Scatters the tear of darkness thin,  
And to the stack, or the barn door,  
Stoutly struts his dames before.*

MILTON

WE have been talking about Ostriches and Emus. Shall we think now about some birds of a very different sort, which live in our own land, and which we can group together as cousins? I mean, Game Birds, Peacocks and Poultry.

It is not known when Pheasants were first brought into our Islands, but it is thought that they may have been introduced by the Crusaders. Their original home seems to have been on the shores of the Black Sea, and it is said that the Athenians were in the habit of breeding them, both on account of their beauty and also as delicious food. It is thought that the English who had been to the Crusades learnt from the East the custom of sending up a Pheasant to the table with its head and tail feathers still upon it, a custom which till that time had only been observed in the case of a roast Peacock. In hotels in the South of France and Italy I have seen this custom still kept up on great days, such as Christmas Day, when a roast Pheasant with head and tail feathers showing is solemnly carried round the dining-room before being carved and served to the guests. A famous writer on birds, Willughby, in the seventeenth century, wrote that the flesh of Pheasants "caught by hawking" was better and of a higher flavour than when it was "taken in snares."

Pheasants enjoy thick woods near water, where they can find plenty of shelter among furze bushes, brambles, tall reeds and rushes, for they live chiefly on the ground, though in winter they roost on the lower boughs of trees.

Some splendid foreign Pheasants are Reeves' Pheasant and the Golden Pheasant, and Silver Pheasant, all natives of China.

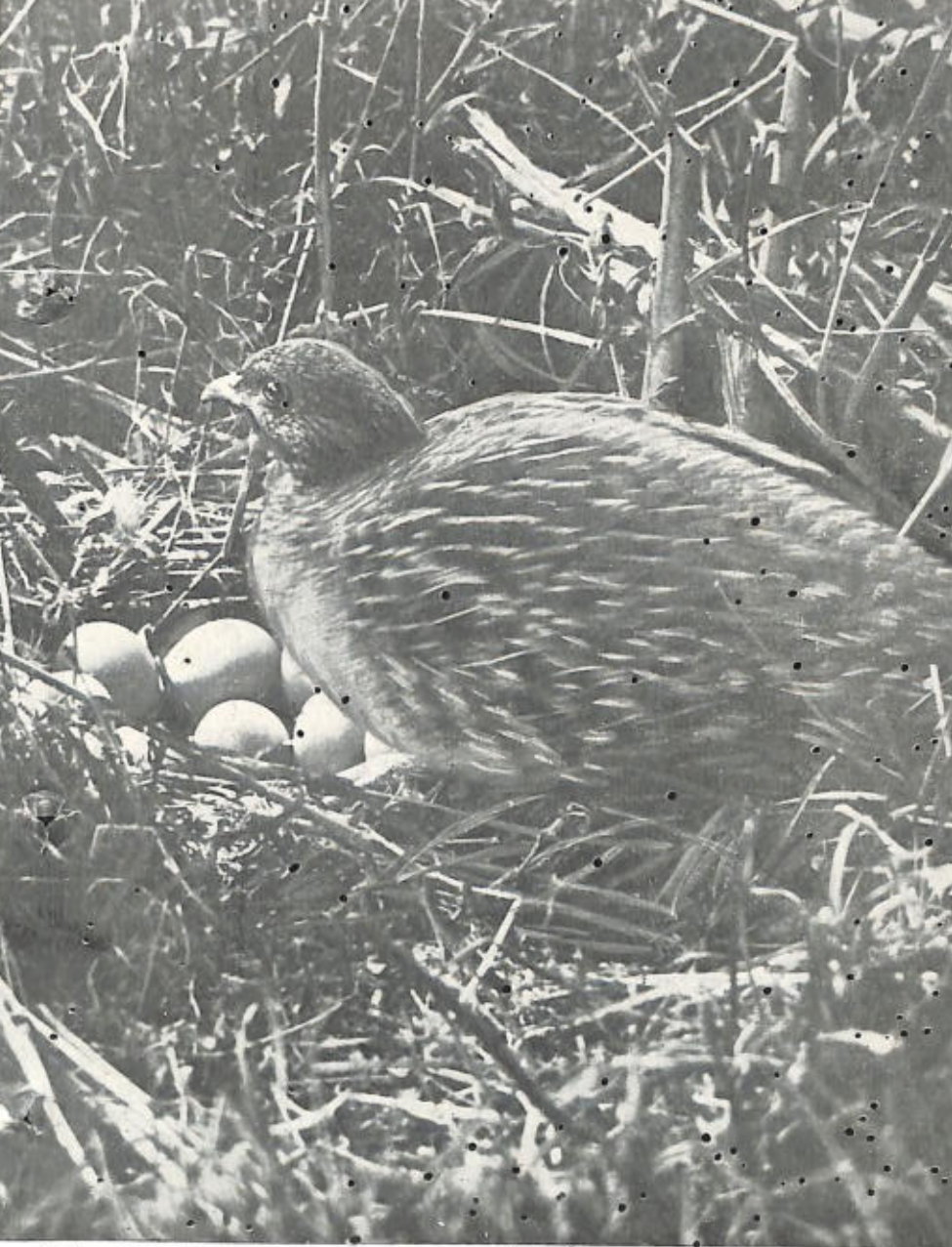
While Pheasants prefer woods, Partridges like to live and nest in fields, and if you are walking across a field in autumn or winter you may be startled by the sudden rising of a covey of Partridges, or in the spring-time you may disturb a pair. Mrs. Partridge begins to lay about the end of April or beginning of May, her nest a simple depression in the ground lined with dried grass and dead leaves. Both parents are brave in defending their nests and young. Nothing will make the sitting bird leave her nest, and sometimes she has allowed herself to be lifted up by the hand. Cases are on record of the Mother Partridge carrying away her eggs to a place of safety, probably helped by the cock bird. Twenty-one eggs have been carried away to a distance of forty yards in about twenty minutes.

The baby birds are strong on their legs and run about as soon as they are hatched. The mother takes them perhaps to an ant-hill or to some caterpillar-infested spot and teaches them how to hunt for food, and she scratches away the soil with her claws to set them a good example.

But, we must go to the moors among the heather if we want to see another game bird, the Grouse. The Red Grouse is altogether British and not found in any other country. The Ryper of Norway is very like it, and has the same sort of call—"Go back, go back, go back; ut ut ut!"—but the Ryper has white bars on his wings in summer, and turns white in winter.

A near relation of the Grouse is the Ptarmigan, which is found on the higher slopes in Scotland. Like the Ryper, the Ptarmigan turns white in the winter, and has been seen to plunge into the snow when hunted by a hawk and escape under the white covering. Many of the birds which are sold at the poulterers as Ptarmigan are really Rypers ("Willow Grouse") from Scandinavia.

The Red Grouse has also a very handsome cousin called the Black Grouse, or Black Cock, as the male bird is named, while his lady is the Grey Hen. The cocks are great fighters in the spring and autumn. Five or six will meet together, strutting and crowing with a curious note rather like that of a Wood Pigeon, varied by a harsh grating cry like the noise made by whetting a scythe. They beat their wings, and twist and turn about, and then engage in fierce battles. The Grey



*Mother Partridge makes her nest among the heather, or even in an open field, in a slight depression of the ground. She is very brave in defence of her eggs and her young.*

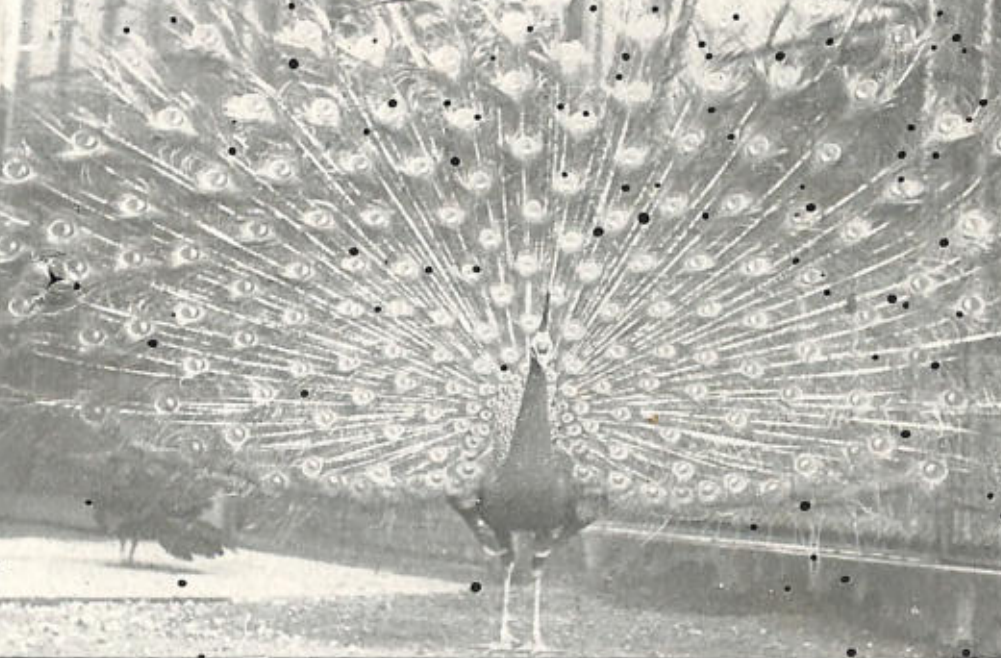
Hens meanwhile look on and admire, as fair ladies were wont to do in old days when their knights fought in tournaments. Apparently very little harm is done.

Another very fine but rather rare game bird—rare, at any rate, in Britain—is the Capercailzie, or Cock of the Woods. Hundreds of years ago they were quite common in pine woods, but after a time they nearly died out. Then about 100 years ago they were reintroduced from the pine forests of Sweden and Norway, and are still to be seen sometimes in fir woods in Scotland. The gentleman is famous for his habit of serenading the ladies. He stretches out his neck, raises his tail and spreads it out like a fan, ruffles up his feathers like an angry turkey cock, and begins his song, or “play” as it is called. “Peller, peller, peller!” he cries, slowly at first, then faster and faster, till he ends with a sort of gulp. The ladies assemble to listen, and answer by croaking, “Gock gock!” His flesh is not of much account for eating, as the pine shoots on which he feeds give it rather a flavour of turpentine.

I dare say you may have seen and admired a magnificent Peacock in a park or garden. And he seems to like you to admire him, for he

BELOW: *The Capercailzie, or Cock of the Woods, a fine large game bird only rarely seen in Britain. He feeds on pine shoots, which give his flesh a flavour of turpentine.*





*Fine feathers make a very fine bird of the Javanese Peacock! His tall crest—his rich train with its dozens of "eyes"—are surely the perfection of ornament.*

will spread out his great train and turn round and round so that you may have a good view of its splendours. Peafowl are natives of India, China, and other parts of the East, the Javanese Peacock being specially resplendent. Peacock shooting is an ordinary sport in India, and though it is rather sad to think of such beautiful birds being shot, they are certainly mischievous as they feed in great flocks in the corn and mustard fields, and also when roasted they are very good to eat. They roost in trees, and they are very thirsty birds, and will only stay in places where they can find water to drink.

Shall we look in on the poultry yard? What a noise to be sure? Do you hear Mr. Turkey's gobble? His native home is America, where he is nicknamed Bubbling Jock, or by the Cherokees, Oococoo. Here in their tame state the young Turkeys are difficult to rear, very delicate, and so stupid that they hardly know how to forage for themselves. If they are left out in the rain, or in a cold, draughty place, they may die. But if they survive to be about eight weeks old they become hardy enough.

These Guinea Fowl, looking as if they were dressed in half-mourning, and calling out "Come back, come back!" as persistently as the grouse cry "Go back, go back!" are rather like Turkeys in their ways. They are quarrelsome birds, pecking at the other fowls with their hard beaks. Their babies are pretty little brown chicks, beautifully striped, with orange red beaks and legs.

Here is the good little plump Dorking Hen, who has just laid an egg and wants all the world to know it, so is proclaiming it at the top of her voice. The handsome Game Cock is also crowing as loudly as he can.

You might notice the shape of their wings. They are rounded instead of being long and pointed, like the wings of birds which fly fast and far such as Seagulls. Mr. and Mrs. Barn Door Fowl do not want to fly far, though, of course, they *can* fly, and sometimes they will get up into trees to roost. But their flight is rather slow and clumsy. Certainly the long beautiful drooping feathers in Mr. Game Cock's tail would be very much in the way if he wanted to take a long flight.

If you talk to some one who understands poultry-keeping you may be told that a feed of wheat and maize is very good for them. Insects, fruit, green stuff are all good. You will also hear that they ought to have plenty of gravel and small stones to swallow. This sounds odd, but the reason is that this "grit" helps them to grind up the grain and any hard seeds on which they are feeding. In a fowl's gizzard—which is a kind of extra stomach—there are two tough, rough pads which take the place of teeth and grind hard food to a pulp; and the gravel and small stones help with the grinding and make the bird better able to digest its food.

These pert little Bantams are quarrelsome people, and a Bantam Cock is quite ready to fight a great Cochin China Cock much bigger than himself. But though they are amusing playthings, they are not of very much use to a poultry-keeper.

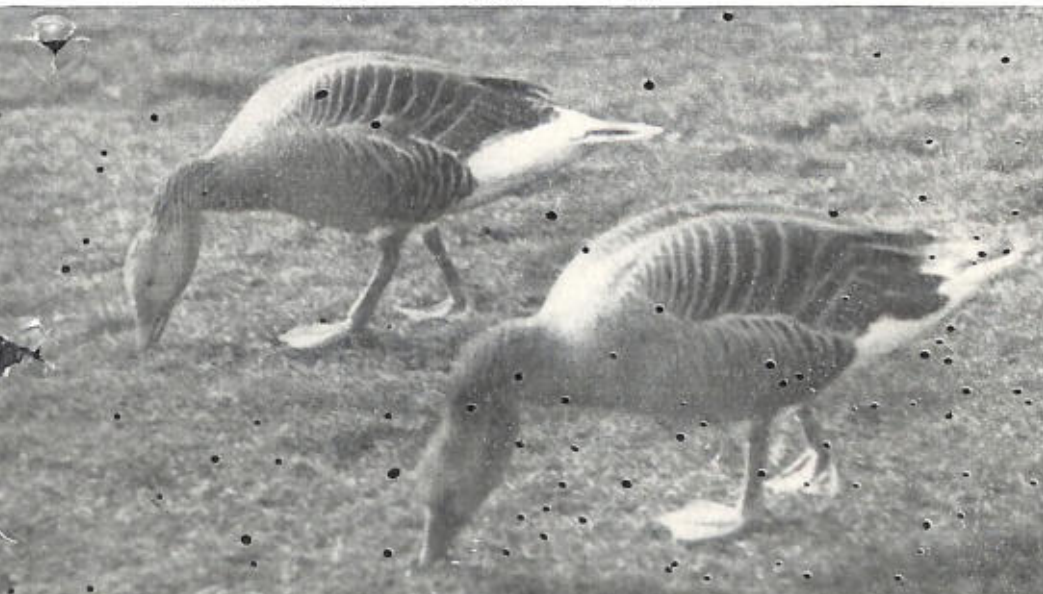
Our domestic cocks and hens are thought to have come from beautiful birds called Jungle Fowl, which are to be found in India and the Island of Java. The call of the Jungle Cock is a very strange noise, which has been described as like "the crow of a young cock with a sharp attack of whooping-cough!"

Mrs. Hen is a very good mother. You know how she "gathereth her chickens under her wings," and will defend them very bravely if they are attacked by a Dog or Fox. Indeed, she is sometimes given Pheasants' eggs and Ducks' eggs to hatch. She is much distressed when she sees the baby Ducklings take to the water, which they are ready to do as soon as they are hatched.

Speaking of the water—over there in the pond we can see and hear the Geese. Some have come out and are waddling about on the land, but they seem really happiest in the water. Our tame Geese come from the wild kinds which are still to be seen in some parts of England and Scotland. There are several kinds of wild Geese—Pink-footed, Bean, Brent, Barnacle, Lag Geese, etc. Many may be seen flying over the Norfolk Broads and elsewhere in large flocks called "Skeins" or "Gaggles," and the noise they make reminds you of a pack of hounds in full cry. Brent Geese like the sea best, and spend the night cradled on the waves.

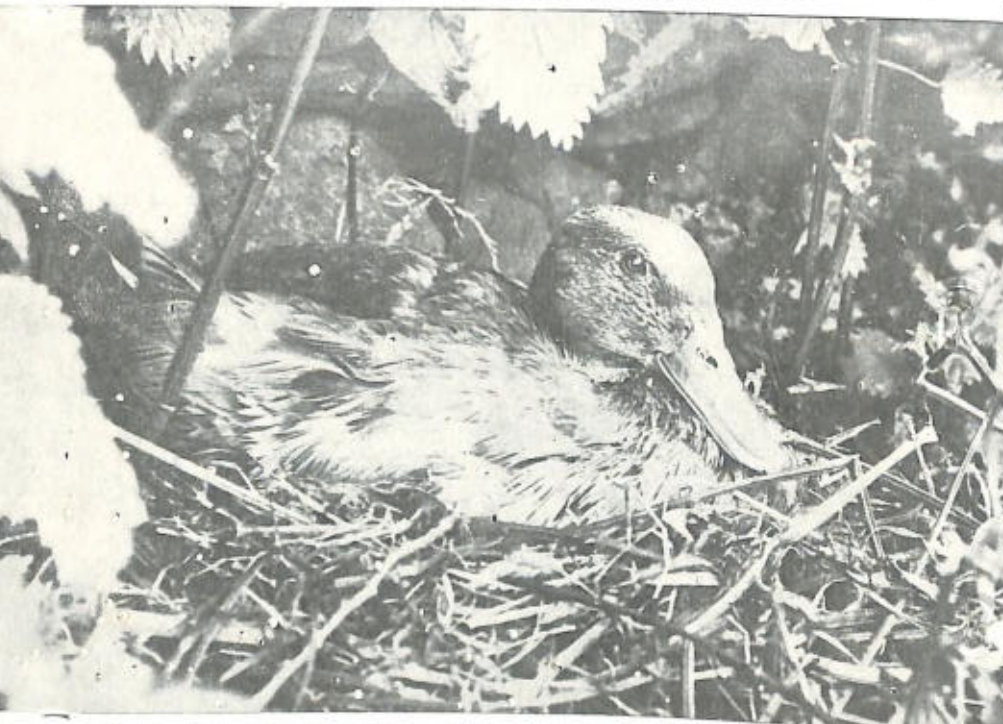
Though we know that it is not polite to call your friend "a goose," the Goose is by no means a stupid bird. It can become quite friendly and follow its owner like a Dog.

