THE RING
OF NATURE

G. G. DESMOND

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THE RING OF NATURE

AT THE GATE OF THE YEAR

THE RING OF NATURE

BY
G. G. DESMOND

WITH FOUR ILLUSTRATIONS BY
J. LEY PETHYBRIDGE

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THE
RING OF KATHARU
IN
OF A DREAM

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TO
A. G. GARDINER
EDITOR OF
'THE DAILY NEWS AND LEADER'
BUT FOR WHOSE ENCOURAGEMENT
DURING THE LAST TEN YEARS
THIS BOOK WOULD NOT HAVE
BEEN WRITTEN

908758

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THE RING OF NATURE

JANUARY

I

WAKING AND SLEEPING

‘Dreaming when Dawn’s left hand was in the sky,
I heard a Voice within the Tavern cry,
Awake, my little ones, and fill the Cup,
Before Life’s liquor in its Cup be dry.’

OMAR KHAYYÁM.

JUST as there is a false or left-handed dawn to the day, so is January to the year. The birds, the flowers, the animals commonly take an exaggerated view of the lengthening of the first few days after Christmas. Snowdrops, crocus, hellebores and daphnes push up with new vigour or break into blossom at any rate if, as often happens, the dawn of the new year has a few mild days. But afterwards it seems to be realized that the climb of the sun to the Easter equinox is to be a long and a stiff one, and Nature halts or even appears to go back. Midwinter day, if you please, is marked in the calendar not as

the end or even the middle of winter, but the beginning.

It is the act of waking that runs the liquor out of life's cup. The animal that remains sound asleep is marvellously sustained with no perceptible expenditure of fat. The woodman has knocked out from an ash 'stowl' a fat, cold dormouse, his head tucked under his tail, stiff in that curled posture, and without the faintest beat of the heart to signify that he is alive. If I put him in a warm room he will awake and be immediately hungry, but it may be that if I put him into a cold chamber he would wake up apparently not a day older ten years hence.

It is not possible, I suppose, that a dormouse could survive in unbroken sleep a whole ice age, and then wake to perpetuate its race in a new tropical world. Rip van Winkle stories of that sort cluster only round such cold-blooded creatures as the toad. The fable of the toad in the solid rock has not been authenticated, but an English investigator has buried one in a closed vessel underground, and dug it up alive at the end of two years. The cold-blooded vertebrates, however, are good famishers even when awake, some of the large snakes kept in zoos having been known to go for upwards of a year without food.

It is the mildness of our winter that makes it harder for the animals than the out-and-out cold of Norway or the mountains of Switzerland.

Few of our warm-blooded creatures sleep till the real dawn appears, though our fauna numbers many alleged hibernators. On this first day of January the squirrel of the pine-wood, nay, all the squirrels of the pine-wood, are abroad. They are down upon the floor digging up nuts and chestnuts, sampling fir-cones, nibbling the bark of ground ash to replenish life's liquor in its cup. The squirrel, it is true, is not exactly a hibernator. He belongs to the intermediate type that stores food against its awakening. These are all rodents. The best sleeper of them all, the dormouse, has a store of nuts that he will not break into much before April. The brown rat has the same, though he is seen out and about in the coldest weather. The field vole makes his store of wheat or haws, or other convenient food, unless he can rely on the mountain of food that man puts up in the potato or mangel clamp. But in every fall of snow I see the dirty tracks of the voles, or can unroof their galleries under the cold crust. The storing habit does not, so far as I know, descend to our rabbits. They stay much underground, dozing and living quietly on their own fat, or leisurely digesting their last cropful of grass. Some have wondered whether a rabbit may not chew the cud, but the hypothesis has no facts to go upon.

A little more and our rabbit might have been a hay-maker like the Little Chief hare or pica of the Rocky Mountains. This animal, though it likes to come out in the winter, would have little

to sustain its waking activities if it did not collect bundles of grass in the autumn, carefully dry them, and stow them in its cave. Little Chief or crying hare, why do you cry? Simply because you have learnt to care about the future?

Our best sleeper in the true sense is the badger. All its winter stores are on its ribs, and when it wakes it has to forage for food just like the bear. The badger is mainly an insect-eater, and only the wasps have learnt to store insects for food. There is nothing a badger likes better than the grubs of a large wasp-nest. No doubt the contents of a humble-bees' nest are as welcome, and when it robs one of these the badger, like the bear, tastes the joys of honey. The bear will break open a rotten log for wood-boring caterpillars; so will the badger. The eggs of ground-nesting birds are a delicacy in spring, and young birds and rabbits and other trifles keep the badger going. None of these things are to be found now, and therefore the brock is underground fast asleep on a good bed of dry grass and leaves. But he will be up soon to taste the lean fare of blue-bell bulbs as soon as the green tips appear above ground, and before too much of the bulb content has been converted into sap. I fancy I can hear him snoring sometimes when I put an ear into the mouth of his sett.

None of the birds hibernate, even Gilbert White's swallows refusing to be found asleep in the bottoms of horse-ponds or in caves or old buildings. When

you look at their remote ancestry, you might suppose that they would provide, at least, a sleeper or two, for there seems little doubt that they are a branch of the great reptile family, all the representatives of which in England are fast asleep at the present time.

Having wings they have little need to sleep through the winter, and still less of the passive temperament that makes such long oblivion possible. When coldness and scarcity of food come, the bird, except such steadfast souls as the robin, drifts with the sun a little way southward, and there finds food plentiful for another week. Thus it southernns and southernns till the sea is reached, and that, too, it crosses if it has the hereditary instinct to face a landless stretch that seems from the shore to have no limit. The autumn migration of birds is not our only evidence that Britain and Spain were once joined with land. Ages ago, no doubt, a southern lake across which the migratory bird flew widened year by year till it became a strait, a sea, an ocean, over which the birds still fly, because their ancestors have done so every year for a myriad generations. Any migrating animal would have been stopped before the river had widened to half a mile, unless we are to take it that the strange whim that leads the hamsters to travel across Norway in occasional swarms and throw themselves into the sea is inherited from hamsters of a million years ago that walked into Scotland dry-foot by this route.

The birds that stay the winter with us are also saved from the necessity of hibernation by their wings. Any one of them can cover a far larger space of earth in its quest for food than a mere wingless animal. In a few minutes a flock of starlings can sweep over several parishes, and dropping here and there find some field on the sternest day of frost capable of yielding grubs. The shrews, eating much the same food, dare not even appear for a moment in the middle of a bare field for fear of the birds of prey. So the shrews are safely tucked away in some dry hedgebank, from which, however, they stir occasionally even in the coldest months to find food for their hot-blooded needs. You would think that if any animals had to sleep in the winter it would be those that eat insects. We have, however, a still more wonderful contradiction of such a reasonable expectation to show.

To-day when the sun was doing his watery best to shine on the bare and apparently dead branches of the apple trees, a little black smudge went flittering across his mild disk, and in and out across the steely, barren sky. I should think that if I could take a muslin bag as wide and as long as the twenty-acre field, and sweep with it the whole country of the Hunt, I should not catch enough winter gnats or other rare riff-raff of the sky to furnish a nuncheon for a single bat. Never was the extravagance of winter wakefulness so clearly shown as in this January midday flittering of our little pipistrelle. What an appetite he is certain

to catch urging himself on wings through this keen air. And his chances of satisfying even the dryness of his palate are scarcely better than if the whole world had been sterilized. If anything in this world is certain, Master Flittermouse will go to bed ten times hungrier than he came out, and on a stomach sharpened and a system made lean by midwinter exercise he must clem till a less fallacious bright day in March really does provide something for the catching.

The miracle of hibernation is the insect. I have known many a fat caterpillar, but never a fat insect. Yet the queen wasp or humble-bee leaves the revelry of late autumn and tucks herself up in some dry place, and sleeps four or five good months without the necessity of renewing her frugal tissues. The honey-bee is, of course, in another case. It is, like man, a civilized creature capable of providing stores to carry it over the winter, not asleep but drowsily awake, like a Russian on his oven, or, a Laplander in his igloo, coming forth on warm days for a stretch in the sun, talking on such days of making the queen lay again, eager for the first flower, even if it be Christmas rose and winter aconite. I know not how a hive bee may sleep in the cold of a Swiss or Canadian winter, but in England it does a little sweeping and clearing up nearly every day.

In the garden is an old building with double wooden walls, which, in order to keep a delayed promise, we have begun to pull down on the first

day of the new year. The space between the walls is stuffed with moss by the bygone builder, and the moss may be said to be almost stuffed with queen wasps that tucked themselves away there when the summer failed. Six of them lie before me on the writing-table, an apparent row of corpses, their limbs so stiff that they would break if you tried too resolutely to bend them, their grim, yellow jaws tense and dry, and no sign of life anywhere about them. But I know that if I put them a little nearer the fire those dead limbs would stir, the antennæ would feel about with an expression of 'Where am I?' and in time the wings would whirr, and the black-and-yellow machine become once more alive and hungry. A very little sun in the new year suffices to wake a wasp here and there, though it is doubtful whether they can as easily get to sleep again, and I think the untimely wasps must mostly perish. The humble-bees are more exact in their waking, and do not come abroad until there is a reasonable prospect of a very industrious insect making some sort of a living. We rarely come across their hibernaculum, though I have been told that they can be found in dry turf stacks. I fancy they creep in under the roots of thyme where it grows on a porous bed of rubbly limestone, and no doubt there are many in hollow trees. The shrew-mice will have a good chance of coming across hibernating humble-bees in their rambles about the earth caves of the hedge-row, though they will not eat so rich as when their

thigh baskets are stuffed with pollen and there is honey in their sac.

In a loft over the stable a dozen small tortoise-shell butterflies have folded their painted banners, and are hanging by hooked feet to a beam. They belong to the only group of hibernating butterflies in our country, and it is fairly certain that the whole of the group has the habit. Some good naturalists have mentioned quite casually having seen half a dozen red admirals flying about in midwinter, whereas others have expressed their strong doubts as to whether this species hibernates at all in this country. The comma, painted lady, Camberwell beauty, and others of the same or allied genus, undoubtedly hibernate, and the brimstone, which comes out from its bed-chamber in February looking astonishingly neat and bright, shows by that fact, and by other characteristics, that if not rightly a *Vanessid* it is of very close cousinship.

The sleepers that you are most unlikely to see abroad in January are the grass snake and the adder. They sleep with great regularity till the vernal equinox, the adder waking a little before and the grass snake a little later than that prime landmark of the year. Sunshine is their need—the bright golden sunshine of April, unchecked by leaves and caught on some grassy bank, or sheltered by a good hedge from the wind. The wise snake knows how to find such a place as soon as the sun is of the right strength, and so the wise

man knows how to find the place where the grass snake or adder is certain to be. We could find them now by grubbing up a sufficiency of the hazel stools in the wood, the grass snakes in a tangle perhaps amounting to dozens, and the vipers mostly solitary.

For some reason, that other sun-lover, the slow worm, does occasionally turn in its winter bed, and come sliding forth even with frost on the ground. At any rate I have found them more than once dead on the road in the middle of the winter. All the chilly-blooded tribe are liable to be paralysed by the cold, and there are many degrees between the absolute torpor of a happy sleep and the lightning speed with which a midsummer lizard darts through the wild thyme when disturbed in its sun-bath or insect-hunt.

The lizards proper lie deep, and are seldom encountered till it is their time to come above ground again, but a cold, shrivelled newt is often found not very deep in a dry stone wall or under some stone or timber balk on the ground. The great-crested newt has lost all the frills that make him so handsome in the summer pond and beyond that ; his fat sides have sunk to less than half their proper girth. All the water is dried out of him, and his lively sliminess has turned to a sort of hard india-rubber. I have even found him as stiff as a stick, from which state, no doubt, he accomplishes the miracle of resurrection. In fact, I can cite a case even stronger than that.

One year when the frost came late in March, it must have caught the newts after their return to the ponds in anticipation of summer. As we skated over the clear ice of a certain brick-field we saw the orange belly of a newt that had got frozen tight in the under surface, and, marking it, were able to secure a cake of the ice with the newt frozen fast in it. The creature seemed as brittle as its aspic, and I believe that if we had tried to bend it it would have snapped almost as readily. Yet when the ice came undone in an aquarium, the newt came to life and swam about as though his experience had been one of the usual incidents of his career.

Newts are often gregarious in their hibernaculum. In the head of an oak that had been for years an ornament and a perch for aubrietia in the centre of a flower-bed, we found one winter over thirty smooth newts lying up together. There are two small ponds near, one twenty yards away, the other more than fifty, and both with a good deal of difficult country between them and the stump. It seemed a wonderful thing that all those newts had managed on leaving the water in autumn to reach their favoured winter bedroom. Who has ever been encouraged to form a high opinion of the family instincts of newts? Yet it seems as though some wise amphibian of ten years ago must have brought his children here to sleep, that they brought their offspring, and so from generation to generation the leader who knew the way raised

the cry of ' Who goes home ? ' and led the sprawling army from the water, which had thus far been the only experience of many of them, up the correct bank at the correct corner, over the grass, through the raspberry canes, across the path, through the strawberry bed, over the high bank, and down to the gravel, and then across the flower-bed and into the proper doorway of the stump. In the spring, old Xenophon would lead his squad fresh from sleep back into the pond, and then would do his best to eat the eggs that were to become the recruits of the army he would have to lead back to bed in the autumn. Twice every year this migration must have been going on for ten years, and yet none of us humans had seen it or got the slightest inkling of it till, the time of the stump having come, we unearthed a part of the secret with a stock-hoe.

Everything sleeping just as much as it must. Everything of no matter what low order of reptile or insect intelligence having just enough to enable it to choose the very best place to sleep in, or far place to retire to, while the winter passes. Nothing sleeping so soundly that the sun will not call it up whether its waking-day be the first of January or the last day of April. The animals of this country, endowed as are no others with the strength of constitution to endure one or two false awakenings and the hunger of wakefulness in cold and foodlessness. And the lord of the animals, man himself, most adaptable to the

climates of the whole world, when he has been bred in these islands. Read the history of colonization and see if it is not so. Write the diary of an average English winter and see if it must not be so.