*A picturesque pair of grey Lag Geese, that have come to earth in search of food. Wild Geese, flying in long flocks or "gaggles," may often be seen near our coasts.*





*"Ducks," says the poet, "are beautiful things;" and as we look at this stately flotilla doubling its reflection in the pond we echo his words.*



*Safety first! The Wild Duck, sitting on the nest which she has lined cosily with down from her own breast, wears a more sober livery than her husband.*

## LOVERS OF THE WATERS

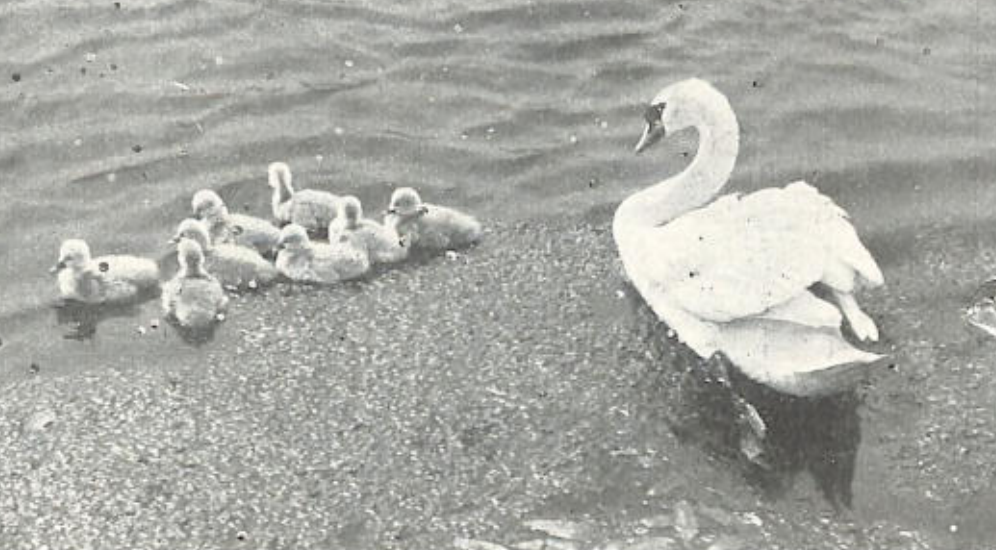
*It chanced upon the merry merry Christmas Eve  
 I went sighing past the church across the moorland dreary—  
 O! never sin and want and woe this earth will leave,  
 And the bells but mock the wailing sound, they sing so cheery.  
 Then arose a joyous clamour, from the wild fowl on the mere,  
 Beneath the stars, across the snow, like clear bells ringing,  
 And a voice within cried—Listen! Christmas carols even here  
 Though thou be dumb, yet o'er their work, the stars and snows  
 are singing.*

C. KINGSLEY

WE said the other day that Ducks' eggs are sometimes given to poultry-yard Hens to hatch, because Ducks are not very good mothers. Besides the tame Ducks which we know so well, waddling and quacking about our farmyard, plunging from time to time in the pond, there are many other kinds of Duck, and our domestic friends come from the Wild Duck, or Mallard, which has longer wings, though its body is less heavy. The drake shows a wonderful display of colours, green, chestnut, white, velvet-black, with legs and feet orange-red. But just in the middle of the breeding season he begins to moult his beautiful feathers and puts on for a time the dull mottled brown dress which the female always wears. After three or four months he changes this "eclipse plumage" again, and goes back to his richly coloured dress.

It is curious that up to the moulting time the drake helps his mate to guard the nest and sit on the eggs, but as soon as the moulting season begins he goes away and hides himself, as if he were ashamed of his shabby clothes! The female meanwhile only moults once in the year, after the eggs are hatched and the little ones can look after themselves. Some Mallards breed in the British Isles, and others come from the North, and only visit us in the winter.

It is very easy to tell the difference between the wild Duck and the tame, but almost impossible to know a wild Swan from a semi-wild one. The Swan which we see sailing along a lake or a river, very



*The graceful Swan gives her family a lesson in deportment. Swans are splendid swimmers, and the babies, called Cygnets, ride easily on the ripples of the lake.*

graceful in the water and clumsy on the land, is known as the Mute Swan. It is said to have been brought to England from Cyprus by Richard I., and is always looked on as a Royal bird. Indeed, there is still a King's Swan Master, in charge of His Majesty's Swans.

The universities, certain city companies, and others, mark their Swans with special marks on the beak. This marking is called Swan-upping; and the ceremony of Swan-upping on the Thames takes place once a year.

A kind of Wild Swan which only flies over to our coasts in winter is the Whooper, or Whistling Swan. It is not so graceful as the Mute Swan, and does not sail about with its neck curved like the letter S and its beautiful white plumage fluffed out, but rather busies itself feeding with its head and neck under water. It gives out three or four deep, trumpet-like notes, keeping time with the upward and downward beat of the wings.

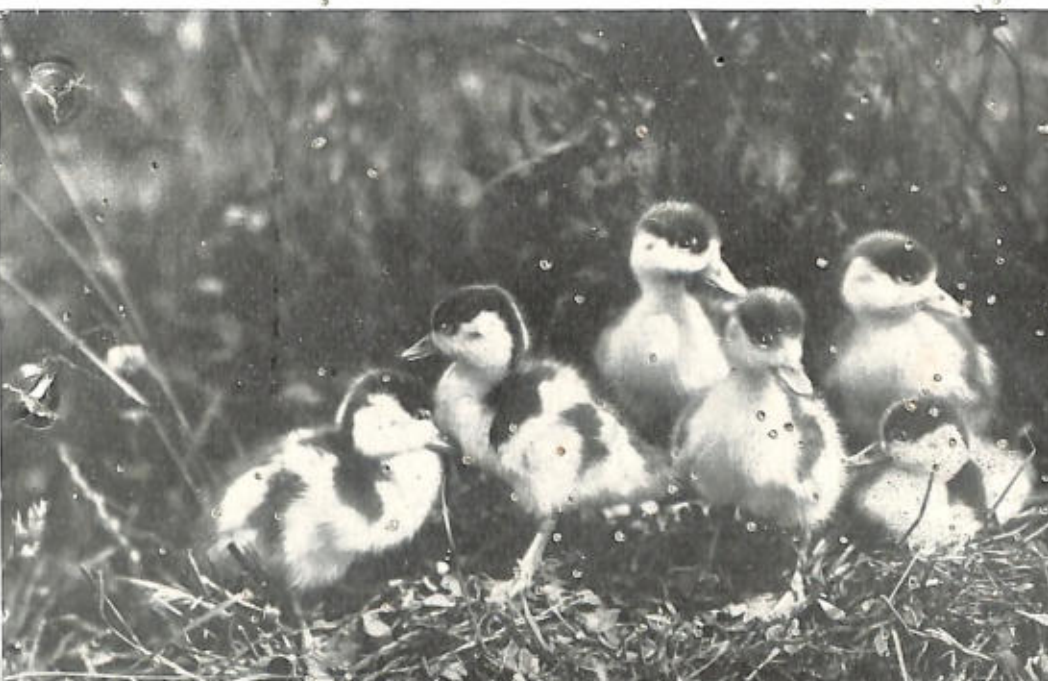
It is better not to make a Swan angry if one can help it, for it is a very strong bird and can give a great blow with its wing. I was travelling one winter night in a motor omnibus, and we had just passed a swannery in a country town when suddenly the front window of the omnibus was shattered with a great noise, and the conductor

started back and lifted his hand to his face, which was cut by splintered glass. The driver pulled up, and through a side window I saw a somewhat dazed Swan sitting in the road, with a small crowd collected round it. It had been attracted by the great headlights of the omnibus and had flung itself against the window. One of the onlookers was stroking and comforting it, but I felt as if sympathy was rather due to the conductor with his cut face and the passengers who had to travel on a cold night with their front window broken!

There is a curious bird which we might describe as half Goose and half Duck, called the Sheldrake. The word sheld means parti-coloured, and the name suits him very well, for he is a mixture of colours—dark green, white, chestnut, black, dark brown, with a bright red beak, and pink legs and feet.

The Sheldrake likes the sea best, but can make itself happy in inland waters, and you may see it in lakes and ponds in public parks. In its wild state it will make its nest in a deserted rabbit burrow, or burrow out a hole for itself, so it is sometimes called the Burrow Duck. The

BELOW: *A fluffy brood of young Sheldrakes. Half Goose and half Duck, the Sheldrake is a sea-bird, but sometimes nests inland in a deserted rabbit-hole!*



drake is said to mount guard over the burrow while his wife is sitting, and afterwards to rear and protect the young. The seven to twelve creamy eggs are wrapt in down which the mother plucks from her own body. Sheldrakes have amusing sham fights, rushing at each other with their bright red bills open, squealing and crying, "Kak, kak, kak!"

The Ruddy Sheldrake has more chestnut-red about him than the Common Sheldrake, and is much more rare, but you may sometimes see specimens in a public garden or park.

A common and very shy fresh-water Duck is the Widgeon, which visits us in winter, and looks for its food in tidal flats near the sea and also in inland waters. On land it eats grass like a Goose, and has been called the "Grass Duck." Another name is "Whew Duck," from its high-pitched piercing cry.

The Shoveler is a handsome Duck, whose colours are pale blue and white contrasted with deep green, dark brown and rich chestnut. A curious thing about this Duck is its bill. All Ducks have shovel-shaped beaks fitted for dabbling in the soft mud, with ridges inside to help them to grasp their food firmly, but the Shoveler's beak is specially wide and shaped like a spoon with a very broad tip. There is only one kind of Shoveler Duck in Europe, North Africa, Asia, and North America, but South America, South Africa, Australia and New Zealand have four other kinds.

Ducks, as you know, have webbed feet, which make them good swimmers, but they also have strong wings and can fly well. When a number of Ducks fly together they generally form themselves into a V-shape, a formation which is often imitated by a squadron of aeroplanes.

A shy and easily alarmed bird is the Greenshank, which likes to visit both the sea-coast and inland waters, especially those in Scotland, every year. If it sees you coming a quarter of a mile away, it will rise screaming into the air frightening all the birds around, fly about its nest, and then towards you, then back again, its body quivering all the time.

The Moorhen, or Water-hen, is a neat little bird, with an amusing prim little step when it leaves the water and moves over the grass,



*A pretty water bird with amusing ways is the Moorhen or Water-hen, which can be easily tamed, and even introduced into the poultry-yard to mix with the Chickens!*

nodding its head and jerking its tail as if to show off the white under the tail coverts. It is easily tamed, and if it lives near a poultry-yard will mix freely with the Chickens and share their food. It is a great diver, and can remain a long time under the water. It is able to grasp the weeds at the bottom with its claws, and can walk on weeds or ooze owing to the membrane on its feet.

Another water bird which looks like a larger Moorhen is the Coot, which spends most of its time on the water, liking best sluggish streams and stagnant ponds. It has been described as "half Duck and Half Chicken." It is a great diver, like the Moorhen, and will "tip" head downwards in shallow water to get at leaves and seeds and little water insects, but it will also feed quite happily on land. While Coots are nesting they are very noisy and cluck and wail, while they splash and wave their wings about and chase each other. They make large nests of reeds and water herbage, sometimes at the edge of the water and sometimes on little islands away from the shore. The nests are quite strong, so that if the water rises suddenly and sets a nest floating,

the mother does not mind, but sits on quietly, and enjoys her voyage till it is brought to a standstill again. When the little ones begin to hatch out, the father bird takes off the first-comers into the marsh to feed while the mother continues to sit on the unhatched eggs.

Coots were much more abundant formerly than they are now, especially on the Norfolk Broads. Sir Thomas Browne, writing about Norfolk birds nearly 300 years ago, told how if a Kite or Buzzard came near the Coots, they would flock together and splash up so much water with their wings that the Kite was forced to leave them alone. The truth of this was doubted till Lord Lilford, writing long afterwards about the Coots on the lakes of Epirus, described how they would defend themselves in the same way from an Eagle by throwing up water with their feet. "In one instance they so drenched the eagle

*The Coot (below), larger than the Moorhen and slaty-black in colour, lives in ponds or sluggish streams, building her nest of reeds and herbage beside the water's edge.*



that it was with difficulty that he reached a tree on the shore not more than 100 yards from the place where he had attacked them."

The Little Grebe, or Dabchick, has the honour of being chronicled in Shakespeare :

"A di-dapper peering through a wave  
Who, being looked on, ducks as quickly in."

She makes her nest of various water-weeds or grasses near the bank of a stream or pool or river, or among the reeds. And when she has laid her white eggs, if there is any alarm, she covers them quickly over with the wet leaves and grass drawn from the edge of the nest, and dives silently into the water, and the nest, which will then look like a mere bunch of dead weed floating on the water, may easily escape notice. When the eggs are hatched the little mother has a curious habit of holding the young under her wings and diving with them if she thinks danger is threatening.

When speaking of birds which live on or near the water, we ought not altogether to forget that fine big bird, the Heron, though he is not very common now, and heronries are rare. When we see him standing or wading in the water, we may not admire him very much, for he seems awkward and ungraceful. But just wait till he spreads his wings, and you see him soar in his wonderful flight, slow and perhaps a little heavy at first, but as he mounts higher it will be a delight to watch the free powerful strokes of the great wings. As a rule Herons nest on the tops of trees, and it is amusing to visit a heronry when the young birds are nearly ready to fly, and are standing on the branches or on their huge untidy nests of sticks, screaming and grunting and squealing to their parents to bring them food.

Another great bird, the Bittern, which used to be common, is not often seen now. The Bittern passes the day in reedy marshes, and comes out at night to feed on fish and frogs and small birds and insects. He has a loud booming cry, not unlike the bellowing of a bull.



ABOVE: *The gathering of the clans! Sea-birds find sanctuary on a rocky islet and make the air clamorous with their cries. BELOW: Sea-gulls alighting on the water—a picture which shows you how lovely and delicate a thing bird-motion can be.*



## RIDERS OF THE STORM

*Sea-bird! haunter of the wave,  
 Delighting o'er its crest to hover,  
 Half engulphed where yawns the cave  
 The billow forms in rolling over . . .  
 Sea-bird, stay thy rapid flight;  
 \*Gone! where dark waves foam and dash,  
 Like a lone star on the night,  
 Far I see his white wing flash.  
 He obeyeth God's behest,  
 All their destinies fulfil,  
 Tempests some are born to breast,  
 Some to worship, and be still.*

A. M. WELLS

GOING along the seashore in some parts of the country we may come across many Sea-birds. We are almost sure to see a Black-headed Gull, who ought to be called Brown-headed for his head in summer is really chocolate brown and in winter white. The rest of the plumage in the grown-up birds is pale grey and white; the young are mottled with brown and have pale brown wings. He likes the seashore in autumn and winter, but in summer we may see him and hear his shrill cry miles inland, especially on marshy ground and heaths. He follows the plough to snap up the worms and grubs which are turned up, but indeed he will eat anything, and if you throw out bread or biscuit on the seashore the Gulls will arrive quickly from everywhere around and almost deafen you with their excited screams. But if you throw a piece of paper or white wood no gull will take the slightest notice, so it is unfair to the Gulls to say of a stupid person that he is "easily gulled"!

One day I was on a pleasure steamer plying among the Channel Islands. A flight of Gulls followed us and the passengers amused themselves by throwing bread and biscuit to the screaming birds, and one very tame Gull took pieces of bread from a lady's outstretched hand.

The Gull's nest is very simply and rather untidily made; it is just a dip in the ground lined with dry grass and marsh plants. In this Mrs. Gull lays three or four greenish eggs with brownish, black and purplish blotches and markings. When the baby Gulls are hatched out they depend on their parents for food for the first week or ten days, but then they begin to pick up food for themselves, and when they are about six weeks old they are able to fly, and parents and young go off together to the sea.

It has been remarked that of late years the Seagulls have taken to coming inland in far greater numbers than formerly. In the great winter of 1890, when the sea pools were frozen, Gulls came inland to the Thames, where people fed them, and ever since they seem to have adopted the habit of often seeking their food far away from the seashore.

The Black-headed Gull has a beautiful sailing flight; he seems able to keep himself aloft for any length of time, just sloping his wings gently if he wants to change his direction, or he can slide downwards in a "coasting" flight with wings outspread and unmoving.

Gulls can be useful in getting rid of mischievous caterpillars. In

June, 1937, there was a terrible plague of caterpillars of the Antler Moth in certain parts of Scotland, where great tracts of pasture land on the hillsides were swept bare of grass by these pests. The Gulls soon found them out and flew down rejoicing to a great caterpillar banquet! Indeed, two or three of the birds over-ate themselves, and were found lying dead, unable to digest their feast!

The largest British Gull is the Greater Black-backed, about thirty inches long and wing about nineteen,

*Beautiful but noisy, the Black-headed or Laughing Gull tends her eggs among the reeds by the waterside.*



while the length of the Black-headed is sixteen and wing fourteen. It is more common in Scotland and on the west coast of Ireland than in England. It has a fine soaring flight, and indeed it is said that this Gull, and some others, can mark down food in a pool three feet deep, rise to a height of four feet, and plunge down upon it into the water with half-opened wings. The Greater and Lesser Black-backed Gulls cannot be very popular with their neighbours, for they are bold, bad thieves, stealing eggs from other sea-birds' nests, sticking their beaks through them and flying off with them. The Greater Black-backed will even carry off small Lambs and baby Deer, besides Fish, Rats, Mice and Frogs.

There is a good instance of "colour protection" in the case of the baby Black-backed Gulls. Till they are about four years old their colour is speckled white and grey, and when they crouch among the grey weather-stained rocks and stones it is very difficult to see them.

Another very common Gull is the Herring or Silvery Gull, a larger bird than the Black-headed, but only seen in summer, for when winter comes he migrates to warmer countries. He gets his name from being specially fond of Herrings, and a flock of these Gulls can be very useful to fishermen by showing where a shoal is to be found, as they fly over it screaming with excitement, though, of course, they also make off with a good many fish.

They nest together in great numbers, often on the ledges of steep cliffs, and sometimes on rocky islands, building nests of grass and seaweed. In the nesting season they make a great noise, sometimes bending their heads down and throwing them up again with a loud



*The "Common" Gull (who is really the rarest of all the Gulls) makes a graceful landing beside her nest.*

"Ollick, ollick!" which the babies of three months old do their best to imitate. If you go near the colony they will give a warning "Ow, ow," and when they are pairing their note is a deep "mau" rather like a cat's "miau," and a soft purring "ououou," and sometimes all chant together with an effect rather like a peal of bells with the chimes rising and falling.

The smallest British Gull is the little Kittiwake, with its short legs and its odd cry of "Kitty-wake, Kitty-wa-ake." It nests on the ledges of cliffs, and lives chiefly on fish, which it dives and swims after with ease, for it is at home in, and even under, the water, though owing to its legs being short, it cannot run along the ground as quickly as some of the larger Gulls.

The pairs are very affectionate; one may see them standing beside their nests, waving their heads and caressing each other, and when one of them is absent each calls to the other "Kittiway-eek, Kittiway-eek," and they enjoy feeding each other. The young of the Kittiwake is called the Tarrock.

• Pretty little sea-birds related to the Gulls are the Terns, of which one of the most common is the Sea Swallow, which is very like a Swallow in appearance though not in flight. Their long tails are forked, and they have soft grey and white plumage and black heads. • Also they arrive in May, as if to announce that summer is soon coming, and are off again to warmer climates in September. A party of Terns out on a fishing expedition is a pretty sight. They beat about and hover over the water, giving short, sharp screams, till at last, perhaps, one bird espies a fish. He stops his flight, hovers for a few seconds like a Hawk, and then swoops down into the water with a great splash. • If he does not catch his fish he rises again at once, but if he has caught it he floats on the water till he has finished his meal, and then flies off again.

Hundreds of years ago a monk called St. Cuthbert built himself a hut on one of the Farne Islands off the coast of Northumberland. Here his only companions were the wild sea-birds. He was very fond of them, and was known as "the protector of the sea-birds."

Later, the lighthouse on one of these islands, called the Longstone, was the home of the famous Grace Darling. On arrival at the Long-

stone, Grace's father, William Darling, found that the high seas which washed the rocks prevented the birds from breeding there. So he laid sand for them along the ledge of the rocks opposite to the lighthouse. He would not allow the eggs to be plundered, and soon hundreds of birds began to arrive and filled the air with their cries as if to thank him for his kindness!