JANUARY

II

THE SUN BEHIND

WE have already seen the sun many times since Christmas, that is, we have been able to look without blinding ourselves through clear air at a ball of watery fire. In fact, it is only now, if at all, that we do see the sun, for, as Meredith truly says, he can only be seen in his effects :—

‘Visions of her shower before me ; but from eyesight,
Guarded she would be, like the sun, were she seen.’

If we see the sun through smoked glass, then we see him in January through the fog. When he breaks through and becomes so bright that we cannot see him, our gratitude is as great as that of the Irishman for the moon, which, unlike the sun, shines when it is dark.

Under a thick mist stained with town smoke the world and every article in it has an entirely new aspect. At one degree of the darkness the ground seems actually brighter than in sunshine. The stones of the gravel path, the frozen clods

of the flower-beds, and the rime-decorated lawn shine as though with an internal brilliance. They are brighter than the sky, if we can call the mist that puts the tops of the nearest trees out of sight the sky. It is as though each thing on the ground were under its special tube, giving it a glimpse of the sun that is hidden from us.

The fog this morning has gone further than that. I step out from the lighted house into a day of night. What is it that makes a fog, though less obscure than a really dark night, more bewildering? I suppose it is that each ray that struggles through has been zig-zagged and twisted so that it cannot tell the truth about that on which it lights. Things seen are distorted in size and shape and, as it were, the things unseen are also distorted. We cannot take any of them for granted as we can in the dark. The things beyond the foreground, however familiar they may have been, may not be there, or they may be something quite different from what used to be there. ' In fact, I expect that if we could take the scientific bearing of the wych elm that by daylight is due north of the garden gate, it would be found to be a point to the east or west when seen through the fog. Its dimensions and apparent distance are undoubtedly new ones.

I grope down the path to where the bird-table is when it is light, though I can see none of its detail this morning. The birds, however, have found it, as a very strange phenomenon testifies. I can see the pieces of white bread I have thrown on the lawn,

and when they have rested there a moment or two they get up one by one and fly away. Brown sparrows in a brown fog have seized them. This world of mystery ought certainly to be explored, and on returning to the house I take further equipment and come out for a longer expedition.

If I had wanted to end the career of a certain unpopular crow I ought to have brought a gun. Here comes the old rascal hoarsely cawing, a black blot in an umber sea, and so near to me that I can hear his wings whistling like creaky leather in the thickened air. After all, that is not very near, for I have heard many wings of which I could not see the owners. The crow, however, perches for a few moments in a hedgerow sapling that I know to be less than thirty yards away. It is about one-third the minimum distance that he usually considers safe.

The birds and animals soon get to appreciate the treachery of the fog, but in early days they often fall victims to the gunner astute to seize his opportunity. The wild things are like children, who, for some years, cannot learn the meaning of perspective, and so speak of objects far away as small. A fog puts a man with a gun four times as far away from a crow as he really is, and the crow thinks that the safety margin has been observed. How foolish of him, yet, dear reader, say off-hand whether he is in a measure saved from his folly; but the thickness of the fog, which will reduce the range of the gun, reduces the striking power of the

pellets, and deflects the aim by placing the object in a false position.

If the crow had not spoken I might not have known it for the bird it is. A bird that looks every bit as big in this magnifying fog turns out to be a bunting, rather bigger in fact than the greenfinches and yellow-hammers in whose company he is on the hedge skirting the cornfield. These bright finches give the only bit of colour, and so brilliant are they by contrast that the fog seems not to have dimmed them by a tone. They sit rosy, bright yellow, and olive-green on a rime-tipped blackthorn, cut off from all background as completely as though this bunch of jewels had been thrust through a curtain of brown paper. Then the birds jump and disappear one by one, as though so many sparks had flown upward and become extinguished in the act of flight.

On the hard ground out by the oaks the rabbits are stamping their fog signals, and now and then I see a ghostly white scut tremble for three bobs till the mist swallows it up. If there were young rabbits now, as there are not, how useful would that follow-my-leader signal be to guide them in the right way. It is essentially for use in the dusk or in the all-day-long twilight under the bushes. The roe-deer that haunt the smallest scrub of the forest have a flag almost the size of a handkerchief, and the bird that is best endowed with a signal to be seen from behind is the bullfinch, that when it is a little frightened is particularly given to travelling

for a long way in the arcades of a thicket, and even in the interior of a hedge.

The lads here have a method of catching the bullfinch that is certainly sometimes successful. They get it in a hedge between two parties of boys and throw stones at it, just as they do at the other birds desired for a pie. But a few stones crashing through the twigs anywhere near a bullfinch so terrifies it that it goes to the bottom of the hedge, and can be picked up there apparently in a trance.

I once caught a jay very much in the same way. Getting up early I found a party of them busy at the cherries, and sent after them the charge of a short-barrelled gun that when a boy I was allowed to use. Of course I voted one of them hit. No great encouragement is ever needed for that self-flattery. It flew away, settled on the outside of a hedge into which it thrust its head, and there stayed till I went up and pulled it out; but I could find no bodily trace of its having been hit, and I kept it alive as a pet.

At this time of year we find the deer in a part of the forest that is almost impenetrable with black-thorn bushes. Under these great hollow thorns the air is appreciably warmer, and under anything but a heavy downfall the tangled twigs would furnish a good roof. It is just such a place as the deer would choose for their 'yard' if the snows of northern Canada came down here; a place they could surround with beaten paths for exercise, and in whose lairs they could await with patience

the reopening of spring. The natural gloom of the hawthorn caverns is scarcely deepened by the frosting of the crystal dome above them, but the fog gives them the mystery of a cathedral when the verger has turned the lights out.

I am within thirty paces of a small herd of magnificent bucks before I see them moving like faint stains in a screen of wool. They are feeding along a line that crosses obliquely in front, and I move cautiously further up towards the point of intersection. I should have come round a big holly bush, and stood face to face with them, if there had not been one more than I reckoned for. Perhaps he saw me, and stalked me as I stalked his fellows. He burst away from about four yards on my left, while the herd was about fifteen yards away. Off they go with staggering bounds, making more noise than usual, partly because of the fright they have had, partly because the fog hinders them from choosing their footsteps as a deer instinctively does in daylight.

As I climb the hill it is seen that the world is not entirely sun-forsaken. As the sun first appears through the fog, it is a disk of palest aluminium across which the mist moves like smoke, sometimes quite obliterating it, sometimes making a half-moon of it, but on the whole giving way. Motion is hopeful. There is nothing down here to contradict the feeling that the fog is here for ever, but up there we can see battle in which light must inevitably win.

It is just noon now. I can fancy or feel a sort of shivering of the air crystals as though the world acknowledged the fact. It seems as though, in spite of the myriad million obstructions, the sun managed to send down a subtle X-ray of hope. Then he fades from aluminium to pale paper and again disappears. But in twenty minutes he has not only come to life again, but has grown to the warmth of copper. As the hill slips below me he brightens and brightens, till at the summit he is actually blinding to look at and casts a shadow. My face acknowledges his warmth, so does the hoar-frost, for it flees from the grass he kisses, and only holds its own behind the bushes.

Yes, get behind your bushes while ye may, slaves of Sut. 'His going forth is from the end of the heaven, and his circuit unto the ends of it; and there is nothing hid from the heat thereof.' Only for a very little while can the vapours of earth cheat us of the great fact that winter has done its worst and summer is coming.

The robin is singing up here, but that is nothing. The robin was singing in the midst of the mist, the only bird that was quite certain that it was all a hoax. But from the hill-top up goes the 'dew-delighted skylark'—up to find a place in heaven where it can sing its heart out. Two ring-doves flying far up catch the sun full on their breasts as I have seen them lighted in the morning before the sun reaches the earth. Yes, two doves and, if you please, a pair of doves up in the air as love is,

and looking on the bright side of things. Below them is the mist like a great brown cloud where the earth should be, or is it sparkling in the sun like a sea of very tender hoar-frost? At any rate, under it the corn is growing to feed their little ones, and all the delights of May are preparing.

The tops of the junipers on the hillside swim out of the mist as though it was water, the darkness of their foliage making the contrast more sudden. The upper branches are almost dry, and as I come down to them the skirts are fringed with crystals. The hawthorns have some of their berries left, black with age, and perhaps some sweetness is coming in the tips of the leaf buds. An adventurous mouse has climbed far into the tree after something or other. It is a red wood-mouse with white throat and belly, and its bright prominent eye must surely see me as I stand quite near and take note of it. Though the eye sees me the owner does not, or thinks that after the trouble of climbing so high it need not come down till war is actually on foot against it. The spray with the rather brightly-coloured creature on it stands out from the thick background much as the bright finches did. Such pictures are hard to find on a day like this, but they are admirably framed when found.

The birds are already thinking of bed in the gorse and bramble of the first hill-fields. What is there but bed on such a day? The open air is full of the 'prtt, prtt' of their wings, and we hear them cannoning through the twigs, yet rarely see them

in this double dusk. The blackbirds are known by their 'plaining' 'tut, tut,' seldom to-day breaking into the 'weech-a-weech-a-weech' that they give when through the clear air they see man coming. The linnets are known by their tinkling chirrup that sounds like forced cheerfulness, but the other birds are vocally too silent for us to know what they are.

There is nothing like these January days for giving us the pleasure of intense and satisfiable hunger. The civilized man who sits down to a dinner of many courses with the remark that he is famished, and then deliberates over the selection of his *hors-d'œuvre*, simply uses the exaggeration that is one of the curses of civilization. He has probably never known what hunger is. Neither do I contend that the hunger established on a ten-mile walk is comparable with that of a man six days without food, though that also a man ought to know before he speaks on the subject.

The usual hour for luncheon has scarcely gone by when the man tramping in the open air is assailed by a feeling not quite in the region of the stomach, but behind the region of the solar plexus, known in old boxing parlance as the 'bread basket' but to-day as the 'mark.' It is the grand terminus of all our radiating activities—gastronomical, physical, and perhaps spiritual. I believe it is a good sign of physical wholeness that hunger soon attacks us there. It takes you like a crisis of life

comparable with the splitting of the chrysalid's case for the emergence of the perfect insect, with the bursting of a blossom from its bud, or the elaboration of wax from the body of the bee. It takes me with a feeling of faintness and a weakening of the legs and a little moistness of the brow as of fright at a new resolution of one's bodily component.

There is no question now of *hors-d'œuvre* or anchovy toast. Simple bread and cheese, of which I have a small packet providentially in my pocket, is ambrosia. Not merely do the salivary glands clamour for them; it seems as though the teeth themselves dissolved in the biting. There was never such a dish prepared in the cleverest foreign restaurant as this bread and cheese. Call it not coarse fare. The nectar that the fairies sip would be far more gross if the fairy were less hungry than I am. The question must be decided entirely by appetite. If the appetite is such that it overwhelms its provender as a whirlwind overwhelms a feather, then the meal is a dainty one even if it consists of bones or stones. A mouse eating of a dead lion must feed grossly, while a hungry lion picking up a mouse would feed daintily. I have boggled at many a sardine worse than I now do at a chunk of cheese and a slab of bread.

What is the thing to live on in the open air? Some of us believe that there must be meat. They will have ham sandwiches, beef sandwiches, or, at least, hard-boiled eggs. A good portable form that

saves the trouble of cutting sandwiches is the cold sausage. A quickly made sandwich that takes a good eating certificate is made by clapping a hot rasher between two slices of bread. When it has frozen cold and set in its own aspic from the thin juice it makes undoubtedly a capital lunch.

I have found my best satisfaction in a lighter preparation than any of these. Between slices of cold, dry toast you put a spreading of the solid honey that belongs to winter. It is somewhat apt on a warmish day to run, or rather crawl out, and make a little messiness on the paper, but there are many virtues to make up for this one possible inconvenience. If the bread is of the right kind and well toasted, it supplements the pointed sweetness of the honey in an uncommonly toothsome way. It stops that craving sweetly, pleasantly, and without a jolt, and it sustains the system through a twenty or a forty mile walk as very few other foods can. So honey and toast for me whenever I can get them.

I have said that the pangs of a hunger for a meal only shortly overdue may not be comparable with those of a week-old fast. Yet any one who has had the curiosity to try has found the longer fast a far different experience than they expected. That imperative emptiness lasts till not more than twenty-four hours from the latest meal, neither does it gnaw all the time. It makes itself felt at what were the old meal-times, and the greatest effort of the starving man is to get over the first

or second meal-time. When the second breakfast has been missed we feel an unusual lightness of body and clarity of mind. Problems at other times complex resolve themselves easily into their answers. The universe is likely to be revealed in the light of some startling paradox. It is an exhilarating time. The writer gets to his task with a zest, and does it passing well.

I have not pursued the fast beyond the third day. I believe that the results thereafter are quite negative. The desire for food becomes less, the habit of the meal-time having been lost, and the resumption of eating after a long fast becomes rather a critical undertaking. But a fast for a few days by one who can rather easily endure it, broken by a gradual resumption of the usual habit, is a useful rest for the usually overworked organs, and proves the wisdom of the Lenten system that belongs to many religions.

FEBRUARY

I

THE SQUIRREL

THIS is the first magic day of spring. The rays of the sun, even when they are not direct, strike through the clothes as though they were not there, and thrill us with a new message. When you sit before the hottest fire, you do not feel warm through the clothes all at once, nor for a few moments. Nor if you wait for hours, or for ever, will you get any of the subtle ichor of benefit with which the sunshine of a spring day floods you in a moment. We have to fall back on a molecular theory of heat to get a conception of the fact. It is as though the fire pelted us with large pebbles, while the sun had a fire of sand finer than the meshes of any clothing.

Rooks and starlings are drawing across the field the line of their search that surely nothing can escape. The light sits on their backs, and glances from shoulder to shoulder as they walk. It brings up the sheen of colour, the purples and the greens

that have been absent for months, and now vividly rebuke any one who should say that rooks and starlings are black. The winter black of tree trunks is also a thing of the past, for now even the most sober of them is bronze or silver or golden with the sap of life shining through the bark. Willows and the cornel are the brightest, as they were the only ones to show colour in the dark days of December and January; next to them come the poplars, which are first cousins to the willows. The white poplar shines like burnished silver in all its branches, and its twigs are swelling into the great red catkins that make us wonder in a few weeks' time where the tree has been hiding itself all the summer and winter. The elms, too, are very visibly burgeoning into their crimson glory of blossom.