To-day the Farne Islands are still a home for sea-birds. The watchers on the rocks will not allow any one to take the eggs; and if you visit the islands you will find a great company of Gulls, Kittiwakes, Sea Swallows, Guillemots, Puffins, Cormorants, Shag, Eiders, Arctic Terns, Ringed Plover, Oyster Catchers, and a few of the rare Fulmar Petrels.

A writer who describes a visit to the islands tells how once past the Crumstone the air was alive with Terns, whirling about and diving for small fish. At the south end of the Staple, one of the largest of the islands, are the cliffs called the Pinnacles, and here appeared groups of Puffins, with orange beaks and legs, a seething mass of jostling Guillemots, and a number of little Kittiwakes sitting on the cliff

BELOW: *Razorbills, Puffins and Guillemots meet for a chat. The Puffin—in looks and deportment the most comical of birds—nests in a burrow and lays a single egg.*



unperturbed. Away from the cliffs the turf was honeycombed by the burrows of the Puffins. A sandy strip in the Inner Farnes; the largest and highest of the islands, was the breeding-ground of the Arctic Terns. They do not approve of intruders, and sometimes they swoop at the head of any one going near their nests. But the Eiders are the chief inhabitants of the Inner Farnes, where they nest in all kinds of places, sometimes on the grassy hillsides, and sometimes in the neighbourhood of the old church and of the monastery, now the headquarters of the watchers, who remain there during the breeding season, from early in May till the birds have gone.

If you are walking over heaths and commons you may often hear a Curlew, or Whaup as he is called in Scotland, flying over, sandy brown, with a very long arched beak. He nests and feeds on heaths and moors, where he swallows Slugs and Snails and insects, but he likes to journey to the seashore and to feed there on any delicacies left by the ebbing tide. One writer says that he saw a Curlew drag out a large Crab from a crevice, strike it dead with his bill, and then nearly choke himself, while he danced about with it, shaking his head as a dog might who had found a particularly delicious bone.

An amusing little wader to be seen on the seashore is the round dumpling-shaped Ring Plover, or Tullet as he is called from his rather low, sad cry. He has a blunted bill, and as one writer puts it, a "black cravat suspended by a black ribbon round his neck," a black arch above a white forehead, and a heavy black band across the eye. These little birds are never still for long, trotting about briskly on the beach, jerking their heads up and down, dashing after a Crab or a Sandhopper, and when they are making love they join in a curious dance.

While the cock bird is courting he shuffles round and round in the sand making "false nests" or scrapes, and picking up tiny pebbles, throws his head back and rolls them down his breast, so that they trickle down on to the edge of the little pit in the sand. If the hen sits in the scrape for a moment he stands by bowing and chattering. When his lady has accepted him the pair stand on tiptoe, spread their wings upwards above their heads, and sail along the shingle together uttering a pretty yodelling song.

The real nest is paved with fine stones or tiny morsels of shell, in

which are laid four cream-coloured, pear-shaped eggs, with black, buff or brown flecks, so that they imitate the pebbles around them. Their nests are often robbed by Rooks and Crows, but if they are made anywhere near a ternery a great flock of Terns may rise up and drive away the robbers. When the nest is threatened the parents will often sham a broken wing, or fall into heaps in a pretended swoon, and if the egg-hunter is taken in and tries to catch the apparently helpless birds, off they fly with a chuckling cry—"Toolee toolee!"

The Oyster Catchers are interesting little shore birds, sometimes called Sea Pies, because of their black and white plumage set off by pink legs and orange red bills. They are not given the name of Oyster Catcher because they catch Oysters, but from their habit of knocking Limpets off rocks by a sudden blow of their wedge-shaped bills. They also feed on mussels and other molluscs. If the shells are shut, and they cannot prise them open with their pickaxe-like bill, they will sometimes carry them up and drop them on to a hard rock so that the shells may be broken in pieces.



*The bright-eyed Ringed Plover with its black and white livery, is a very attractive bird.*

Oyster Catchers will nest almost anywhere, and in many different ways, sometimes just scratching a pit in the sand, sometimes lining the nest with bits of shell, dead sea flowers, or even bones, sometimes building a neat little house of pebbles. The male bird acts as sentinel while his wife is sitting. A writer tells how he saw an egg roll out of an Oyster Catcher's nest, and was going to pick it up and carry it off, when both parents swung boldly around his head, wailing "Kleep kleep," till he took pity on them and restored the egg to the nest.

# NATURE'S PLAYGROUND

## *Book Four*

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## COLOURS THAT PROTECT

*Where the glossy king-fisher  
Flutters when noon-heats are near,  
Glad the shelving banks to shun,  
Red and streaming in the sun,  
Where the shrew-mouse with pale throat  
Burrows, and the speckled stoat;  
Where the quick sand-pipers flit  
In and out the marl and grit  
That seems to breed them, brown as they—  
Nought disturbs the river's way.*

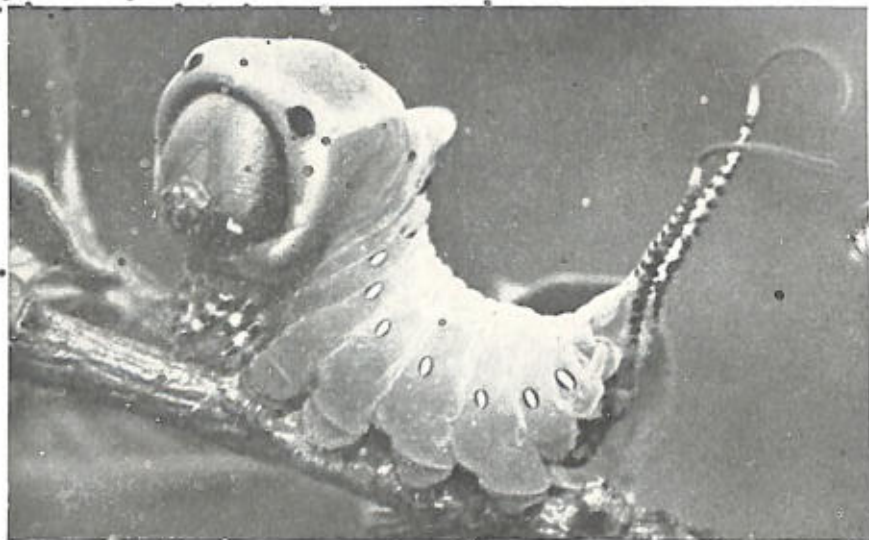
BROWNING

HOW dull it would be if all things in Nature were of the same colour! It would be interesting to see how many different colours we could count in the course of a walk in the country, or even in a town park, or garden. And we might also see if we can find any cases of what is called protective colouring. This means colouring which helps to protect an animal from its enemies.

We find many instances of this protective colouring among insects. The Dingy Spider, which often settles on roads in woods, is dull brown with rows of pale dots along its sides. The Weevil Beetle, grey spotted with black, looks almost exactly like the soil of white sand with black earth on which it settles. The larva of the Privet Hawk Moth, green with white and lilac stripes, is almost the exact colour of the privet and lilac leaves on which it feeds.

The Meadow Brown Butterfly has brown wings almost the same colour as the ground over which it hovers. The Orange Tip has a large orange patch on its fore wings, but the underside is mottled green and white. When it settles on some green and white plant with its wings folded across its back it is difficult to distinguish the Butterfly.

OPPOSITE: *Nature has endowed the Emperor Moth with many peculiar markings which help to give it protection. The "eyes" on its wings have a frightening effect.*



*The Puss Moth gives a fearsome display in the face of danger. Its forked tail lashes the air, and a "head" appears on its body, with glaring "eyes" and "mouth."*

The Swallow Tail Butterfly, rare now except in the fen districts, has a green caterpillar striped with black. This changes into a chrysalis which at first is of a bright green colour, but as the green leaves on which it hangs begin to turn yellow in the waning summer, it becomes yellowy brown also, as if to match the colours of its plant.

The Puss Moth has a very curious Caterpillar. On first coming out it is velvety black in colour, with two pink threads like very slender whips appearing at the tail end of its body. The Caterpillars feed on the poplar or willow leaves on which their mother laid her eggs. They are probably fairly well hidden by their black colour against the black spots and markings on the leaves. But later they moult their skins three times and change to a green colour. After the second moult a very curious "mask" comes over the head. This mask is rose red, shaded with greyish blue, and carries two great black spots which look like staring eyes.

If you touch the Caterpillar behind, even lightly, it will instantly turn its "face" round and seem to glare at you. At the same time it

will raise its pink tails and lash out with them, whipping them over its head and back again. All this may well terrify the Ichneumon Flies which are the Caterpillar's worst enemies, when they come to attack it. These Ichneumon Flies are "parasites," and lay their eggs in the poor Caterpillar's back, and so gradually kill it.

The Caterpillar of the Elephant Hawk Moth has probably a terrifying appearance to birds or other enemies. It is dark brown, striped with black, and there are two great round black markings, edged with violet, like two great eyes, on the fifth ring of its body. On its tail it carries a kind of short black horn tipped with white. But in spite of its alarming appearance it could not possibly hurt anything except the leaves on which it feeds.

The Comma Butterfly, which one may see on an autumn or winter day, has tawny wings spotted with black above, but underneath they are brown. On each of the under wings is a white spot shaped just like a capital C, or a comma.

The wings are scalloped, rather as if some one had snipped little pieces out of them and made a pattern running round the edges. When the Butterfly settles on a crinkled, shrivelled brown leaf, it folds its wings so that only the underpart shows. Then it is difficult to distinguish it from the leaf on which it sits motionless.

There is a beautiful Butterfly, which some of you may know, called the Purple Emperor. He gets the name of Purple from the glowing rich purple sheen which in certain



*The Caterpillar of the Elephant Hawk Moth shows a false face to the world, with strange markings to take the place of eyes and mouth.*

lights plays over the brownish black of his wings. He likes to sail very high over the tops of tall oak trees. The mother, who has not the same lovely purple colour, lays her eggs on the leaves of trees, often of willow or poplar or aspen. The Caterpillar which comes out is dark brown at first, changing to green to match the leaves after the first moult. But it is the chrysalis which gives us the best example of "mimicry" as it is called. The chrysalis hangs on to the leaf in its little silken hammock. It is much thicker than the leaf, but it has white dots and a fine white marbling of colour mixed with the green. This "stippling" makes it appear as flat as the leaf, so that it becomes difficult to see which is leaf and which is insect.

Perhaps you know the curious little houses, or homes, which the larvæ of the Caddis Flies make for themselves in the water. They are not really Flies, by the way, for they belong to a family called

BELOW: *The pupæ of the Purple Emperor Butterfly know that they are safe so long as they settle beside the leaves where they escape notice.*



*Trichoptera*, or Hairy Winged, and are related to the Lace Winged family. They make themselves cases or little houses of all sorts and materials and shapes and sizes, and walk about in them. The mother Caddis Fly is a dark brownish insect with four wings. She runs along the surface of the water and lays her eggs on the leaf of some water plant. Her baby when it comes out is a soft helpless creature. It would soon be snapped up by a hungry fish if it did not make a little case in which to keep itself safe. So it sticks together pieces of stick, sand, shells, dead leaves, moss, rushes, anything which comes handy, into all sorts of shapes. It crawls about on six thin long legs and carries its house after it, with only its little red head and shoulders showing. The case is lined with a comfortable silky tube, to make it easy for its soft body.

The Caddis grows too big for its house several times during its life under the water. Then it adds to the old case a fresh row of sticks, or some more moss, or whatever else it can find. Or else it makes itself an entirely new home. At last the time comes for it to change into a pupa. It shuts itself up in its case and casts its skin. And it changes into a white pupa with black eyes, a hooked beak, and a pair of antennæ. There it lies in its little house at the bottom of the water, till at last it grows its wings and flies off as a Caddis Fly. The little creatures must often escape notice among the medley of weeds and little shells and other things of which their cases are made. You would find it very amusing to keep some Caddis grubs in a bowl of water. Give them glass beads, shells, coloured paper, etc., for making their cases, and see the different dwellings they would build.

We may notice that some brightly-coloured insects, such as Wasps



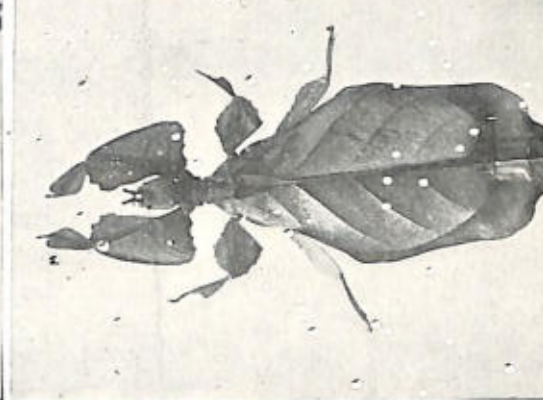
*The Pine Beauty Moth hides, unnoticed, from its enemies, among the pine needles of its home which it resembles very closely.*

for instance, seem to carry warning colours. There are certain stinging insects which mimic some of the stinging ones. The Common Drone Fly is very much like a Bee, and the Wasp Fly like a Wasp both in shape and colour. One of the so-called Robber Flies, which invades the Bumble Bees' nests and preys upon them, is very like a Bee. Even its hind legs are like the pollen-bearing legs of Bees.

There is a Moth called the Lunar Hornet-Moth which is much more like a Hornet than a Moth, though it has no sting. It has yellow and black bands, and it has transparent wings which are most unusual in a Moth. It can even make a buzzing sound like the buzz of a Wasp! Moreover, unlike most Moths, it flies by day. It lays its eggs in the bark of a Goat-Willow.

When we were thinking about the Straight Winged Family, we mentioned the Stick Insects. They do not live in England, but they can easily be bought at some naturalists' shops. In England we have some Caterpillars which also mimic twigs and sticks. These are the larvæ of the Looper or Geometer Moths. They get their name of Geometer or Land Measurers, because they seem to be measuring the ground as they loop themselves along. When the Caterpillar wishes to move, he clings to a twig with his six true legs. Then he lets go his hold with his two pairs of false legs, or claspers, which are near the end of his body. He brings these up near to the fore legs. Then he loops up the middle of his body into a sort of arch, like a croquet hoop. Having taken hold of the twig with his claspers, he stretches out his body and finds a fresh foothold. Thus he goes along, lopping up his body and stretching it out again, at a wonderfully quick pace.

But there is something still more wonderful about his behaviour. He is not only a land measurer, he is also an acrobat. If he wishes to remain at rest on a twig, he just catches hold of it with his hind and middle claspers, and stretches his body straight out or sideways. He may keep himself in this position for hours together. When the brown Caterpillars are stretched out in this way, they look exactly like a dead twig of the tree on which they have settled. There are green Caterpillars which rest in this way on green stems. They keep themselves in place by throwing out very fine silken cords from their mouths, by which their bodies are fastened on to the twigs.



*The Leaf Insect is very difficult to distinguish from its leafy hiding-place. Its legs resemble small leaves. The Stick Insect is also cleverly protected by Nature and can hide among the branches without fear of detection.*



*There are three Green Tree Frogs in the picture above, but Nature has given them a sporting chance to conceal themselves. Below, a Red Grouse fits into her surroundings, and on the right the Little Tern leaves its spotted eggs unnoticed on the beach.*





*The Gulls have no qualms about leaving their young unprotected while they search for food. The carefully-built nest makes a perfect background for the birds.*

An experiment has been tried of putting some Caterpillars on the twigs which they mimic, and laying the twigs over the nests of birds which were feeding their young. The birds cannot have seen them, for they perched on the twigs without taking any notice of the Caterpillars. When the same Caterpillars were taken off the twigs and put on white paper, the birds snapped them up. Even more curious is the case of some Caterpillars which, when weaving their cocoons, spin and stick to the outside a number of small cocoons which mimic the cocoons of a parasite. Thus the real cocoon is kept safe, for the enemy does not think it worth while to attack it, as the chrysalis seems to have been destroyed by the parasite!

You may remember that we have mentioned the Black Backed Gulls. The babies are speckled white and grey. When they crouch among grey weather-stained rocks and stones it is very difficult to see them. Larks, though they fly so high, make their nests on the ground. As the nests are made of dry grasses, dead leaves, and other dark substances, they are not easily seen against the brown earth.

Can you think of some birds' eggs which are laid amongst stones, and are shaped and mottled so like the stones that it is a puzzle to find them? We may remember those of the Sea Swallows and Ringed Plover. The Lapwing's olive-coloured speckled eggs match well the dark earth on which they are laid. As a rule eggs laid in dark places are

white. In cases where the hens "sit tight" on their eggs, the birds, rather than the eggs, often match their surroundings.

If we try to think of larger animals with protecting colours, we shall easily remember Mountain Hares, Stoats, and Weasels. In the North where there is much snow, these creatures cast off their brown fur in winter and grow white coats to match the snow. The beautiful white fur called ermine comes from the winter coat of the Stoat.

There are mimics among flowers as well as among insects. Not of course that they know they are mimics! Nor can we always tell what good the mimicry does—but the curious fact remains.

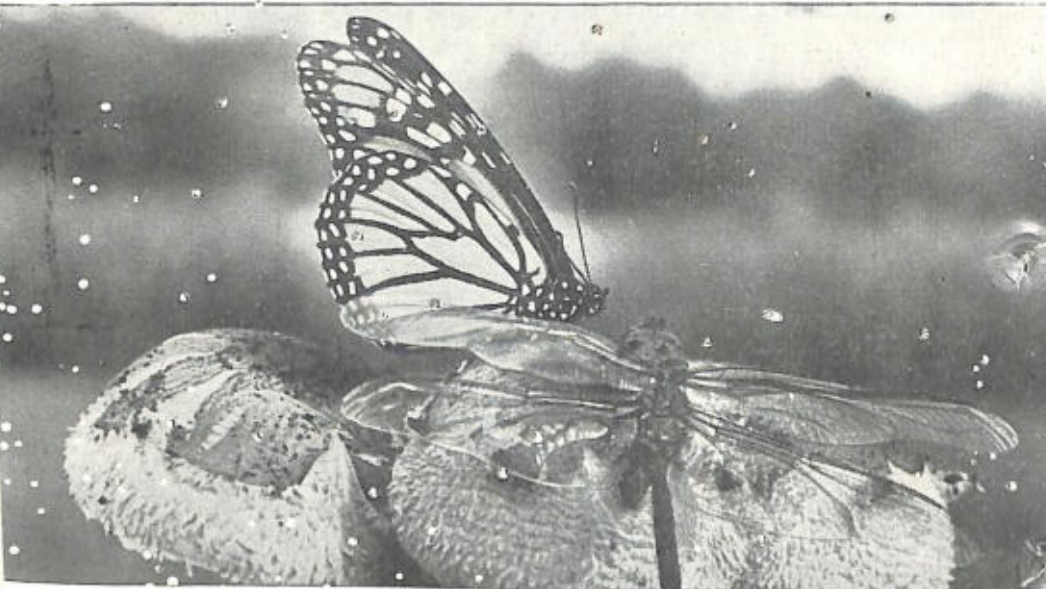
Among flowers the greatest mimics are found among the Orchids. There is the Bee Orchid which looks like a Bumble Bee with its wings spread. If you come upon the little brown and black flowers of the Fly Orchid, you might think, if you looked at them from a distance, that they were clusters of flies on a stalk. The Spider Orchid looks just like a Spider. There is a Butterfly Orchid which makes one think of a little white Butterfly with fluttering wings.