The flowers in the wood seem to know that it will be useless to try and grow when there is a canopy of leaves overhead. Violet and blue-bell, daffodil, primrose, lily of the valley, anemone, must all have done blossoming before the beeches are in leaf, and they are visibly preparing for it. Even they have no chance where the dog's mercury has established itself. It makes a continuous carpet of leaves, which you can see shake in their tops when mouse or adder moves through the stalks. The dog's mercury is blossoming amain, hanging out its green catkins, from which every footstep sends out puffs of pollen. The sun falling in patches through the branches flecks their deep green

with circles and long shafts almost as bright as beech leaves.

Further on, the trees change to pine. The sun splashes their red trunks with flame, and even brings colour into the burnt-out floor. Walking on the dead and silent needles, I check automatically as something warmer and hairier than vegetable debris catches the eye. It is the long, dry hair that feathers a squirrel's tail. The little animal has its back to me, and is busy digging in the soft super-mold, working briskly with its fore-paws, his nose all the while between them to seize the prize as soon as it comes in sight.

It fishes out something, perhaps no more than a half-decayed fir-cone, and sitting up with the morsel held in its hands, sets to work with its teeth. Over the bushy tail I can see the long winter tufts of its ears twitching and nodding at the work of the jaws. Creeping silently round I catch the profile of its face, with one of the bright black eyes that seem to look out on all sides at once.

It is the conventional squirrel picture. The tail is up parallel with the back, but curled away from the head like an acanthus leaf. The tufted ears point straight up from the smooth-haired face, the Roman nose of which ends in sharp chisels busy on the cone, which the fore-feet hold close beneath the chin. All is according to convention except the colouring, for we have very few animal artists who can refrain from drawing the squirrel in a mixed dress of summer and winter. The red

squirrel is as grey as a rabbit in winter, and it is only then that it has the long ear-tufts. By the time it has got on its summer red the tufts are gone, and its ears are scarcely more distinguished than those of the mouse.

Suddenly I lose the picture of an acanthus-tailed squirrel even in grey. Perhaps it has been digging at another squirrel's hoard, perhaps it is the victim of robbery, more likely the spirit of boisterous love comes into the wood on a sunbeam. There is a short sound like a cough, and another squirrel rushes out from somewhere, the acanthus-tailed one drops its booty, and, as Huckleberry Fin says expressively, 'lights out.' All its beautiful pose is thrown to the wind, the curved body becomes a long straight line, and the tail a long straight continuation. The two squirrels rush off *ventre à terre*, just like stoats, double round a tree, and come rushing back towards me, double again and away, but this time the pursuer, taking a shorter corner, catches the other, and for a moment they tumble one over the other more like vulgar rats than the dainty squirrels they are. Then one of them, it is impossible to tell which, rushes up a tree, and the other comes nosing back towards the little pit whence the fir-cone was dug.

When the squirrel is moving about leisurely in the search of food on the ground, it is seen to be much more like a large dormouse than a small rabbit. The dormouse, too, in spite of its sleepy habit during the winter, is an astonishingly active

animal, leaping high up a tree trunk, and clinging where it touches with the certainty of the squirrel, though not having the same power of running up a vertical surface.

With back rounded in typical mouse curve, my squirrel goes loping round this bush and that, reminding me far more of the kangaroo than the rabbit ever does by the light way in which it touches the ground with its fore-paws between the hops that it takes from the hind-feet. Suddenly it sits up, far up, on its hind-legs, its ears pricked, and its face expressing puzzled anxiety. The first sound that alarmed it was the chuckling voice and the whirring wings of a pheasant down in the hollow where the nut-brakes are. But now there is a measured 'chunk, chunk,' like the bite of a keen axe into wood. It is purely a mechanical sound, and if not of human agency must be the hammering of a nut-hatch on the shell of a nut he has unexpectedly found. Foolish squirrel to twitch and turn about so at such an innocent sound.

The 'chunk, chunk' continues, and now appears to be nearly over my head. It cannot be a nut-hatch, for it obviously moves about, whereas the bird fixes his nut in a crevice of the bark and hammers at it there till his meal is reached. The squirrel takes three jumps, and reaches the nearest tree. It pauses a moment, and lashes its tail like a cat—its beautiful acanthine tail thrashing to and fro in angry wags. Then it clasps the tree and runs up the trunk with a 'wow-wow-wow-

WOW-wow ' that is far more canine than any other rodent can accomplish, with the possible exception of the prairie ' dog.'

I look up, and behold the mechanical ' chunk, chunk ' is the vocal product of the other squirrel running lightly on the black clouds of the pine foliage, and crying ' cave ' to its companion. It runs right to the edge of a cloud, its hind-feet turned out till they almost point backward, so that they hold a sheaf of twigs between their hands. And it jumps from one cloud to the next, passing from tree to tree as easily as we from paving-stone to paving-stone. The other squirrel pauses at the first fork and looks back at me, working its jaws in a kind of mumbling rage. I clap my hands, and it rushes up the next stage with another ' wow-wow-wow-WOW-wow,' turning and sitting there, and again wagging its tail like an angry cat.

No more sitting up with elegant acanthine tail. Squatting along a branch or dumped into a fork, it peers impudently out, or it takes a straight-tailed run and launches itself flatly on the air, almost flying to the next tree, or it spread-eagles on a trunk almost like a handkerchief with hooks at each corner, or hangs from only the hind-legs like a bat, this protean creature that seems many animals rolled into one. I shall have to leave it now, for it is far too much offended to do anything but hurl at me its arboreal Billingsgate, and shout to his brother burglar, ' Here 's a stranger, Bill, let 's heave a brick at 'im.'

The squirrel is the monkey of the rodent tribe. Its feet, compared with those of the rabbit, are wonderfully elaborated for a climbing life. The fingers are long and thin, with claws for hooking into the bark of a tree, like climbing irons, whereas the monkey climbs like an expert alpinist with the padded tips of its fingers. Let any man tackle the rough bark of an unswarmable oak in this way, and he will get something like a revelation. With two fingers of each hand hooked on projections not twice the thickness of a penny, he can hang the weight of his body what time he gets a lodgment of the same kind for each of his nail-edged boots. He could climb no better in stockings, because the toes are not prehensile, and their pads cannot be brought into action on account of the nails.

The squirrel, working with nails instead of toe-pads, brings his hind-feet into action almost exactly in the same way as we use the climbing irons, catching the hooks in well out on each side of the line of the body. It is his work in the smaller branches that has most modified its members however. The thumb instead of being opposable, as in the monkeys and man, is almost aborted. The gymnast on the horizontal bar never uses his thumbs, has to work, in fact, on the assumption that he has no thumbs. He wraps his fingers round, and hangs on by their pressure. If he had nothing but horizontal bar work all his life, and life after life, his thumbs would become

mere supernumeraries, and in the course of ages dwindle entirely away.

Little did you guess, O squirrel, the immense consequences that hung on the way in which you took hold of the first tree. If you had but walked along the branches holding them between hand and thumb like the monkeys (and incidentally the chameleon), you might have evolved into something much more man-like than you are. When you hold a nut you wrap the whole hand round it instead of holding it with precision between finger and thumb. Perhaps the size of the nut is against you, perhaps the monkey developed his thumb in order to catch fleas. Inconveniences and calamities are the greatest blessings sometimes. A more persistent enemy than the pine-marten might have given our red squirrel wings or an extended parachute such as some of the tribe have acquired.