BELOW: *The Weasel's white winter coat not only keeps him warm during the cold weather, but gives him a chance to hide in the snow when danger is at hand.*





*The Swallow-tail Butterfly makes its bow to the world, proudly displaying its lovely colouring and beautiful wings. It has just emerged from its pupal hull and is ready to try its wings for the first time. The White Ermine Moth (right) has a less gaudy beauty, but is also lovely in its own quiet way.*



*The gaily-patterned Monarch Butterfly shares a toadstool with a Dragon Fly, whose acuzy wings glitter in the sun. Both exquisite in their different ways, they are sun-worshippers whose lives are brief and gay.*

## CHAPTER TWO

# A BEAUTIFUL FAMILY

*He who bends to himself a joy  
Does the winged life destroy;  
But he who kisses the joy as it flies  
Lives in eternity's sunrise.*

BLAKE

WE have already discussed Beetles. Shall we think now about another very large tribe of insects, among which are some of the most beautiful, at home and abroad? I mean, the Butterflies and Moths. In Natural History books you will find them called the *Lepidoptera*. This word means "Scale Winged," because their wings are covered with little scales. If you take a wing in your hand you will find your fingers covered with powder. If you put this powder under a microscope you will find that it is made up of tiny scales. It has been calculated that there are as many as a million and a half scales on the wings of some Butterflies.

When we were talking about Spiders we found that a Spider is not an insect. Well, what is an insect? The word comes from the Latin for "cut into." If you cut a piece of paper into the shape of an insect—a Fly or a Beetle for instance—you will find that you must cut it into three divisions. There will be the head, the middle part, called the thorax, and the tail or abdomen. It has six legs. The Caterpillar indeed seems to have more than six, but it has only six true legs. The funny little stumps (sometimes as many as five pairs) are called the pro-legs, false legs, or claspers, and the Butterfly leaves them behind when it turns into a chrysalis. In its perfect or winged state the insect has two horns on its head, called antennæ.

An insect goes through four stages. These are, egg, larva (or maggot or caterpillar), pupa or chrysalis, imago or perfect insect. The larva grows, but once the insect has changed into its perfect state, or winged state, it does not grow any more. So a little Fly never grows into a big one, as some people think!



*An unusual and decorative type of Butterfly is seen here resting between flights. It is of the order Chaxaraxes. The Poplar Hawk Moth, on the right, finds Nature's camouflage very effective as a means of defence. Its colours blend into the poplar.*

But the larva moults several times, because while it is eating a great deal, its skin becomes too tight for it. So it has to cast its old coat and put on a larger one. Insects have breathing holes along the sides of their bodies, called spiracles. These spiracles let air into their wonderful breathing tubes. The breathing tubes are called trachea, and they are spread in a sort of network all over the insect's body.

Do you know the difference between a Butterfly and a Moth? The best way to tell the difference is to remember that a Butterfly has swellings or knobs at the end of its antennæ, but the antennæ of Moths are very seldom knobbed. Their antennæ are generally more like threads or feathers. Then as a rule a Moth has its wings spread out when it is at rest. But a Butterfly holds its wings upright over its back when it settles, or folds them across its back like a little cloak. Most Butterflies fly about in the daytime, but the greater number of Moths fly by night.

Butterflies and Moths in their perfect state have sucking tongues. These tongues are often very long and folded around like the main-spring of a watch, when not in use. But Caterpillars have biting tongues. This is why the winged Butterfly or Moth sucks honey and

sweet juices for itself, but it lays its eggs on leaves for its little ones to feed on when they come out.

They have various plans for keeping themselves or their eggs safe and warm through the winter. In a few cases the eggs may have very tough shells. The Caterpillar may bury itself underground or burrow into trees. The chrysalids may shut themselves into strong cases or warm silken hammocks. The perfect Butterfly or Moth may hide itself in some warm cosy nook, and then you may see it to your surprise flying about even in winter on some unusually warm sunny day.

Some Butterflies differ slightly in their colours in summer and winter.

Let us think about one or two Butterflies and their life histories.

There is a pretty little Butterfly called the Painted Lady, which comes and goes in rather surprising numbers. These Ladies are great travellers, and take advantage of favourable winds to help them across the Channel or wherever they wish to go. They fly in large companies, like squadrons of aeroplanes!

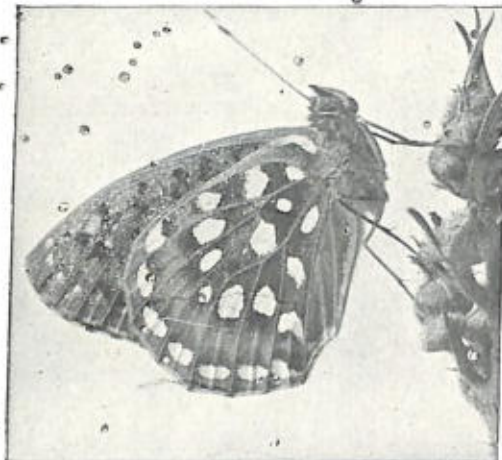
Now let us watch one Lady going about her business of egg laying. She carefully examines a clump of nettles and thistles, and chooses a leaf on which she lays her clusters of tiny pale green eggs. Then she disappears. Off she goes, to be happy, let us hope, and enjoy herself through her short life in the sunshine, sucking the nectar from the flowers. Presently out from the eggs come some little greyish Caterpillars with black heads. They grow by degrees and feed busily on the nettle leaves—ugly little things, giving no hint of the beauty which will be theirs some day.

After a time, perhaps in about a month, one of the Caterpillars



*When the Puss Moth, seen in this picture, is full-grown, it presents a very soft and attractive appearance.*

leaves off feeding. What is the matter? Is he ill? No, for see—he is very busy spinning a silken pad on to a leaf stalk. Now he catches hold of the pad with his claspers, and hangs head downwards from the stalk. A few hours pass, he begins to wriggle, his skin bursts, he shakes himself out of it.



Another beauty of the air is the Dark Green Fritillary, with burnished silver on its wings.

The cast skin falls to the ground. Then the Caterpillar—or rather, the Caterpillar no longer, for he is now a chrysalis—fastens himself again on the pad by means of some tiny hairs on the end of the body. Now the chrysalis will remain hanging on to the stem, greyish at first, but presently showing burnished colours, green, crimson, gold, silver. Twelve days pass, and then if we look closely

we may see some coloured wings showing through the chrysalis' outer skin.

Shall we see the Butterfly come out? We cannot be certain. We have no means of knowing whether it will be the next minute or after twenty-four hours or more! But if we do catch the wonderful moment when the chrysalis skin breaks, and the Butterfly comes out, head first, we may be disappointed at first. For the wings look crushed and the Butterfly seems almost a cripple. But wait. While we look the wings begin to lengthen out, the colours show, they are limp and wet now, but in an hour or so they will have dried. Now the Butterfly will feel—who knows how?—that he can fly. His legs will move quickly to and fro, his wings will flutter, and he will climb to the top of the stem, as if to look out over the promised land. Then see! he has spread his wings, black, white, orange, yellowish grey, with spots of blue, and away he flies to explore the unknown country in his free flight.

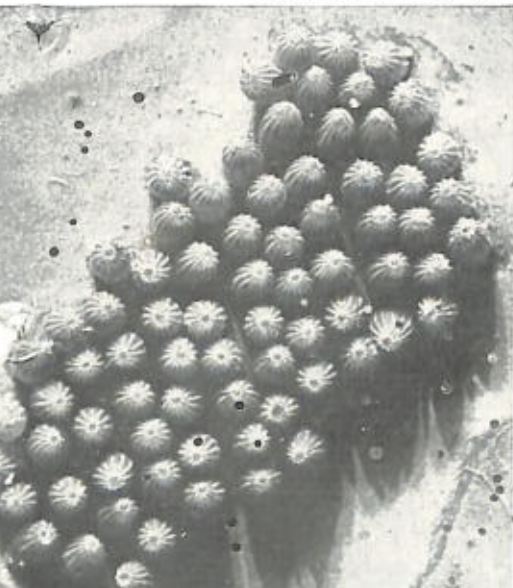
Some butterflies which you know well if you have gardens are the Cabbage Whites. Very mischievous they are, for their caterpillars spoil our cabbages by gnawing the leaves. They have an interesting life history all the same.

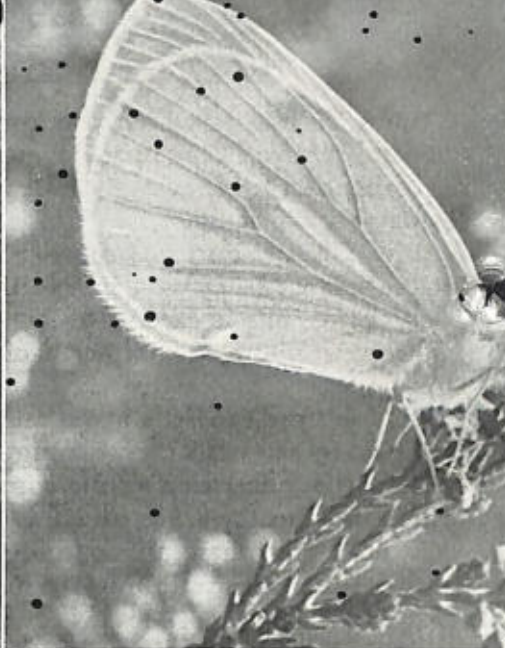
The Cabbage Butterfly mother lays a great quantity of eggs, which look rather as if they were tiny rolling-pins with a pretty pattern carved upon them. She is careful to lay her eggs on a cabbage leaf or some other green plant, so that her babies may have plenty to eat when they come out.

In due time the little green and yellow Caterpillars appear, and set to work to eat with their strong little jaws. And how they do eat! A naturalist once tried giving some Caterpillars bits of cabbage leaves which weighed twice as much as their bodies. In less than 24 hours they had eaten them all up, and weighed a tenth more than before. This is as if a man weighing 180 lbs. ate in one day 360 lbs. of meat and weighed only 18 more lbs. afterwards.

All this eating makes the Caterpillar's skin too tight for it. So several times in its life it casts its skin. Before this event it leaves off

BELOW: *The eggs of the Cabbage White Butterfly resemble the seed-cases of the poppy. The young caterpillars (right) emerge from them and very quickly crawl away in search of vegetable leaves for food.*





*Nature keeps a balance among its creatures. In the first picture are seen the larvæ of an Ichneumon Fly, which have eaten up the caterpillar of a Cabbage White Butterfly. On the right is a fully-grown Cabbage White.*

eating, and becomes very quiet and lazy. Then the skin begins to split along the back, and with great efforts and wriggings the Caterpillar struggles out, soft and helpless. But soon the new skin, bright and smart-looking, hardens. Then the newly-dressed Caterpillar sets to work to eat again.

At last, when the Caterpillar is fully grown, it is ready for its great change. Once more it ceases to eat, and its colours fade. Watch carefully, and you will see it begin to be very busy. It finds some comfortable place, a wall or a fence or even some plant to which it can fasten itself. Here it spins a little silky hillock or mound and fastens itself on to it by its claspers. It spins a silky covering for its body, crossing and recrossing the threads till the cocoon is finished. In about thirty hours it has turned into a chrysalis. There it rests without moving or eating, as if it were fast asleep or dead.

Very soon the chrysalis skin splits, just as the Caterpillar skin had split, and out comes the Butterfly. The insect is no longer a slow crawling grub, or a dull chrysalis. It is a pretty creature with white wings with black or brown spots, flying about in the sunshine and sucking honey from the flowers.

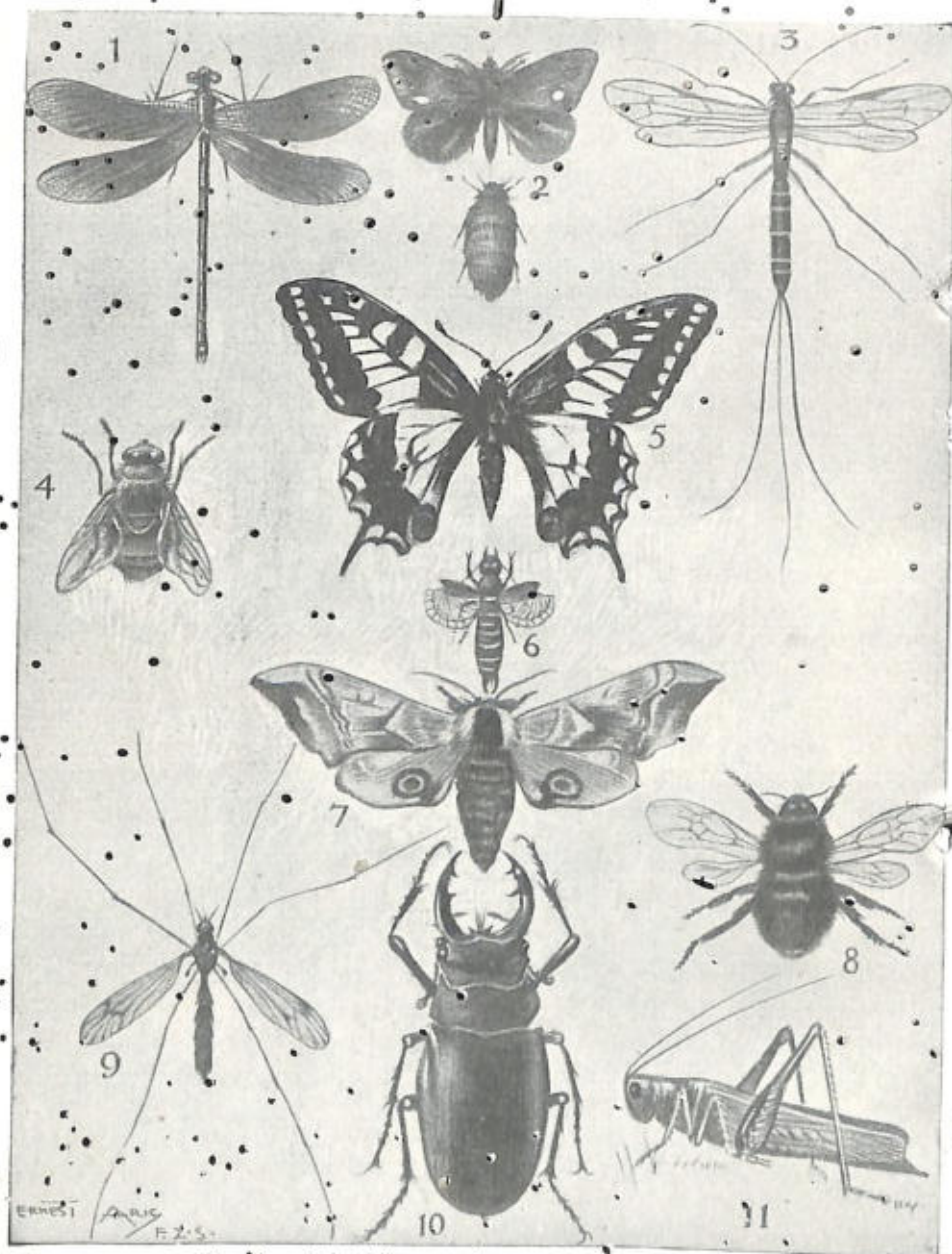
The Cabbage White Butterflies lay such quantities of eggs that if all the eggs hatched out and the Caterpillars lived, cabbage beds would be ruined. But fortunately for us, the Caterpillars have many enemies. Birds feed on them. Also there are certain small flies, the Ichneumons, which lay their eggs in the chrysalids and the chrysalids perish.

Watchers on Scolt Head, Norfolk, have told how they saw great streams of White Cabbage Butterflies fly over one very hot June day, before an East wind. The stream was passing during the whole afternoon till dusk. Many were pursued by seabirds, and they were also buffeted by the wind.

It is rather sad that such beautiful creatures as Butterflies and Moths so often have mischievous Caterpillars. But let us try to forgive these mischievous ones, as the beauty of the Butterflies gives us so much pleasure.

BELOW: *The Large White Butterfly, with its distinguishing black mark on its wings, rests during a flight to taste the sweetness of a flower.*





BRITISH INSECTS.—Showing their different orders. 1, Dragon Fly—*Neuroptera*; 2, Vapourer Moth (male and female)—*Lepidoptera*; 3, Ichneumon—*Hymenoptera*; 4, Blue Bottle—*Diptera*; 5, Swallow Tail Butterfly—*Lepidoptera*; 6, Earwig—*Forficulida*; 7, Eye of Hawk Moth—*Lepidoptera*; 8, Bee—*Hymenoptera*; 9, Daddy-Long-Legs (Crane Fly)—*Diptera*; 10, Stag Beetle—*Coleoptera*; 11, Grasshopper—*Orthoptera*.

## THE TWO-WINGED TRIBE

*Together both, ere the high lawns appeared  
 Under the opening eyelids of the Morn,  
 We drove a-field, and both together heard  
 What time the grey-fly winds her sultry horn,  
 Battening our flocks with the fresh dews of night:  
 Oft till the star that rose at evening, bright,  
 Tow'rd heaven's descent had sloped his westerling wheel.*

MILTON

Do you remember how many large families of insects we have already discussed? The *Coleoptera*, or Sheath Winged insects, to which Beetles belong. The *Neuroptera*, or Nerve Winged, to which belong the Dragon Flies. The *Orthoptera* or Straight Winged, with Crickets and Grasshoppers as members. The *Lepidoptera* or Scale Winged Butterflies and Moths. The *Hymenoptera*, to which belong Ants and Bees. We have not yet thought of a very large family which includes some very curious insects. Many are very harmful, and certainly they are less beautiful than Butterflies or Dragon Flies. But they are interesting in their own way. They are the *Diptera*, or Two-Winged insects.

Almost all the insects which do not belong to the *Diptera* have four wings. *Diptera* have only two true wings. They also have a pair of "balancers" or "poisers," short stalks with little knobs at the top, like tiny drumsticks. You can see them plainly in Daddy-Long-Legs, and fairly easily in a Gnat. They are thought to help the insects in flying, and may perhaps serve as ears. A tiny hearing apparatus, or what may possibly serve as such, may be seen in some insects' "balancers" under a very strong lens of a microscope.

All true Flies belong to the *Diptera*. I say "true" because many insects which are called Flies are not Flies at all. You can think of some—Butterflies, Dragon Flies, Gall Flies. You will know that they

are not true Flies if you count their wings and find they have four. On a sunny afternoon in autumn you will see the Drone Flies and Wasp Flies busy on the Michaelmas Daisies. Perhaps at first you will wonder whether they are Bees and Wasps, for they are so like them, but count their wings. You will find that they have only two wings, and if you look very closely you may be able to see the poisers also.

Our tiresome House Flies, Bluebottles, Stable Flies, Autumn Flies, stinging Gad Flies and Forest Flies, and other pests, belong to the *Diptera*. Years ago it was thought that Flies were useful. It was supposed

that their grubs or maggots were good scavengers, helping to rid the world of decaying stuff on which they feed. But now it is known that they are dangerous little creatures. They carry dirt about on their tiny feet, and leave it on our food, and spread it wherever they settle. Also if we are not careful they may lay their eggs in the meat in the kitchen! And besides being very unpleasant they may cause illness. So we must try to get rid of Flies as much as we can.