If the squirrel's food were entirely fruitarian, as some people imagine it is, he would fare but ill during the time between the end of the winter store and the ripening of next year's nuts. He must be hard set in winter, to judge from the scores and hundreds of fir-cones nibbled into cotton reels that we find in the wood. The pine kernel is an excellent food when it assumes the proportions found in the stone pine—a roll of fat containing almost the bulk of a pea, but there is very little food in the cone of the larch or the Scotch pine. As soon as the trees begin to shoot, the squirrel

begins to live on salad and the sugary layer between the outer bark and the wood of favoured trees like the sycamore. Some of his digging in the floor of the wood unearths such substantial succulents as blue-bell bulbs and the richly-stored rhizomes of anemone. Whenever he gets a chance he prefers to take something substantial to stuffing his crop with grass like a rabbit.

It is inevitable that our friend should find many a bird's nest in his arboreal capers. He is the soul of curiosity, and it was not for a moment to be expected that the first squirrel should fail to sample these strangely-coloured acorns found three and four in a cup, that we call eggs. Even our so-called vegetarians eat eggs, and so does the squirrel. He is not so particular about their freshness, and an egg that has sprouted into a chick is no more amiss to him than an acorn that has hatched into a young oak. So the bird population owes a good deal of its restraint to the patrolling of the squirrels.

Last autumn I came upon a squirrel sitting acanthus-tailed on a log, and very busily eating. He was dining on the brown fungi that sprouted from the decayed wood. An experienced mycologist would have taken home such fungi and eaten them cooked, but the majority of people would have called them 'nasty poisonous cankers.' I think that the squirrel eats a good many fungi that even the mycologist bars. At any rate, there is among the edible ones a vast store of nourishing food during the fungus season, and in what month

of the year does not some boletus, morel, puff-ball, or agaric produce its fleshy fruit ?

The fungus-eating squirrel was, of course, immensely indignant when he looked up and found me watching him at his meal. He popped a large piece in his mouth, and ran up the trunk of an oak that bristled with tiny shoots. This 'brushwood sheaf' he hurriedly probed with his nose, at last finding a cupboard in which he might dare leave his treasure, and when his mouth was free to tell me what he thought of my impertinence, he let me have it with all the force of his vocabulary.

By May, our little grey squirrel will be in his summer red, and his ears close cropped by comparison with the tufts he wears now. His mate will by then be a mother. Their nest is usually stored in a hollow tree where such sites are common ; but in our wood they build the great domes of sticks familiarly called dreys high in the branches of beech or pine. At the age of six weeks the young squirrels are fully active and charming miniatures in every respect of their parents, whom they accompany in their frolics till near the end of the year.

When the trees are fully leaved we naturally see less of our arboreal friends. But taking full advantage of their cover, they do not trouble to absent themselves when man comes into the wood. One of the most delightful incidents of a solitary lunch in the wood, or of an artist's séance there, is the way in which the squirrels peep at one from

this side and that, then come and show off just like so many small boys anxious to attract attention. They dare one another to come near to you, fight one another to show what brave fellows they are, pretend great alarm when you move, and only when you treat them very badly will they shout and swear at you, as they will when the woods are bare and life is perhaps a little annoying.

One summer habit of the squirrel leads forcibly to the conviction that he loves a practical joke. He takes his food to the top of the tree under which you are sitting. There he tears it to pieces, be it green pine-cones or what not, and the rejected fragments bump through the branches and fall with wonderful precision on and round the big non-climbing biped on the ground. There is no finer picture of summer peace than to stand under a beech sixty or seventy feet high, whose trunk is completely lost as soon as it pierces the first tier of leaves, to hear the faint ticking of the little animal's teeth, and to see the husks of beech mast, as though thrown from a fairyland above the bean-stalk, come trickling down.

FEBRUARY

II

ST. VALENTINE'S DAY

OVER the door of the Salvation Army Shelter in Blackfriars Road is a plane, bearing among its branches the remains of a wood-pigeon's nest. Thus can a ray of wildest country life penetrate to this wilderness of squalid houses in the centre of London. To-day it seems as though the old nest is patched with a few new sticks, and certainly both the birds are back, sitting beside it in the sun with an air that speaks plainly of their intention to start housekeeping anew.

Over Blackfriars Bridge the hundreds of gulls that have lived on the bounty of Londoners through the winter are daily putting on their nuptial plumage. In the winter, they were just grey and white birds of so general a gull type that many called them kittiwakes and suffered no reproof. Then a little black crescent appeared behind the ear, next a little black dot between that and the beak, and now the spots are spreading towards each other, and in some of the birds have flooded

the whole face with the hood that proclaims the black-headed gull.

The aerial evolutions of these Embankment gulls become daily more ambitious. Leaving the water and the outstretched hands that more rarely than of yore offer them food, they spread their motionless wings and, now leaning upon the wind, now sailing before it, ascend their wonderful spiral staircase till they are no more than dots in the far sky. From such a height they can see, when the weather is clear, the stretches of Thames estuary and the low island in the marshes where they were hatched last summer, and will breed in the summer to come. Daily, some of them head off to the east, and come down no more to the charity of the Embankment. No doubt, they establish here their parties of two, and make shy elopement from the crowd here to the daily growing crowd in the breeding rookeries.

There is a shrill squabbling at the top of a shop façade, and two sparrows locked in strife fall to the pavement almost under my feet. If St. Valentine will not be denied here, how he must be revelling in more sylvan scenes.

When Christianity began to gain the upper hand in Rome it found that the Feast of Lupercal, falling on the day that we now call the fourteenth of February, was one of the best observed of solar holidays. It is half-way between solar Christmas and solar Easter, the winter solstice and the vernal equinox. Every one upon a journey is fond of

the half-way house and, after that, of the quarter-way house. If the ideal is midsummer, we are half-way there at Christmas. We are down at the bottom of the hill below which there is no other deep, and, as we turn our faces upward, there is a pæan of rejoicing that the darkest day is past. At Easter we are within sight of the end of the journey, and in possession of half the sweets of summer. There is no longer any hurry. We should not mind keeping the flowers of May till it was time for winter again, so that for many people the happy land is reached at Easter, and St. Valentine's Day becomes the real half-way house.

In Rome the Lupercalian Feast was a kind of Saturnalia, a feast of love founded, as it appeared to the Christians, on a purely material and carnal base, and so we established the Feast of St. Valentine as a prophylactic. The wine to be put in the old bottle must not be too new. There must be jollity of a slightly more secular flavour than the austerity of confirmed Christianity required, in order to attract the young people who had found joy in the Lupercalia. And the result has been that the Feast of St. Valentine was always more secular than ecclesiastic, and has to-day lost nearly all its appeal.

The slipping out of the calendar of eleven days, whereby all our dates are shifted back towards Christmas, and therefore become colder, has also helped to kill the day of St. Valentine, May-day,

and other fixtures. Perhaps, too, the English climate was always too fickle to bear the transplanting of these spring festivals from the more settled climates in which sun-worship originated. But we nature-lovers, or I to speak for one of them, cling to these fixed sun-marks with a faith that is unshaken by many disappointments. If it is not the actual day on which birds mate, as country tradition will have it to be, there is, even in the worst of years, a good deal of avine courting to be seen on this day.