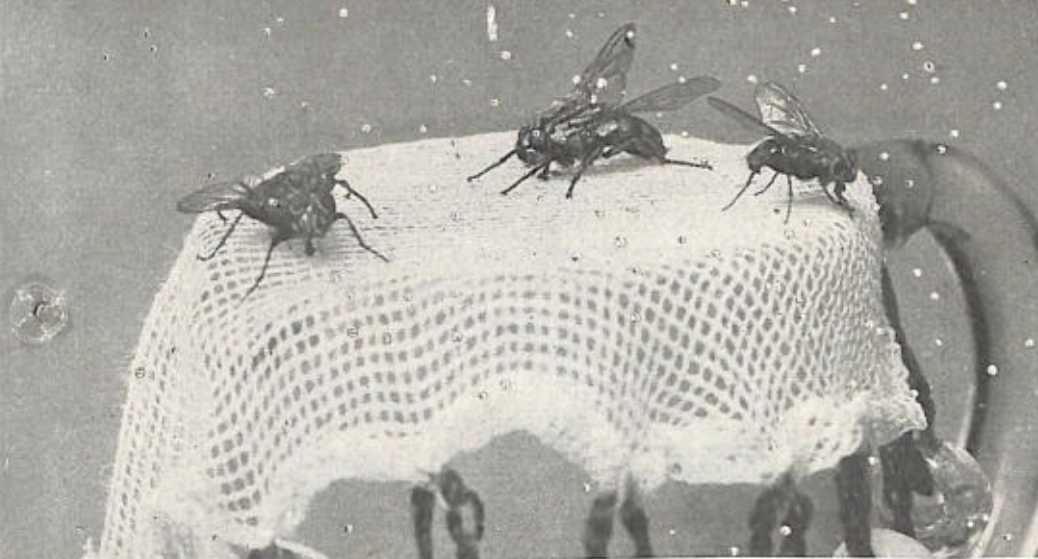
The foot of the House Fly consists of a pair of claws and two hair-covered pads.

One way, of course, is by keeping our houses very clean. It has been calculated that during her life a Fly may lay five or six batches of eggs of 120 to 150 each. So it is no wonder if there are plenty of Flies about in summer wherever there is a dirt heap. Our dust bins should be regularly and often cleaned out, and we must take care that

the lids fit tightly. Also in summer the food that we keep by us should be covered with fine wire-gauze covers or butter muslin. If we buy vegetables and fruit which have been put out for sale on a stall out of doors, they should be cooked or well washed before they are eaten, as Flies may have crawled over them.

But though Flies are so dirty and dangerous, there is something very interesting about the way they are made. We will think more about this when we talk about the wonders of the microscope.

Another member of the *Diptera* family, the Tipulid which we call Daddy-Long-Legs or Crane Fly, is terribly mischievous. It is not



*There are many ways in which food may be kept from the contamination of House Flies. Above, a covering has been placed on a milk-jug to keep the best at a distance.*



*This House Fly, a dangerous spreader of disease, has settled on a pat of butter where it may leave its poisonous germs behind. The Fly, however, has its own enemies to fight, and on the left is seen an unwary Fly trapped by a Tongue-leaved Sundew.*

mischievous in its winged state, for it does not bite or sting. But its larva, often called Leather Jacket, feeds on the roots of grasses, so it does much damage in meadows. The mother Crane Fly stands up on her long hind legs, with the point of her egg-laying apparatus ("ovipositor") on the surface of the ground. She turns her body from side to side, as a Carpenter turns his bradawl, till she has made a neat little hole in which to lay her egg. The larva which comes out of the egg is a tough-skinned creature with a red head. It gnaws the roots of the grass, and at last it changes into a pupa. Later the pupa's skin splits, and a new Daddy-Long-Legs comes out. The farmer's best friends are the Starlings and Wrens and other birds which peck the larvæ out from the ground. A pair of Wrens carrying food to their young were carefully watched, and were seen to visit the nest 74 times in 2 hours, and later 29 times in an hour. Every time the bulk of the food they carried consisted of Leather Jackets.

There is a very curious kind of Tipulid called *Sciara*, found in the forests of Norway and Hanover. Its larvæ form immense processions. They have no feet, but thousands fasten themselves together with a sticky kind of substance, and in some strange way they manage to draw themselves along at a snail's pace. Columns of these little creatures have been seen covering thirty yards of ground. These processions of *Sciara* Caterpillars were first written about by a naturalist in 1603.

Another Two-Winged insect which we know only too well is the Common Gnat. Irritating as it is, its life history is interesting. It begins its life in water, for Mrs. Gnat lays her eggs in the nearest water she can find, stagnant water for choice. This reminds us that it is not wise to have a rainwater butt very near the house, if we can help it. The eggs are laid in a little cluster shaped like a lifeboat.

In course of time the little Gnat larva (some village boys I knew called it "Bullyhead") pushes off the lower end of the egg. Then the baby comes out through this trap door, and swims head downwards in the water. The quaint little creature has a large round head, and a kind of forked tail. Though it lives in the water it needs air, and it comes to the surface to breathe. It pushes up the little tube in its tail above the water to take down air into its breathing tubes. Its skin is



*The pupa of the Gnat is short and round in shape. It swims about, sometimes on the surface, but does not eat. Soon the skin splits and the pupa emerges as a Gnat.*

so thin that we can see the digestive and breathing tubes through the skin, and the "dorsal vessel" beating, which takes the place of a heart.

Some hairy tufts near its mouth are always moving. They cause currents of water to flow into the mouth, carrying tiny insects and morsels of the vegetable and earthy matter on which it feeds.

The larva sheds its skin several times in the course of a fortnight or three weeks. Then it turns into a pupa. Its shape is now changed. Its body is shortened and rounded, and when it is not swimming it rests with its tail brought up to the under part of its head. Instead of breathing through the tube in its tail, it has two breathing tubes in the thick part of its body. They are shaped like Asses' ears, and the pupa brings them to the surface of the water when it wants to take in air. It still swims about, but it does not eat.

When the time is ready for the perfect insect to come out of the pupa skin, the skin splits, and the insect uses it as a kind of raft. It gradually stands up in this skin boat, and makes ready to fly with its



*The Male Mosquito, less dangerous than the female, since it does not transmit malaria, has nevertheless a vicious sting. It is most active at night.*

six tiny pointed needles, like a surgeon's instruments. She pierces our skin with these tiny weapons, and sends some poison down into it, which causes the red spots and irritation.

A Common Gnat's bite is very annoying, but the bite of the dreaded Mosquito, which is a kind of Gnat, can be very dangerous. It has been discovered by clever naturalists, after years of research, that Mosquitoes carry diseases, especially yellow fever and malaria. The Campagna around Rome was famous in old days for harbouring malaria. A region round the Panama Canal, in America, had a very bad name for malaria and yellow fever. Now that war has been waged against Mosquitoes, yellow fever has been stamped out in Panama, and cases of malaria are much fewer. The Campagna has become much healthier. Land has been drained, oil poured over water to prevent the Mosquitoes from laying eggs, and people leaving water butts uncovered are heavily fined.

newly-grown wings. This is a time of great danger for the Gnat. It has been a water creature, now it can only live on land. If it falls into the water it will be drowned. No doubt it is fortunate for us that so many do drown before they can get themselves free. For if all the millions of eggs laid by Gnats hatched, what an alarming quantity of Gnats would be flying all around us!

Only the female Gnat bites. Her tongue is a very fine sheath, into which are neatly folded

There are several ways of telling a Mosquito from a Common Gnat. Here are two. A Mosquito hums and a Gnat is silent. When a Gnat settles, its back is hunched and it clings to its support by its hind legs. But a Mosquito keeps its back in a straight line with the head, and stretches out its hind legs or waves them gently to and fro. We may be very glad that our Gnats are only slightly harmful in comparison with the dangerous Mosquitoes.

There are some Flies which are not only harmless, but really useful to us. The larvæ of some of the Hover or Hawk Flies—*Syrphus lucorum* and *Syrphus pyrausti*, for instance—feed on the mischievous Aphides or Plant Lice. When the mother *Syrphus lucorum* is going to lay her eggs she looks for leaves or twigs which are thickly covered with Plant Lice. There she lays them, never putting two eggs near each other. When the young larva comes out it finds itself in the middle of breakfast, dinner and supper. It clings to a leaf with the end of its tail, and stretches out the forepart of its body, and catches an Aphis with its mouth. It pulls the unfortunate Aphis away from the leaf, and holds it up on high in its mouth. Then it sucks the juices, throws away the empty skin, and waits for the next Aphis to come its way. In this way it gets rid of many harmful pests and justifies its own existence.



The Hover Fly, so called because of its habit of hovering motionless in the air, is distinguished by its bright colourings.



## SKILFUL SWIMMERS

*I wind about, and in and out,  
With here a blossom sailing,  
And here and there a lusty trout,  
And here and there a grayling,*

*And here and there a foamy flake  
Upon me, as I travel,  
With many a silvery waterbreak  
Above the golden gravel,*

*And draw them all along, and flow  
To join the brimming river,  
For men may come and men may go,  
But I go on for ever.*

TENNYSON

HAVE you learnt to swim? Let us think of some good swimmers to-day, better even in their own way than the great swimmers we read about in the papers who can swim the Channel—I mean, fish. A fish's way of swimming is different from a man's. For one thing, a fish's swimming is natural, whereas a man must learn the art.

The animals which swim best, the Dolphins and Porpoises, are not fish, though often spoken of as such. Perhaps the best swimmers among the fish are the Tunnies and other members of the Mackerel family.

A fish is made in the way best fitted for cutting the water. Its body is wedge or spindle shaped. In the greater number of cases, it has five kinds of fins, and the fins help to steer it. If it wants to move forward quickly, it bends its tail fins very rapidly from side to side. If it wants to glide along slowly, it just waves its fins gently backwards and forwards. The lobes, or fringes of rays on the fins, act like the blades

OPPOSITE: *When the fishermen return to harbour laden with the spoils of the sea, they often find many strange fish in their nets. In the following chapter we learn about some of the ocean's vast family.*

of oars. If a fish lost its fins it would turn over on its back, for they help it to keep its balance.

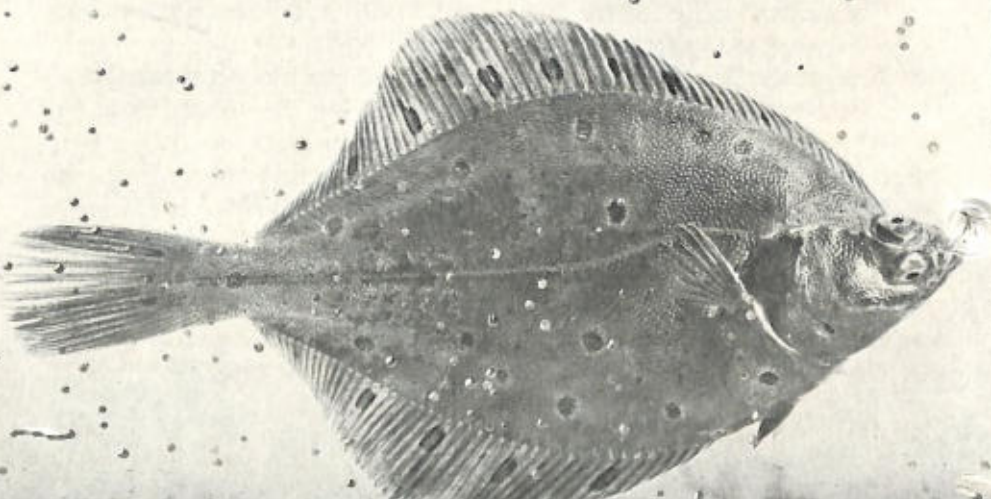
The Tunny, when swimming very quickly, uses only the middle and tail fins, and the front fins lie out of the way in a hollow under the body. The tail, with its tail or "caudal" fins, acts as a scull to strike the water and push the body onwards.

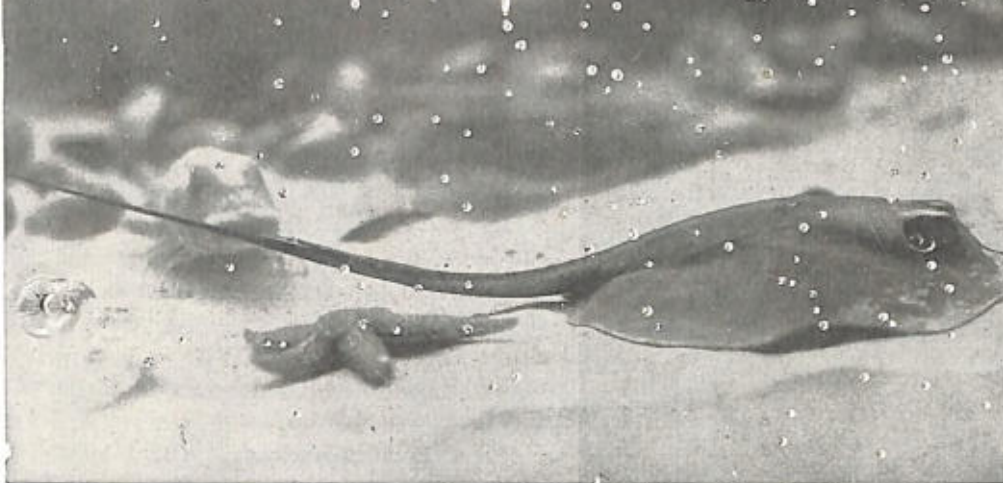
In old days paddle steamers had wheels at the side. Now side wheels are very little used. There are screws underneath the water at the stern of the ship which push, so to speak, from behind and send the ship along. In the same way, the fish's tail with its tail fin acts as a back scull and pushes the fish along from behind.

A naturalist tells how once he and some friends were left in a fishing barge on a small lake by an ill-tempered boatman. The man jumped ashore taking the scull with him, and pushed the boat away from the shore with his foot. The naturalist remembered how fish swim, and taking the largest fishing rod in the boat he pushed it into the head of the rudder. Thus he had a ready-made scull, which he could move gently backwards and forwards, and so move the barge wherever the party wished to go.

But in a ship the screw is very small compared with the size of the ship which it moves. The tail of a fish—say, a Tunny—is small

BELOW: *The Plaice has little energy and is quite content to lie motionless at the bottom of the sea. Note its closely-set eyes and the spots on its body.*





*A strange sea-creature is the Sting Ray, with whip-like tail armed with barbed spines. This proves a useful weapon of defence in the struggle for existence below sea.*

compared with the big fat body which is sent along by its movement. Where does it get the power? In the case of the ship, the screw gets its power, as you know, from the engine. In the case of the fish, the power which works the fins comes from the wonderful arrangement of bones and muscles in the body. If you have cooked fish for dinner you know how careful you have to be not to swallow any of the many bones. You can often lift off the back bone with your fish knife, say from a fried Sole. So you know that a fish has many bones in its skeleton. These bones, with the muscles, are like the engine which gives the power to move the body along.

If you can visit a large aquarium you will find that there are many different ways of swimming among the different kinds of fish. Skates and Rays for instance have very wide, large fins (pectoral fins as they are called) all along the side of the body and head. In the water these fins look like wings, waving and bending over, as the fish rises and falls. One kind of Ray indeed, the Eagle Ray, is so called because its fins are so much like wings.

Then again, other flat fish, such as Sole and Brill, glide or climb over the bottom of the aquarium. Suddenly they beat the water with their unpaired fins and raise the body slowly. Then they bend and wave themselves along with an up and down movement. Eels and Congers have the same undulating way of swimming.



*The Eel is a very peculiar creature. It has a heart in its tail and wears a pair of protective "spectacles."*

How much can fish see? They certainly have large staring unblinking eyes. Most of the flat fish, such as Plaice and Turbot, lie on their sides at the bottom of the sea when they are young, and by degrees the eye on the side on which the fish lies travels slowly across the head till it comes near the eye on the other side, and the two eyes are brought close together. Naturalists who have studied the subject carefully think that the fish which swim near the surface of the water only see what is exactly in front of their eyes. The great number of fish which live in the depths of the sea may have a still feebler eyesight compared with our own. Perhaps their vision is more like ours when we are surrounded by a dense fog.

Two fish have lately been brought to the Zoological Gardens, given by the Paris Colonial Aquarium. They are blind Cave Fish, and were caught in an underground water in the Belgian Congo. They are about three and a half inches long, and have creamy white bodies. The gills and a line down each flank are pink, owing to the blood showing through the skin. They are blind, but probably like other blind cave dwellers, such as blind Snakes, they are sensitive to light.

Our Common English Eel can wriggle over fields when it wants to get from one stream to another. A naturalist has written that he has even seen Eels creeping over rocks and contriving in some way to crawl along the flat surface as easily as a Fly walks over the ceiling. An Eel has a kind of pouch or bag in its gills which will hold a store of water. It is certainly a curious fish. It has an arrangement to protect its eyes rather like a pair of spectacles. It carries in its tail a heart, called a "lymphatic heart," which can be seen moving (or "pulsing") up and down under its skin.

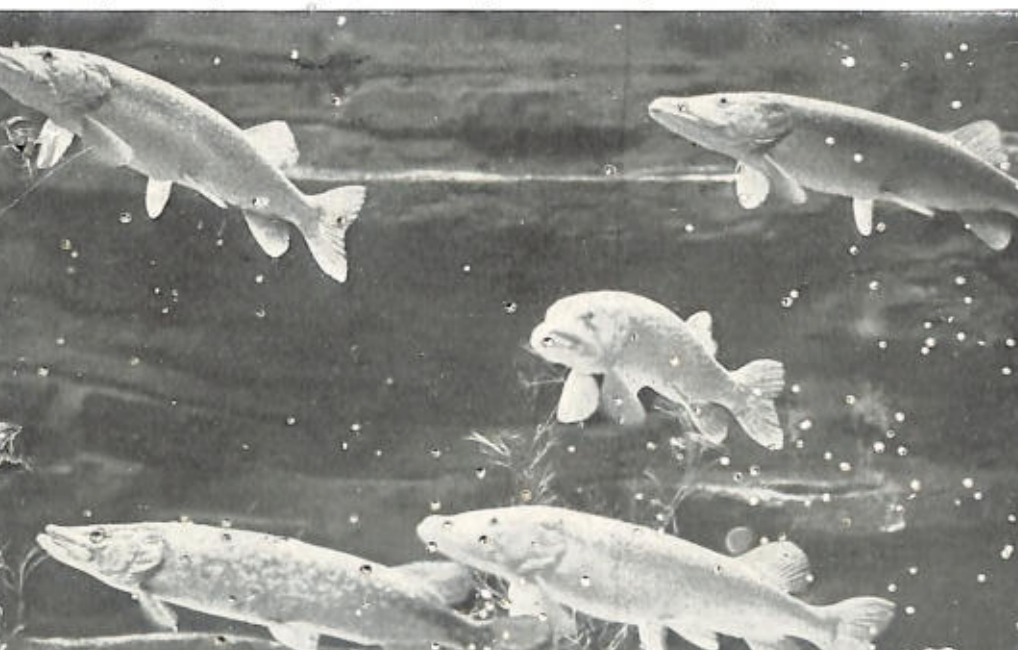
Though fish live in the water they need air as you and I do, but they breathe in a different way. A fish is always opening and shutting its mouth, taking in water and letting it out again, but it does not swallow any. Its breathing gills are just behind its eyes. The water flows over the gills, and they take in air out of the water for the fish to breathe.

Fish lay an enormous number of eggs, though a vast quantity never come to anything. It is said that if all the eggs of all the fish in the sea and rivers and streams were hatched, the water would be so full that there would be no room for the fish to move!

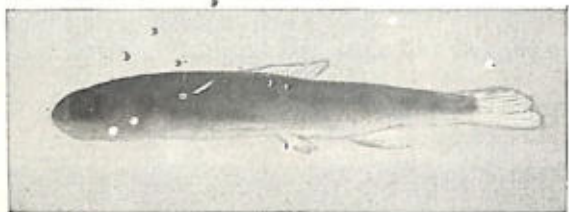
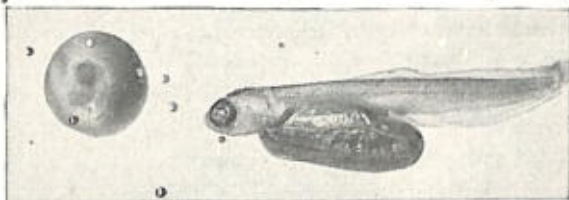
Some fish live to a great age. It is thought that Carp and Pike may live more than a hundred years.

Salmon, "the king of fish" as he has been called, and Trout provide excellent sport for fishermen. Salmon spend part of the year in the sea and part in the river. When the time comes for the Mother Salmon to lay their eggs they leave the sea and travel to some river to spawn.

*BELOW: The wicked-looking Pike are the greediest fish in the pond. They are a danger not only to other fish, but to Frogs and Voles and even larger creatures.*



When they enter the river they are in fine condition, fat with firm red flesh and silvery skin. They have been feeding hard and laying in stores of food to last them till after spawning time. Sometimes they take great leaps into the air and shoot over high waterfalls on their journeys. Often a fish will fail at first to jump to the swift smooth water above the waterfall, and be swept back to the bottom again in the swirl of water. But it tries again till at last it succeeds in its leap.



*When Salmon eggs are hatched they become tiny transparent fish, living on their egg-sac. After two years they follow their parents to the sea.*

When the Salmon arrive at the spawning place in a shallow part of the river, Mrs. Salmon lashes out a trough with her tail in the gravel or sand at the bottom of the river. She places her eggs in it, moving slowly up stream as she does so. Mr. Salmon stays near her and fiercely keeps off all intruders.

When once the many eggs have been laid, the parents leave them to

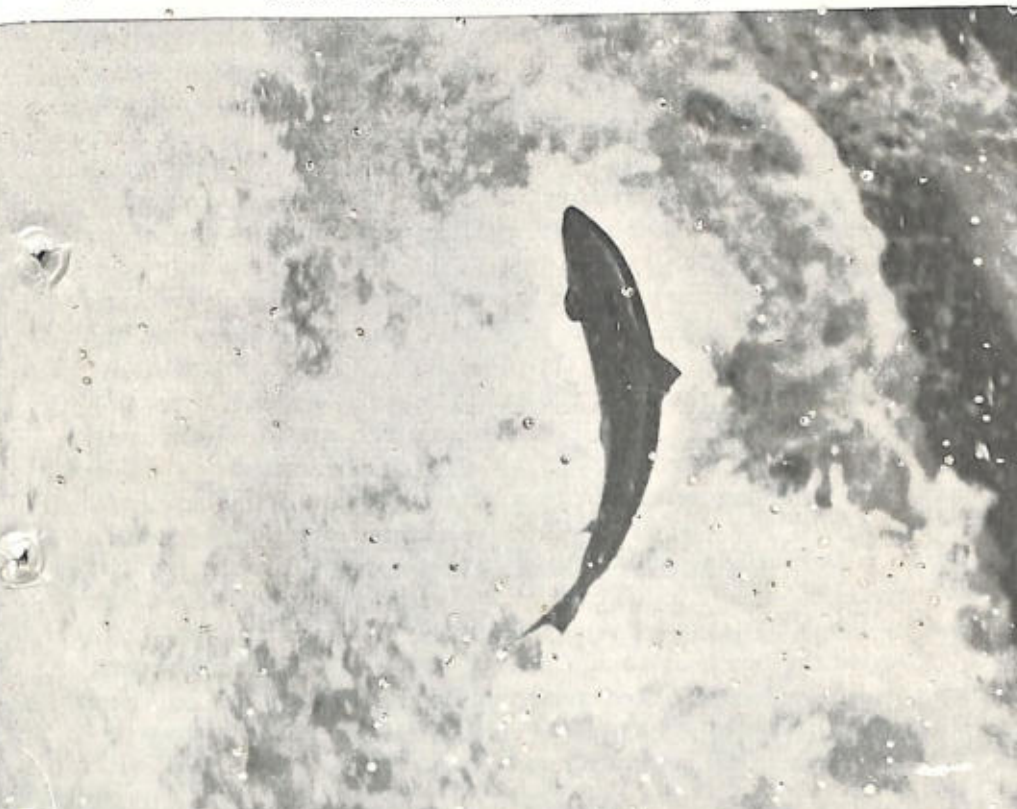
be hatched by the warmth of the river, and they themselves return before very long to the sea.

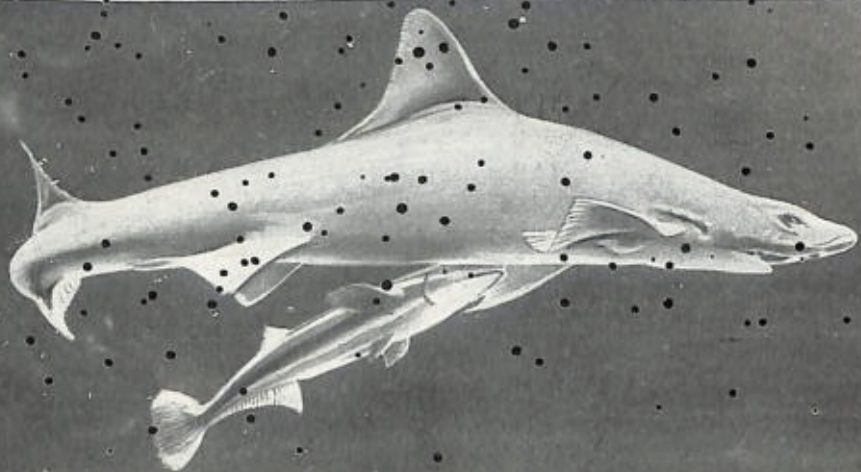
The young fry come out in early spring. A good many are snapped up by Eels, Pike, and certain fish-loving birds. Those which are left, known as "parr," feed and grow for about two years. Then they follow their parents to the sea. At this stage they are called "smolts." The next year many of them go up the rivers, and are known as "grilse." But many remain in the sea for two or three years, and grow to a great size.

The Salmon is a very greedy fish, and is supplied with a great array of teeth. As the young Salmon grows older it gradually loses some of its teeth, and a very old Salmon may have only one tooth left.

A very curious river fish is the Lampern, which looks rather like an Eel. It is sometimes called Seven Eyes, from a row of eye-like holes on the side of its throat. These holes are really the opening through which the water passes from the gills. It belongs to the same family as the Lamprey. The Latin name for the family is a word meaning Stone Sucker. Both Lamperns and Lampreys get this name from a habit of sticking firmly to stones by their mouths, by means of what is known as "suction." When they wish to scoop out hollows at the bottom of a stream in which to lay their eggs, if they find a stone in the way they will drag it quite a long distance downstream by their sucking mouths in order to get rid of it.

*BELOW: The amazing power of the Salmon's leap is demonstrated in this picture. When the Salmon leave the sea and ascend the rivers to their spawning ground no obstacle will hinder their determined progress.*





*Sharks sometimes take with them a pilot in the form of a Sucker which attaches itself to the larger fish and helps to guide it.*

The Lamprey spends most of its time in the sea, but goes up rivers for spawning about April or May. I have read that Lamperns as well as Lampreys are excellent for eating, and not poisonous as some suppose.

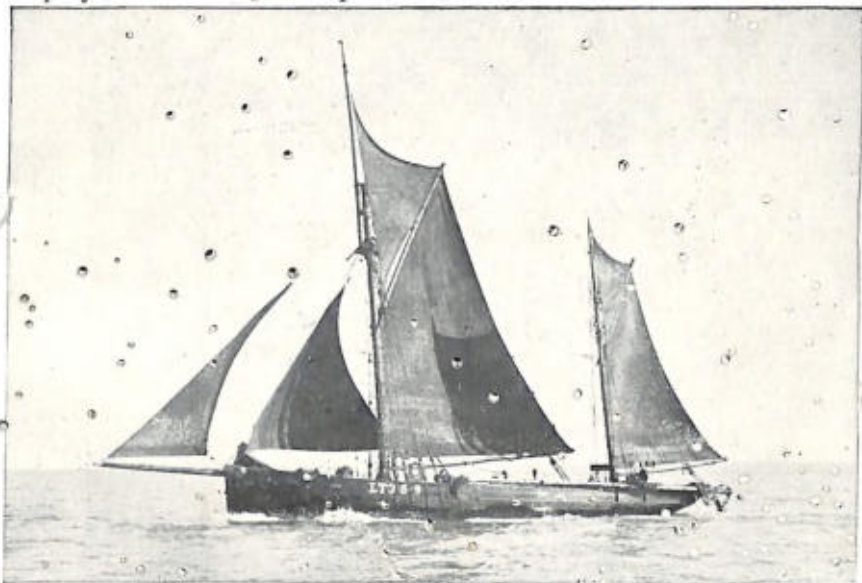
Many fresh water fishes besides Minnows belong to the Carp family, such as the Gudgeon, Roach, Dace and Bleak. Their pretty silvery scales make them pleasing little fish to keep in an aquarium.

A friend told me about a lady who had a square fish pond in her garden, with pink lilies and ten little Goldfish. When the lady went near the pond they thought she was bringing them food, and nine swam towards her at once. The tenth, who was more silvery and had a silvery tail, was attacked by the nine. So he set up a little solitary home in a corner of the pond, and had to be fed by himself.

Very different from these friendly little fish are the fierce, cruel Sharks. In the autumn of 1937 Basking Shark became very troublesome and even dangerous off some of our coasts. A message from Campbelltown, Argyllshire, told how Shark hunters who harpooned a Shark in Carnadale Bay, from a dinghy, were towed by the monster for twenty-eight hours. The Shark appeared to be more than thirty feet in length. There were three men in the dinghy when the Captain harpooned the Shark at 11 a.m. The creature set off at great speed, zigzagging under the water and dragging the dinghy after it. After some time it seemed to be heading for the open sea, but it turned and dragged the boat for several hours between Arcan and Mull.

Meanwhile the patrol boat to which the dinghy belonged, called the *Myrtle*, followed closely, and sent out a second dinghy. The three men rested in this second dinghy while the men from the *Myrtle* took their places. When dawn was breaking fire broke out on the *Myrtle*, and when the men on the *Myrtle* had succeeded in putting out the flames the dinghy had disappeared. An alarm was raised at a lighthouse, ships were warned, and three aeroplanes went in search of the lost boat. At last, at 3 p.m. on the day after the fight with the monster began, the Campbeltown lifeboat sighted the dinghy and brought the men ashore. The Shark had dragged them five miles south of Sanda, but when the lifeboat came alongside it was lying quite still and exhausted.

You know that Herring fishery is a very important industry. In the North Sea eighty to ninety nets are put out each night during the season from a fleet over one and a half mile long. About one hundred Yarmouth Herring boats and over four hundred Scottish boats are employed from Yarmouth port.



*Fishing smacks, with their trawl nets, set out to wage war on the creatures of the sea. Their bag-shaped nets are dragged along the sea-bottom.*



## SWIFT RUNNERS

*A stag of warrant, a stag, a stag,  
A runnable stag, a kingly crop,  
Brow, bay and tray and three on top,  
A stag, a runnable stag.*

JOHN DAVIDSON

THERE is a family of beautiful, swift and graceful creatures which carry horns (called antlers) on their heads—the various kinds of Deer, Red, Fallow, Elk, Musk Deer, Reindeer and others. Formerly Red Deer roamed about freely in forests and on moors in England. As late as the time of Queen Anne they were common in Wolmer Forest in Hampshire, and some were still to be found in Epping Forest fifty years ago. Now, however, they are very rarely to be seen except in Deer Parks, and in the Highlands and the Hebrides, and on the moor of Devon and Somerset.

If we think of the antlers as branches we may say that the so-called “tines” are the twigs on the branches. Sportsmen and Deer keepers speak of the brow tine, the bez tine, the trez or, royal tine, and the surroyal or crown. Except in the case of Reindeer, only the males have horns, which they shed every year. When the antlers have just been shed, some little velvety knobs soon appear on the upper part of the forehead, which gradually grow bigger and new antlers are formed. At first these are covered with very short velvety hairs. By the time that the new antlers are fully grown, the velvet becomes hard and dry and peels off, or the Deer rub it off against the stems or branches of trees.

Fossil antlers of Red Deer, much larger than any seen on living Deer, some being more than forty inches long, have been found in caverns in Europe. It is known that Reindeer once roamed wild in

OPPOSITE: *The kingly Deer, with his crown of antlers, presents a picture of grace and dignity. Only the males grow antlers, except in the Reindeer family.*

England as their bones have been found in Kent's Cavern near Torquay and other ancient caves.

During the pairing season, the end of September and beginning of October, the Stags have violent fights together, pushing each other with their horns and making a queer, hoarse grunting noise.

When Stags are hunted they will generally take to the water, and stand perhaps on a rock in the middle of a river where the Deerhounds cannot follow. So "the hart desireth the water brooks."

The Mother Deer will make her young lie down in the heather or fern by pressing it down with her nose, and will leave it hidden there during the day. But she is on the watch, and goes to its help if she thinks there is danger from a Wild Cat or a Fox. The fawn lies curled up like a Dog with its nose to its tail.

Fallow Deer, which are often kept in parks, are smaller than Red Deer and have shorter horns. Some are brown, but more often they are fawn or yellowish brown with large white spots. They are generally considered to make better venison than Red Deer. They are specially fond of horse chestnuts, which the bucks knock down from the branches with their antlers. They are also very fond of salt.

BELOW: *The Scottish Red Deer are found in herds among their native hills. Note their fine antlers which they will later shed.*



Deer, however, seem to have a greedy appetite for all sorts of strange things. They are reported to be ready to eat anything which is offered to them, and one deer is said to have devoured a gramophone record! Red Deer are known sometimes to eat their antlers after they are shed.



*The handsome Fallow Deer, with its short branched antlers and coat dappled with white on a fawn ground, is often to be seen in our great parks.*

A writer to a newspaper tells how when camping out one summer in Arundel Park, he was annoyed to find one morning that his

soap had disappeared, and his bucket was empty: Later he was told by some one living in the neighbourhood that the Deer in the Park made a practice of visiting any tents there and eating anything they could find, evidently looking on soap as a favourite titbit!

There are some very large Deer in North America, with huge horns, called Wapiti. The old Stags have a very loud roar, rather like the bray of a Donkey, and the traders in the Rocky Mountains call them Jackass Deer. A fight between two Wapiti Stags is an interesting sight to watch. A male comes near a band of hinds and makes a kind of challenging scream. The male leader of the ladies answers the challenge, and a furious battle begins, both Stags screaming, bellowing, grunting. The noise of their antlers clashing together may be heard a long way off, till one is killed, or feels himself vanquished and goes sadly away.

The pretty little Roedeer wander about in forests in Scotland, and are still to be seen occasionally in the Lake District and North of England, and in Surrey, Dorset, and Wiltshire. They are great jumpers, and will easily bound over a space of eight or ten yards, and



*The war-like Wapiti, or Elk, found in North America, gives forth a challenge to its enemies. Note its branched antlers.*

leap a wall six feet high. They like to roam about at night, and in very small companies, generally only a family party of buck and doe and their fawns.

Unlike most Deer, both males and females among the Reindeer have antlers. They are very valuable to the Laplanders, and in Lapland the most wealthy may possess a herd of a thousand, and the poorest about forty. They are tamed like Cattle, and are taught to draw sledges over the snow, and to carry men and heavy packages on their backs. In the waste dry places there is a kind of white lichen which the Reindeer feed on during the winter. If the lichen is covered with snow the animal scrapes the snow away with its head and nose and hoofs.

The Reindeer of North America is called Caribou. Reindeer have very broad hoofs, deeply cleft in the middle, which give them a good support when cantering over the snow.



*A host of Caribou fording the Yukon River: These handsome creatures, with their fine antlers, are a branch of the Reindeer family.*



## A TALK ABOUT GARDENS

*The Lord God planted a garden  
 In the first white days of the world,  
 And He set there an angel warden  
 In a garment of light unfurled.*

*So near to the peace of Heaven  
 The hawk might rest with the wren,  
 For there in the cool of the even  
 God walked with the first of men.*

*And I dream that these garden closes  
 With their glades and their sun-flecked sod  
 And their lilies and bowers of roses  
 Were laid by the hand of GOD.*

*The kiss of the sun for pardon,  
 The song of the birds for mirth,  
 One is nearer GOD's heart in a garden  
 Than anywhere else on earth.*

DOROTHY FRANCES GURNEY

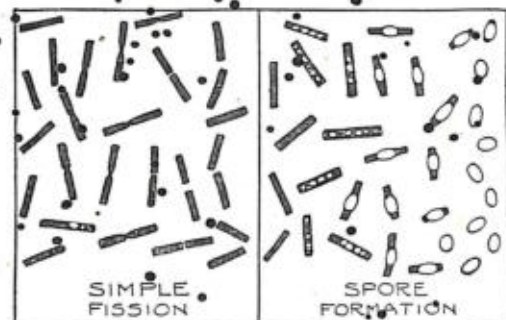
Do you work sometimes in your School garden? There is a garden belonging to a village school which I know well, and Reggie who works there has written a School Diary which I have been allowed to see. He tells me a good deal about the soil in which plants grow.

According to Reggie there are twelve compositions which go to make up soil. The four most important, if you leave out water, are nitrogen, potash, phosphoric acid, and lime. Without these we cannot expect good crops. But all kinds of plants do not need them in the same quantities. He says that extra nitrogen is needed for leaf and stem crops, such as Cabbages, Lettuces, Spinach, Celery, Rhubarb, and

OPPOSITE: *There is nothing more pleasant in the world than a garden that has been carefully planned and yet does not distort Nature. In this chapter we learn how to make the best of our gardens, and what to grow in them.*

Asparagus. Extra potash for root crops such as Potatoes, Parsnips, Beet, Carrots. Extra phosphoric acid for fruit and flower crops, and Peas and Beans.

The other compositions are silica, alumina, soda, chlorine, sulphuric acid, iron, and magnesia.



*Bacteria reproduce mainly by splitting in two, but sometimes they multiply by shedding spores developed within the parent organism.*

Bacteria cannot do their work. What does that mean? Well, Bacteria are very tiny members of the Fungus family, so small that it is said that one hundred and twenty thousand would cover a printed full stop in an ordinary book, and two thousand millions could be lodged in a teaspoon. Some of these microbes are very harmful and cause diseases. But there are many others which are good and useful. And some of the good Bacteria help the plants to get their food out of the soil and the air. For instance they get carbon for them out of carbon dioxide and nitrogen from ammonia.

Reggie gives a list of plants called "leguminous plants." They are Clover, Beans, Peas, Furze, Broom, Acacia, Laburnum. These have little nodules on their roots filled with colonies of microbes, which supply the plants with the nitrogen which they need.