In Hyde Park there are hundreds of wood-pigeons, or, as we must say to-day, scores of pairs. They are busy in the tops of the elms, perhaps getting sticks for their nests, but more likely just toying with those early emblems of love and summer, the buds swelling and bursting into rosy blossoms. We earthlings had no idea that flower-time was so near up there, till the wanton doves threw down on us little sprays of pink elm-roses. One pair of wood-pigeons is just sitting on a dead branch in the full bathe of the sun. The birds do not even trouble to look at one another; each knows that the other is by, and that is enough. The sun striking them full in the breast brings up out of the grey, a purple iridescence on the neck, a bluish-pink on the bosom, and a warmth of the dove-like tones as though they were translucent to a light within. Perhaps they are.

Not even the doves can enjoy love without battle. You see them lift a pinion and flap a rival appar-

ently as harmlessly as a lady strikes with a fan, but, as a matter of fact, the blow is no mean one. The wing has hard knuckles, and can bruise almost like the pads of a hare when he boxes for the right to make a doe his own.

See the meek moor-hen that walks so mincingly on those long, green toes that seem as soft as the cooked feet we still sometimes meet with in a hash of fowl. To-day, the cock moor-hen hunches his shoulders, thrusts out his beak, and runs most truculently after another that dares to invade his territory. The other knows the weight of a moor-hen's weapons and makes such haste to get away that he violates a year-long tradition and takes to his wings. The hunch-backed one follows, overtakes him on the water, and forces him to a naval engagement. The two birds face one another, sitting well back in the water. Then they fly up like barn-door cocks, each striving for the upper hand, and each clawing at the other with those long, limp-looking, but really hurtful feet. There is plenty of spring-time courage in this bird, and the battle is fought out many times at intervals of hours and days before the marriages of the year are arranged.

There is a never-failing comedy in progress on the piece of water called the Dingle at the foot of the fall out of the Serpentine. This is by far a more suitable and æsthetic nesting site for the mallard than any other in the Park. Below the fall there is a little creek gently winding through

a thicket of bamboo and other growth to a pool with green lawns sloping to the edge of the water, with sprouting giant rhubarb and polygonum, with flags, Japanese butter-burr, and many other delights.

A duck and a mallard are swimming on the pool, she talking a good deal, he taciturn as men generally are. From far up the Serpentine, high in air, come two birds, whose outstretched heads and wings set far back proclaim them to be ducks. They circle magnificently overhead, and at last descend to the pool by a steep spiral and a straight plane, that lands them like two ploughs on the water, cutting furrows two yards in length before they can pull up.

The duck in possession chatters more shrilly than ever. You can plainly hear her say, 'Send the impudent baggage packing, dear, and her man with her.' The drake in possession goes after the new duck and chivies her round the pond. It is the best way to make the other drake fight, and besides, there is pleasure in mixed cruelty and gallantry to the opposite sex. Cruelty gets the upper hand, for he rushes at her and pulls a feather out. She utters a squawk, labours to her wings, and goes off up Serpentine whence she came. Her mate, who ought to have fought for her, takes wing too, and joins her, no doubt explaining when he catches her why it was that he elected not to fight. The duck in possession is plainly relieved at the upshot. It seems to be on the cards that one's man may

make love instead of war to a new-comer, and send both his former mate and the new drake packing.

Sometimes the drake is sent away, and the duck with the persistence of her sex only retires up the meadow, then comes back and chitters about the marge, now and then re-entering the water. In such a case, as often as not, the resident duck takes up the war and chases her rival out of the water and along the meadow till the other takes wing and off. Never many minutes pass without some more or less determined effort on the part of another pair to win the pool. The first occupiers are very seldom, if ever, evicted, so much advantage does the consciousness of right give. I have no doubt that the drake that can win and keep this most eligible site may have the pick of all the ducks of Hyde Park, St. James's, Buckingham Palace, and Holland House.

The meadow, which is a good hundred yards long, and half that width, slopes upward all the way from the pool. A few trees stand about it, and bushes encroach from the sides. Any one would say that it was an ideal place for rabbits, and there are rabbits. Not the grey wild rabbit, however, but black ones and yellow ones. The grass is extraordinarily green at all times of the year, and five or six of these strongly coloured rabbits make a complete and fascinating picture that few Londoners fail to appreciate.

To-day there is the excitement of a rabbit hunt.

The best regulated of dogs will sometimes get out of hand, and it is not uncommon for the park police to have to exact damages for destruction of life. Even the winged things, such as the absurdly tame wood-pigeons, fall victims to the sudden onslaught of an active terrier. Before they can get wing they are down, and then it is a case of 'I'se warrant you how he mammocked it.'

A well-bred rough terrier, and one that has evidently been well cared for, and well trained, has probably come out for a walk without his best-obeyed master. He leaps the railings, and charges down their sacred green among the rabbits. They bolt in all directions. The dog begins to follow one, changes his mind as another flashes more temptingly across his vision, takes after that one a trifle too late, and so loses them all in the bushes, not being a dog of nose.

But there never was a dog of gaze yet but made greater pretence to nose than the veriest blood-hound. He comes running and sniffing over the green, like a boy scout who imagines himself a Sherlock Holmes. One rabbit, instead of running to the bushes, has contented itself with just putting a tree between itself and the danger. We can all see the rabbit and the dog, but the dog knows nothing of the rabbit, and the rabbit does not know exactly where the dog is.

At length, by a pure fluke, the pursuer comes round the tree and almost stumbles on the rabbit.

Off it goes like a shot, and the dog lumbers after. Some imagine it a very close thing; but just as the dog is getting its stride, a magisterial whistle puts him out, and after a wild circle or two over the delightfully fresh grass he clears the railing and leaves the circus to the rabbits only.

If the chase had taken place in the snow, as it often may on St. Valentine's Day, we should have had an interesting record of dog and rabbit character. The track of the dog would be represented by a series of curves, almost running to circles, and that of the rabbits by straight tangential lines. The explanation is that the rabbit makes straight for home, while the dog makes straight for the rabbit where it is seen from time to time in its course across the dog's horizon. It is only the dog wise by experience that guesses the point the rabbit is making for and runs in a straight line to cut him off. And then the rabbit may turn just at the right time and give him his trouble for nothing. Other things being equal, the chances are in favour of the pursued, and the beast of prey must either be very much swifter or more cunning.

By feeding in company, rabbits have evidently yet another string to their bow, as our rough-haired terrier showed us so well. Not only must you be fleet enough to catch a rabbit, but you must be able to make up your mind which rabbit you will run down, and stick to it. There is a proverb better known in Denmark than here: 'He who chases two hares will lose them both.'

But let us leave Hyde Park far behind and keep St. Valentine's Day where no one lives but those who get their living direct from the soil. The cottage gardens are one sheet of snowdrops—Fair Maids of February—standing in their spotless thousands like uncountable confirmation candidates. (Candidate, a candid person, from *candida*, signifying shining white.) You would think that these gardens were dedicated to nothing but snowdrops the whole year through; but somehow in summer the roots of other flowers feed without harm among the sleeping bulbs, and give us sheets of other colour almost as close-woven as this shining white garment.