Reggie gives a recipe for testing the amount of lime in the soil. Collect a handful of soil and spread it on a window ledge indoors and let it dry. Then break up some of the soil as finely as possible and put it in a tumbler. Pour over it carefully an ounce of hydrochloric acid and watch. If the mixture froths and bubbles the soil is rich in

lime. Reggie has a great deal to say about lime, which farmers and gardeners say "sweetens the soil." This means that a limed clay allows water to drain off, so that the field or garden bed will not become water-logged. Also lime makes the land less sticky so that it is easier to cultivate.

Moreover, if there is not enough lime in the soil, the

lime. If there is little or no bubbling the soil has not enough lime and this should be put right. Lime can be added to the soil as quicklime, ground lime, ground chalk, and basic slag.

Reggie has a good deal to say about the "rotation of crops," which simply means that after one kind of crop—say Cabbage—has been grown in a garden plot for a certain length of time a change should be made, and a different kind of crop—say, Beet—should take its place.

Here is one reason for changing crops about in a "Puss in the Corner" fashion. When one crop has taken a great deal of one sort of nourishment out of the soil, for instance sodium or potash, it is good that it should be followed by a different crop needing more of another kind of nourishment, say sulphur or phosphate.

Another reason is this. Particular weeds infest certain crops. If the same crop is grown in a plot year after year these weeds increase and become stronger and stronger. Seeds may lie sleeping for many years and then blossom if the soil is disturbed. In 1901 a large rabbit warren on a hill in Oxfordshire was dug and levelled for Yeomanry manœuvres. The next year the whole surface was covered with Yellow Charlock. And in 1903 it was white with White Campion. The seeds of both kinds of plants must have been buried and left undisturbed for an unknown number of years, and then come to life when the soil was dug over.

There is a third reason for rotating crops. Each time that



*The garden Pea is included in the crop rotation system because of the swarms of bacteria found in the nodules at the root, which enrich the soil.*

the crop is changed, the soil must be dug over, hoed or trenched. And of course the crops are much more likely to flourish if fresh soil is constantly brought to the surface.

Here is Reggie's plan for cropping during two years. In 1937, Shallots, Carrots, Parsnips, Onions, Beetroot, early Peas, late Potatoes, Cabbage, early Potatoes, late Peas, Brussels Sprouts, Broad Beans, Cauliflower, Dwarf Beans, Lettuce, Marrow, Radish, Runner Beans, Savcys, Turnips, Leeks, Parsley. In 1938 the crops are planned for in the opposite order, beginning with Parsley to be planted where Shallots had been, and ending with Shallots to take the place of Parsley.

I see in the diary an explanation of the difference between digging and trenching. Digging means breaking up the land with a spade or fork to a depth of ten inches, which gardeners call "one spit." If the land is disturbed to a greater depth, for instance two "spits" or about twenty inches, the work is called trenching.

Some one has said that a good gardener treats his land as a Cat her kittens, cleaning and feeding it!

Necessary tools for every garden are, a spade, fork, hoe, garden line for measuring, and wheelbarrow. It is important to keep the spade, fork and hoe clean and bright, and not to put them away with soil clinging to them. Perhaps you know that there is a right and a

**BELOW:** *This picture shows the Runner Bean beginning to grow. First the radicle pushes down to form the root, and then the plumule reaches up to form the stalk.*



wrong way of handling a spade? You may find it useful to take a lesson in digging from an experienced gardener or farmer. One good rule is, do not kick or push the spade, but use the weight of your body to press it into the earth.

In old days, before the plough was invented, all land needed for cultivation was broken up by hand, as is still the case in certain lands where ploughing is unknown.

Why must soil be ploughed, dug, or in some other way broken up? In order to get it ready for the weather—sunshine, rain and air—to do their work. All soil came in the first place from the crumbling of rocks, or “weathering” as it is called. A piece of rock might be split by strong sunshine or intense cold. The split widened, especially if ice crept in and stretched it. And water might slowly melt the rock. Thus through centuries rocks have gradually crumbled away and given us our garden soil and the good land in which we grow our corn. It is interesting also to note that rotted vegetation, such as leaf manure, has taken something out of the soil and then put back something into the soil to feed the plants which follow it.

I have read this little story, which reminds me of “the House that Jack built”! A man found that the Trout in a large pond in his grounds were not doing well. He threw into it cuttings from his Grass lawn. The Grass was promptly attacked by Bacteria, which caused the Grass to decay, while they themselves flourished greatly. But presently the living specks called Infusoria began to eat them. The Infusoria in



*Pansies, with their gay faces and rich colouring, are welcome visitors to any garden.*



*The handsome Gladiolus lends grace to its surroundings. The hardy Chrysanthemum (right) brightens up the autumn days with its feathery beauty.*

turn were eaten by Water Fleas. The Water Fleas made excellent food for the young Trout. And so the Trout flourished once more.

Reggie does not say anything about flowers, but here are a few hints if a corner of your school garden is given up to flowers, or if you have a small flower garden of your own. In the spring you may sow Sweet Peas, Mignonette, pink Hawkweed, Stocks, Love-in-a-mist, Snowdrops, Phlox, Larkspur, Pansies. Mignonette and Love-in-a-mist grow best on chalky soil. About May Canterbury Bells can be sown, with Sweet William, Honesty and Wallflower. In June, Forget-me-nots, in July seeds of Pinks; but Pinks can also be spread by cuttings or "pipings." Hardy Annuals may be sown in June, such as Poppies, Larkspur, and Pot Marigold, to follow the spring flowers which are taken up, and to fill bare places. October to November is the best time for planting Tulips. Roses can be planted from October to March, but perhaps November is the best time.

You know that the grand landscape gardens belonging to large houses or Parks, or at Kew, have forest trees and ornamental shrubs, as



*The Snapdragon, which used to grow wild on the hedgerows, has now been cultivated as a garden flower. The picture above shows a fine sturdy specimen.*



*The Rhododendron is a foreign visitor which was brought to England in the seventeenth century. There are many colors varying from white to purple.*

well as flower-beds. We have thought about some of the large forest trees. We may think now about some beautiful shrubs and bushes to be found in large gardens. There is the Tree of Heaven, with beautiful red winged fruits and handsome long leaves. No doubt you know the Almond Tree which has pretty pink blossoms in spring. There is the curious Araucaria or Monkey Puzzle which will grow fifty to a hundred feet high, and makes a good effect. The various kinds of Barberry have differently coloured flowers. Buddleia, the Orange Bali Tree, has bright honey-coloured heads and smells deliciously. Scarlet Dogwood has beautiful dark red leaves in autumn. One kind of Deutzia has rose-coloured flowers, another pink, and another white. Forsythia with its yellow blossoms is a graceful shrub. There are various kinds of Spiraea, with dark red, rose-coloured, white, and yellow flowers. The Guelder Rose is a strong little shrub, of which the Snowball Tree is a double variety.

Of course these are only a few of the many ornamental shrubs to be seen in large gardens. You may discover others for yourselves in public gardens and parks.

BELOW: *The lovely Guelder Rose, with its clusters of small creamy flowers, grows sturdily in almost any soil, and later on gives a brave show of red berries.*





SCULPTURE AND BURIED  
TREASURE

*There rolls the deep where grew the tree,  
O earth, what changs hast thou sear!  
There where the long street roars, hath been  
The stillness of the central sea.*

TENNYSON

WE have thought about rocks crumbling and giving us our garden soil, and earth in which to grow our crops. You remember how we spoke about the "weathering" of rocks, the work of rain and water and ice. This kind of work has been going on through thousands of years. Rivers and rain and ice have been like sculptors carving out the face of the earth. And in many places they are still slowly changing it.

You know if you are in a street after a heavy shower you see a dirty stream rushing along the gutters. The mud in the water is simply dirt washed off the roofs of the houses and the stones in the streets. In the same way a heavy shower falling on a field washes off some of the soil and carries it off to the nearest stream, and the stream passes it on to the river. In our own country the rain is very seldom violent enough to carry a great quantity of earth, though this sometimes happens in the Tropics. But sometimes—in Wales and Cumberland for instance—we hear of deluges tearing up rocks and sweeping everything before them.

Moreover, rain water, mixed with carbonic acid from the air and the soil, is able very slowly to dissolve or melt all kinds of limestone rocks, from the softest chalk to the hardest marble. Thus through long centuries water has hollowed out caves and gorges and changed the face of the rocks.

OPPOSITE: *Nature, the best of all craftsmen, has designed scenes whose beauty surpasses anything that man can imagine. At Swallow Falls, in Wales, the graceful rush of water over a rocky river bed makes a perfect picture.*

Water flowing through limestone districts generally takes up carbonate of lime. If you go to Matlock in Derbyshire, or Knaresborough in Yorkshire you will be shown all kinds of objects, a bird's nest, a man's hat, a handkerchief, and other things, which look as if they have been turned into stone. You will be told that they have been "petrified" by the dripping springs. But the water has not really turned them into stone. It has simply covered them with a crust of carbonate of lime which it has picked up from the rock over which it flows.

In the same way certain mineral springs are charged with sulphate of magnesium, salts of iron, and other matters. These make them health-giving, as at Bath, Harrogate, and other health resorts where invalids go to bathe and drink the waters.

Rain, rivers, and running water take a great part in carving out the land. But perhaps ice bears an even greater part than unfrozen water. You know how in a very severe winter the frost may burst the pipes in a house. And in the same way ice acts like a ploughshare and breaks up the ground. And it is also a chisel, cutting out the rocks by slow degrees.

If you travel in Switzerland you may see rivers of ice called glaciers. I think we may say that a glacier is formed in much the same way as a snowball is made. You know how when you are making a snowball you begin by squeezing a lump of snow in your hand and then you roll it along and it gathers up more and more snow as it travels. Well, the upper piles of snow on the mountain-tops press down and squeeze out the lower piles, turn them into ice and send them sliding down into the valleys as frozen rivers or glaciers.

Travellers tell us that the beauty of the Mer de Glace (Ice Sea) near Chamounix in Switzerland cannot be described in words. You see toothed crags, snowy rocks, huge precipices, and Mont Blanc in the distance, reflecting rosy colours over the snow when the sun is setting. All around you are great glaciers, flowing slowly and without any sound, regularly marked or veined with beautiful ribbon-like markings.

OPPOSITE: *The beauty of frozen ice and snow, which gradually changes the face of the landscape, is displayed in this view of the Mer de Glace, in Switzerland.*



We cannot see a glacier moving, however closely we watch, but it is moving as surely as the hour hand of a wound up watch is moving though it seems to be still. And those who have studied and measured tell us that it travels more rapidly at the middle than at the sides, and at the surface than beneath. This is because at the middle and at the surface it is not hindered by its rocky sides or its rough bed.

If a glacier flows down a very steep slope the ice becomes very much broken, and sometimes it is torn into great openings or crevasses, often hundreds of yards long and hundreds of feet deep. Often these crevasses glitter like fairy palaces, with walls of lovely blue ice. And huge granite boulders are scattered about, as if a giant had been playing at ball.

Sometimes torrents flow under the glaciers with a murmuring sound. There may come a roar like distant thunder when some great pyramid of ice gives way through the melting of the snow and comes crashing down. A great quantity of snow—an avalanche as it is called—may come leaping down from crag to crag, sometimes working fearful destruction and burying whole villages.

BELOW: *The hardy little Violet may be found blooming near the regions of ice and snow as happily as though it were in a sheltered garden.*



But in the lower regions of the Alpine glaciers you would find many lovely flowers, some perhaps on the very edge of the ice—Gentian, Pasque, Anemone, Veronica, Violets, Moss Campion, Soldanella, Crocus.

Many large rivers, such as the Rhine, the Rhône, and the Ganges, may be traced back to

muddy streams coming out from glaciers. We may also notice that the largest number of people are gathered together near the mouths of great rivers, such as the Ganges, the Nile, the Thames, the Mersey, particularly where the rivers make the surrounding land fertile.

The fine stones and gravel which the glacier carries along polish and scratch the surface of the rock over which it flows. Thus, as one writer puts it, "it is as though some giant hand had rubbed the surface of the rock with fine emery powder, and at the same time rasped it with a huge file."

In many parts of our own land we can see traces of the work done by glaciers which have long since disappeared. In Scotland, Ireland, Cumberland, North Wales, and Cornwall, for instance, we may come upon great stones called "perched rocks." They have been left by the ice oddly poised on the very edge of a precipice, or balanced on some sharp point of rock, looking as if a giant might easily topple it over if he so desired. Or we may notice flat-domed hummocks of rock called "roches moutonnées." Often too we may see "ice scratches" and markings upon old rocks. And sometimes we may find markings showing that the land was once under an icy sea, and that icebergs thousands of years ago had thrown down stores and boulders on the rocky floor.

Arctic explorers and sailors in the Polar Seas come across great



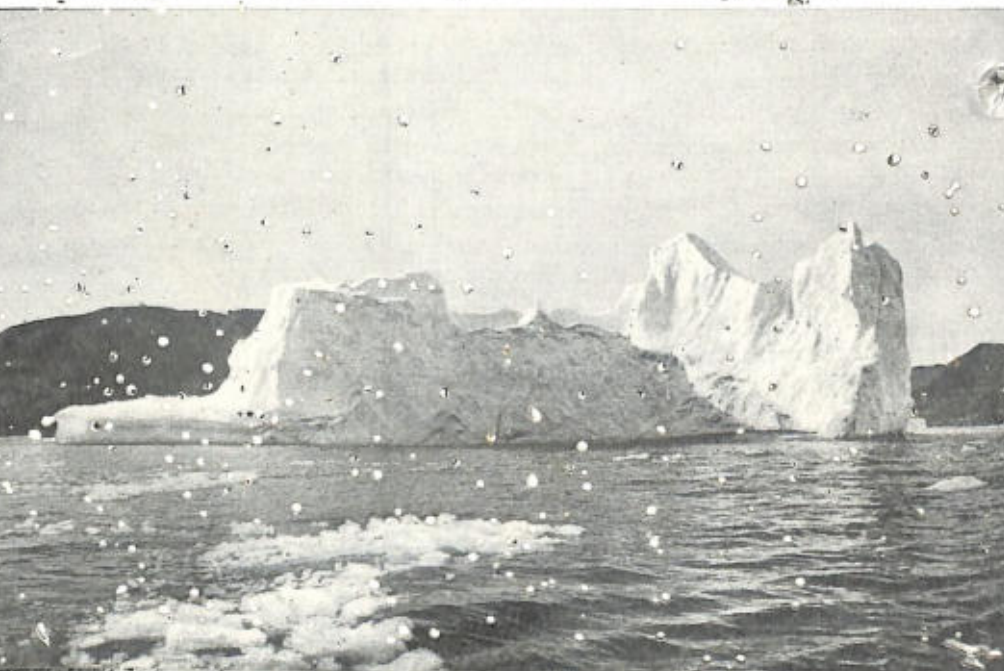
*The crocus, a welcome visitor which grows wild on the Alps, makes a bright patch in many gardens.*

icebergs—ice mountains—often as much as 750 feet high and taking all sorts of shapes such as church spires, Gothic towers or minarets. Sometimes they are carried along by a current under the ice and break through it with a great booming sound. Bears may be seen riding on the icebergs, using them as snips of passage.

We spoke just now of markings on certain rocks showing that what in some parts is now land was once under the sea. Again in certain places the sea covers what was once dry land. Besides studying the markings on rocks, we learn about these changes from fossils. Bones and shells of sea animals and traces of sea plants are found in rocks, and below the surface of the earth, and in quarries. Sea shells and Corals have been found at a great height on the Alps and Andes and Himalaya Mountains. Many limestones are almost made up of the joints of certain sea animals called Stone Lilies.

Paris is built over chalk, and this chalk is formed chiefly of the remains of very tiny animals, like those which form the ooze, at the bottom of the Atlantic. The ooze, or yellow mud, is made up of the

*The iceberg in the picture is 750 feet high and 600 feet long. Note the ice which has broken away from it as it melts. Icebergs often bring down rocks fast in their frozen masses, and when they melt the rocks fall into the sea or are dropped along the coasts.*





*Here is a picture of some large fossil Sea Lilies found in Swabian Jura. These lilies, now turned into stone, were between six and nine feet long when they were growing. They bloomed on the earth long before it was inhabited by animal life.*

broken or crumbling shells of the same tiny sea animals. (The chalk used for writing on blackboards is a composition and not "natural" chalk.)

We find an instance of the sea swallowing up the dry land at Winchelsea, in Sussex. Winchelsea is one of the Cinque Ports, and was a large and flourishing place in the Middle Ages. But in the thirteenth century the sea came in and flooded the town three times. In 1276, when this happened for the third time, Old Winchelsea was completely covered by the sea and lost. As an old writer recorded, "On the second of the nones of February the sea in the Isle of Thanet rose and swelled so high, and in the marsh of Rominal, that it brake all the walls, and drowned all the ground: so that from the Great Wall of Appledore as far as Winchelsey toward the S. and W., all the land lay under the water lost." The present town, New Winchelsea, was afterwards built on a hill overlooking the sea.

Speaking of fossils, we need not go farther than our coal scuttle to see what may fairly be called a fossil! For coal is really made up of the remains of the plants of past ages. It comes from a time when here and



*The spores of the Club Moss, seen above, contain medical properties.*

in many other parts of the world there were vast forests full of strange plants. There were giant Tree Ferns in those coal forests, and scaly trees like giant Club Mosses, called Lepidodendron, with huge cones, and trunks sometimes 100 feet long. Clouds of yellow spores (seeds) may be shaken now from a branch of Club Moss, or "Lycopodium." Chemists roll pills in these spores. Imagine these Club Mosses grown into tall trees, and their thousands of spores very much larger than the spores of Club Mosses now. Picture to yourself showers of great spores falling from these Club Moss Trees, and mixing with the fallen fronds of the Tree Ferns, thus forming thick

soil. Then through the long centuries this soil became pressed down, sinking under the sea to be raised again, perhaps many times, and in time buried under sand and mud. At last it became pressed together into the coal which we burn on our fires to-day.

We know about these forests because bones of animals, and parts of hardened or fossilised plants, have been dug up in coalfields. The microscope shows the spores and spore cases of the Club Mosses, parts of stems, leaves and seeds, when thin slices of coal or shale are placed under a strong lens.

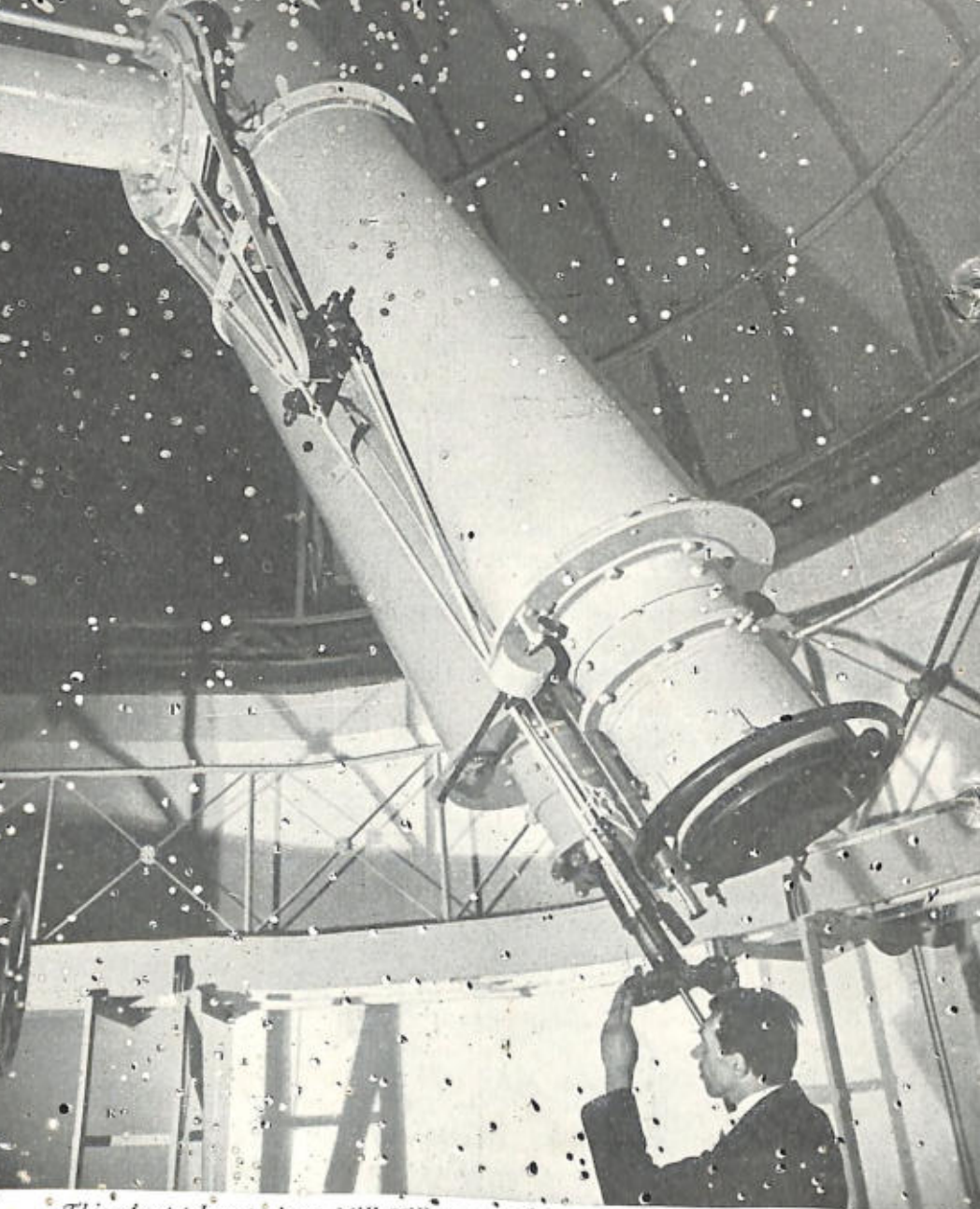
Fossil remains of animals, such as Ammonites, Sea Urchins, and the remains of Lizards, Snails, Fish, Butterflies and other insects, have been found in rocks, as well as the bones and sometimes whole skeletons of huge animals long ago extinct. You may see some of these gigantic skeletons in the Natural History Museum in London. On the whole the animal fossils are more numerous than the fossils of flowers and other parts of plants. The simplest forms are found in the oldest rocks.



*We can tell, from fossil remains, that prehistoric monsters, like the Dinosaur above, inhabited the earth in bygone days.*



*The fantastic creature shown above is a Brontosaurus which lived at the same time as the Dinosaur. On the right is the fossilised remains of an Ammonite, a marine mollusc that is now extinct.*



*This giant telescope is at Mill Hill near Hendon Aerodrome. Notice how the dome of the observatory has been slid back, so that the astronomer is gazing into the depths of the night.*

## A JOURNEY TO THE HEAVENLY BODIES

*Look how the floor of heaven  
Is thick inlaid with patines of bright gold:  
There's not the smallest orb which thou behold'st  
But in his motion like an angel sings,  
Still quiring to the young-eyed cherubins.*

SHAKESPEARE

*Lo, these are but the outskirts of His ways, but the  
thunder of His power who can understand?*

BOOK OF JOB

SHALL we take a long journey to-day in a magic aeroplane? We will travel right away from our Earth and pay a visit first to the Moon. How strange everything looks as we pass out of the Earth's atmosphere! All is sharp and clear cut, either light or dark, with no shade. The sun is a bluish globe of light set in a jet black sky.

Now as we come up to the Moon we find that she is a dead world. She has no atmosphere, no air, no water, no towers, no trees, no living creatures. What has become of the seas which we have seen marked in lunar maps? Sea of Tranquillity, Sea of Showers, Bay of Rainbows, and the like?

Well, they were named by astronomers who thought that there were seas as well as mountains in the Moon. But now better telescopes have shown that what were thought to be seas are really plains scattered over with ring-shaped hollows or craters. There are also many mountains, of which at least six are more than two thousand feet high. Many of them have been named after mountains on the Earth, so we have Lunar Alps, Lunar Apennines, and so on.

If only there were air to breathe we should find that we could climb the mountains with ease. As the Moon is much less heavy than the Earth she does not pull things down with the same "force of gravitation." If a man could jump four feet on the Earth he could

## THE NEW MOON



NEW    1<sup>ST</sup> QUARTER    FULL    3<sup>RD</sup> QUARTER    OLD

*The Moon goes round the Earth and they both go round the Sun. When the Moon is in such a position behind the Earth that the Sun cannot light the side we see, there is "no Moon." Little by little, however, the "face" of the Moon is lit up until when the Sun is able to light up all the side we see, we have a "full Moon."*

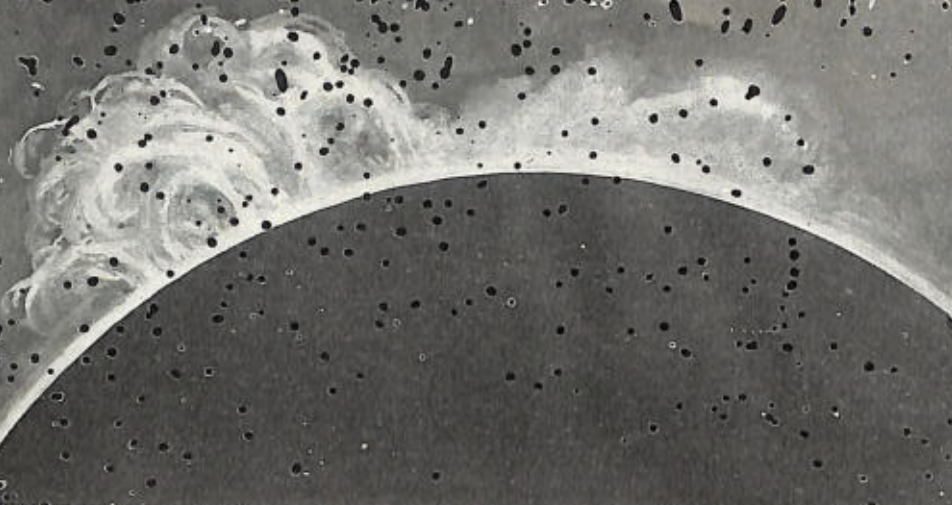
jump twenty-four feet on the Moon. If he could carry one sack on the Earth he could carry with exactly the same effort six on the Moon. A cricketer who can throw a ball a hundred yards here could send it six hundred yards on the Moon. A mountaineer could scale six times the height which he can climb here with no greater effort.

We must thank "Lady Moon" for causing the ocean tides to ebb and flow, for we owe the tides mainly to her attraction. As a writer has expressed it, "If the moon were suddenly struck out of existence, we should immediately be apprised of the fact by a wail from every seaport in the kingdom. From London and from Liverpool we should hear the same story—the rise and fall of the tide had almost ceased. The ship in dock could not get out. The ships outside could not get in. The maritime commerce of the world would be thrown into dire confusion."

You know that the Moon shines with light reflected on her from the Sun, and also by reflected light from our Earth. When there is a "New Moon" we see a thin wisp-like crescent shining brightly.



*The Moon faithfully travels round our Earth and always shows the same half to our gaze. On the surface we see black patches which we imagine resemble a face. In the bottom picture you see a photograph of the craters on the Moon's surface.*



*The Sun is a large burning mass with hot gases rising from its surface like flames. During an eclipse of the Sun, these flames may be seen through a telescope.*

We can also see a faint dark outline of the rest of the round Moon, "the Old Moon in the Young Moon's arms" as we say. The crescent shines with light reflected from the Sun, but the rest of the Moon can just be seen because of earthlight falling upon it.

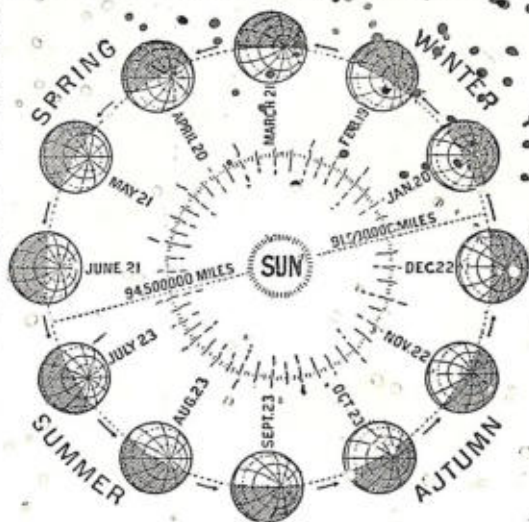
It is time that our magic aeroplane took us onwards towards the Sun, and now we find ourselves close to the little planet Mercury. Our Sun has nine planets journeying around him. He is the king of the family called the "solar system," and our Earth is one of his subjects. Mercury is the smallest planet, and the nearest to the Sun, rushing round him in eighty-eight days. So that if you lived on Mercury you would have a birthday about every three months! But you certainly could not live on Mercury, for he is so close to the Sun that everything on the side nearest to the Sun must be in a state of boiling heat.

Well, here we are at the Sun. How far have we travelled? Astronomers tell us that the Sun is ninety-three million miles from the Earth. It is very difficult to picture to ourselves what this distance means. Think of it in this way. Light travels 186,000 miles a second and it takes about eight and a quarter minutes to reach us. Or to put it in another way. If an express train travelling sixty miles an hour left the Sun for the Earth in the reign of Queen Elizabeth I it would not be here yet, indeed it would not arrive till about 1970. If we touch a

red hot plate we quickly take our fingers away, yet our fingers are burnt because it takes a certain time (of course very short) for a message to travel from the fingers to the brain; and the brain tells us to remove our fingers. Now let us pretend that a man could stretch out a long arm and touch the Sun. A message travels 93 million miles along his arm to his brain telling him to move his arm or it will be burnt. But the man would have his hand on the Sun more than a hundred years before the message could reach him to tell him that it was burning.

What a rumbling and rolling and thundering we hear as we approach the Sun! Evidently we are arriving just when a mighty storm is taking place on its surface, and the Sun is throwing out gigantic flames of molten gas, which astronomers call prominences. They see and photograph these prominences during eclipses. One which was photographed in 1919 looked like a giant Ant-Eater, 250,000 miles from snout to tail. (We may remember that Mount Everest, the highest mountain on our Earth, is only five and a half miles high.) This giant looked as if it might gulp down the whole Earth like a pill. Then it seemed to raise its snout and tail off the surface of the Sun, then to grow more legs, and start to jump upwards. It jumped to 475,000 miles, after which the Sun set and the onlookers could not watch it any more.

Perhaps we shall see some "sunspots," and we shall find that they



*The diagram above illustrates how we get our seasons. Note where the lines meet on the Earth. That is the North Pole. We live in the Northern Hemisphere, so when the North is slanting towards the Sun we have longer days and more Sun. When the North Pole slants away we have shorter days.*

are not "spots" at all, but huge rents or crevasses in the envelope of gas which seems to wrap him round. One of these so-called spots was calculated to be 75,000 miles across and 150,000 miles deep.

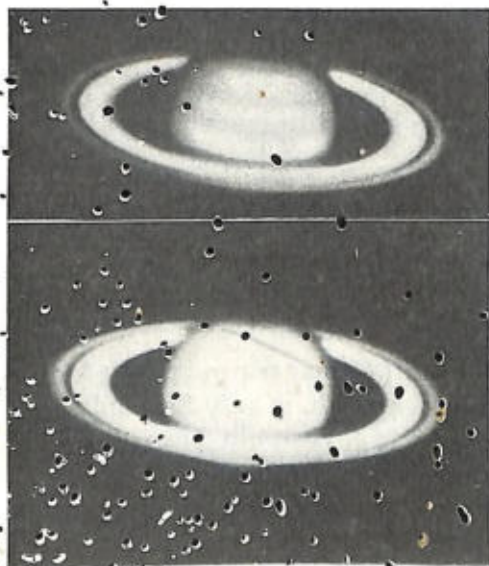
And how large is the Sun himself? We should have to bring together about a million Earths to equal him in size, and he weighs about 332,000 times as much as the Earth. So a man on the Sun would simply lie on the ground, unable to rise, overcome by his own weight.

Now we visit the other planets. Our nearest neighbour is the beautiful Venus, which is much the same size as our Earth. The red planet Mars is smaller, and various markings can be seen through telescopes, which some think may be canals made by human beings. Mars has two moons.

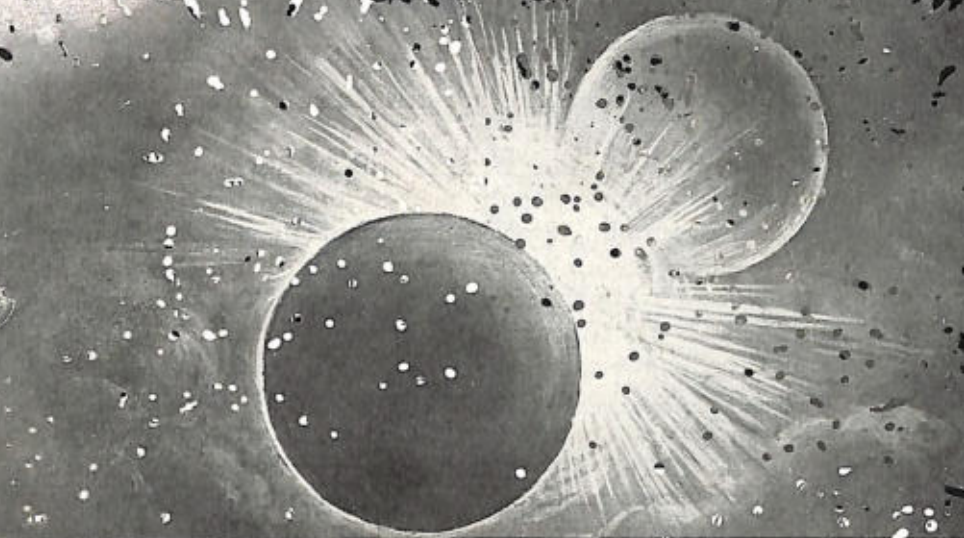
Our magic journey has led us on to the largest of the group, the giant Jupiter. He is 1312 times bulkier than our own Earth, and weighs about 310 times as much. He marches majestically round the sun in about eleven years and ten months of our time. He has twelve moons.

The next largest, Saturn, is specially interesting because as well as having nine moons, he has three curious rings constantly spinning round him. It is thought that these rings are made up of quantities of miniature moons, or of one moon broken up into fragments.

But we have not yet come to the end of our magic journey to the planets. For hundreds of years astronomers knew nothing of any planet beyond Saturn. At length, in 1781, the famous William Herschel discovered that there was another huge



*Saturn has rings running round him as seen in the above pictures.*



*Picture of how planets may be born. Two stars pass very close to each other and some of their hot gas is drawn away; it would then cool and form solid planets which would travel around one of the stars.*

planet. Though it is so large it had not been seen till then, because it is so many millions of miles away. This planet is named Uranus, and it is now known that he has four moons. He travels round the Sun in eighty-four years.

In 1846 two astronomers, an Englishman named Adams and a Frenchman named Le Verrier, were hard at work trying to find yet another planet. They were certain, after observing the path of Uranus very carefully and noticing how irregularly he travelled, that some heavy body was drawing him out of his regular path. After very deep calculations both men settled upon one particular part of the heavens to search with their great telescopes. There sure enough; almost at the same moment, one observer in England and the other in France, they found another huge far-away planet. This planet is called Neptune, and he has two moons.

In 1930, in the same kind of way, yet another planet was discovered and given the name of Pluto. He is about forty times as far from the sun as we are, and marches round him in 248 years of our time. Who knows what more may be discovered beyond Pluto in the years to come?

Besides these nine chief planets and their moons, there are many

smaller planets, called planetoids or asteroids, ruled over and lighted by our Sun.

But if our magic aeroplane takes us still farther on our journey, we shall find that our Sun is only one star among myriads of stars, many larger than our Sun. Probably many have planets of their own. We can tell a planet from a star if we remember that a planet shines with a steady light, while the rhyme which begins "Twinkle, twinkle, little star" tells us quite correctly how a star shines.

The most brilliant star to our eyes is Sirius, in the constellation Canis Major (The Greater Dog). The splendid constellation Orion has two stars brilliant enough to be called "of the first magnitude," Betgeuse and Rigel, and five others of the second magnitude. There are about twenty stars north of the Equator of the first, and about 3,200 of the sixth magnitude. Altogether about 5,000 that can be seen without a telescope. The greatest telescopes can show stars to the eighteenth magnitude. But photographic plates bring to light

thousands more which cannot be seen through telescopes. Indeed astronomers tell us that there may be as many stars in the universe, not to be photographed or numbered, as there are grains of sand on every seashore in the world.

And besides the stars there are the mysterious "nebulae," or dust clouds, masses of bright gassy matter. They are plainly seen in some parts of the sky, as for instance in the great nebula of Orion. Some parts of the sky are richer in stars than others. There is a fine star cluster, as it is



*The nebula of Orion.*

called, in Hercules and another in the Milky Way. All these stars and "nebulae" which we see are, however, parts of the star-island or "galaxy" in which we live and astronomers have seen millions of other such galaxies, many very like our own.

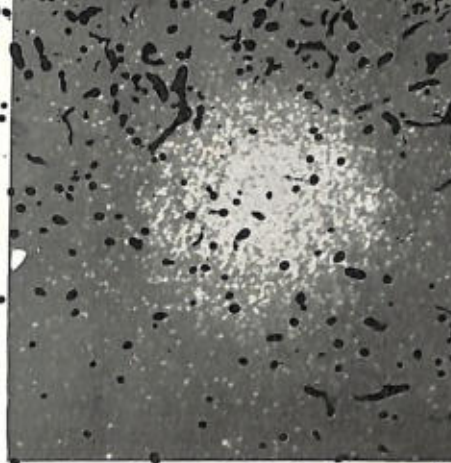
We said that light, travelling 186,000 miles a second, takes about eight and a quarter minutes to reach us from the Sun. But how long does it take to travel to us from the stars? From some of the nearest, four, fourteen, or even twenty years.

From the more distant millions of years. Thus the light which we see shining to-night from some of the stars may have left those stars when Queen Victoria was being crowned, or when Magna Carta was being signed, or even millions of years before the first Christmas at Bethlehem.

Long years ago a Psalmist exclaimed:—

"When I consider Thy heavens, the work of Thy fingers,  
The moon and the stars which Thou hast ordained,  
What is man, that Thou art mindful of him,  
And the son of man that Thou visitest him!"

And we, who know more about the stars than he could have known, may well echo the words. And we know that He Who has "set His glory above the heavens," and from Whom all life comes, is our GOD and Father, and that GOD is Love. He has made us for Himself, that we may love and worship Him, and our hope is that one day "we shall be like Him, for we shall see Him as He is."



*Here is a photograph of a Star Cluster. It contains thousands of stars packed much more closely together in space than is usual.*

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