On the orchard bough that overleaps the cottage roof, not the orchard bough of which Browning sang, but with bare grey twigs showing as yet none of the promise of May, sits and sings a chaffinch. The slate of his neck has burst into a blue flame, the chestnut of his breast overflows his wings and glows like incandescent copper; and when he flies before his mate with the deliberate intention of showing off his charms he flashes dazzling white swords in his tail, and dazzling white bars upon his wings.

The chaffinches are everywhere as we walk along, sitting on vantage trees and singing their stammered cry of 'g-g-g-ginger beer.' They do not, as most birds, sing all alike, but a bird here and there has taught himself a longer song, or introduced some variation into the war-cry of the

race. Then up from a hedge go two of the birds, beak to beak, towering like butterflies, but fighting to far more purpose. They come down locked to the ground, from which only one flies away. I pick up the other, and find as I feared that one of its eyes has been pecked sightless. It is some minutes before the poor thing can recover and fly away, all its warlike pride for the time being destroyed.

Every one desires to sing on such a day as this. Even the rook, which at other times never attempts more than plain speech, and that none of the sweetest, comes to his love with drooping wing and upspread tail, bowing like a ring-dove and 'caw-caw-cawing' in an absurd attempt to play 'Home, sweet Home' on one note.

The woodpecker is far wiser. He knows that his voice is a poor one, and he makes the woods ring with a very pretty piece of instrumental music. The great spotted-woodpecker is particularly industrious and successful. Choosing the most resonant piece of dead wood in the whole country-side, he comes to it again and again at intervals of a few minutes throughout the day, and makes a rattle upon it that stirs the heart of nature like a violin, not merely through the drum of the ear, but through the nerves of the skin. He is a solitary bird and a rare bird, but at length his far-ringing call reaches the ear of another. She comes near and answers the call with a like vibration on another tree, and some

naturalists have declared of their experience that the hen-bird never sounds upon any other branch that will not give a note about a tone lower than the one struck by the cock.

I can hear all day the rattle of one of these birds that has apparently not yet found a mate, and when I like can go out and see how he performs his music. So rapidly does he move his head that it runs into a blur, and he delivers some ten strokes, the whole sum of his call, in the space of a second. Sometimes when you open the lid of a box against a wooden wall, it hits with a shivering succession of rebounds that fairly well produces the call of the great spotted-woodpecker.

Each bird has its own distinctive charm in the way it 'shows off' at mating time. The humble hedge-sparrow has its own, which earns for it the name of 'shuffle-wing.' The goldfinch makes wonderful play with the gold upon its wings, so does the scarcely less aureate greenfinch, the plover flashes from rifle green to white with unwonted verve, the jay and the hawfinch fly slowly before their lady-loves so as to show how wonderfully they are coloured on an expanded view.

Every one has his favourites. Mine, I think, is the pied wagtail. It droops its wings and struts them upon the ground, like a very daintily made turkeycock. It is so ethereal in its martial loveliness that it seems to have a difficulty in keeping the ground, for it blows up

into the air, still maintaining its spread-eagleism, occupying a space that seems three times as much as usual, but with an obvious tenuity of substance that makes you think you are looking not at a bird but a butterfly. So with a picture of the amorous wagtail, culled from a thousand to be seen on a fortunate day, I maintain from year to year my impression of St. Valentine's Day.

MARCH

I

CATKIN TIME

ALL along the river the alder pyramids have burst in a single night into clouds of powdered primrose. The catkin buds, which were yesterday short and brown, have opened like concertinas and become full-grown 'lambs' tails.' Packed in each of those brown buds were some hundred and fifty fleshy bosses, each holding about twenty male blossoms or pollen masses. The stalks on which the bosses sit had but to lengthen to some three times its length, and the pollen masses are uncovered to the sun and the wind. The sun ripens them, and then the wind bears the dust from the trees in incalculable multitudes of grains, almost as small as atoms of scent. The air for many square miles is far more full of them than it is of snowflakes in the fiercest storm. At the greatest height at which a balloon travels we should not escape them, and a female catkin twenty miles away would run quite a good chance of getting fertilized.

Yet, if we are conscious of them at all, it is merely as an odour, while we fondly imagine that the catkins themselves are just one of the fancies of Spring's paint-brush somehow designed for our delectation.

I have got down a spray from the alder tree's primrose mountain. At the tip it bears on three twigs three of the male catkins. The pale yellow is sprinkled with hard brown dots, in which you recognize the colour that belonged to the whole catkin before it opened. You can shut up the concertina with difficulty, and the brown dots come together, reproducing the state of affairs that by itself it can never reproduce. On the next twig above the catkin twig is one bearing five tiny little cones, which a magnifying-glass shows to be slashed with crimson, and to be potentially shaped like the dry and open cones of last year that still adhere to the tree. Remote from both catkins and cone, on the same spray but nearer to the trunk, are the leaf buds, as yet showing few signs of opening.

Nearly always the male catkins open before the females. All nature is thus gallant. The ladies must not be kept waiting, and often and often it is the fate of the male to perish in a late frost that just misses the more phlegmatic sex. The male nightingale, willow wren, or other migrant arrives by a more perilous passage some days before the hen, as though to prepare a place for her in this cold country; the cocks of our resident species

grow vocal and pugnacious while their prudent hens still think it too early to think of nesting; the male bee hardens in a week of March wind before the future mothers appear. In no department must the ladies be kept waiting.

The crimson slashings on the cones or female catkins are the peepings of the stigmas. Unlike the male element, these can be to a certain extent covered again after being uncovered, and thus saved from sudden inclemency of the weather. They do not become receptive till the males have discharged their pollen by millions and trillions of grains, and the atmosphere is one vast bath of impregnation. Then the alder trees suddenly turn from yellow to rose-colour, the lengthened female catkins exposing all their crimson, but diluting their brilliance with the sober scales that covered them in the bud. All along the river then are trees of one colour, and the other, yellow next to rose, yellow perceptibly turning to rose, and finally the pale peep of green.

The lambs' tails of the nut bushes have been flying all the winter. Over and over again the tragedy of the fatally disappointed male has been played. The frosts have nipped off several armies of them, the rains have soddened the pollen so that it could not fly, and the wise little stigmas kept themselves close in bud. The nut bush does not produce all its catkins at once, but sends scout armies forward at each slightest hint of spring. It will be found, though, that the alder and the other

trees putting forth catkins now do so with their whole strength.

Wind flowers upon trees must be produced before the leaves have started to open. Multitudinous as the pollen is, it must be set free in a world that is not everywhere clogged with foliage to catch it and put a fruitless end to its voyage. How multitudinous it is, who can say? Figures would be of no avail. Possibly it is greater in the evergreens than in deciduous trees, as though these trees knew how much greater is the danger of pollen going astray among leafed branches. The yews are now studded with innumerable little yellow balls like the flower of mimosa. I touch a branch of it and the powder flies off like smoke, as thin and as volatile, melting into the air like the steam of a locomotive, though, unlike the water particles of steam, each atom invisible in its smallness is an atom of life expressly aimed at the fertilization of a seed of its own kind. How futile to attempt to calculate the number of pollen grains on this one yew tree among the millions that stud our chalk hills!

In districts where many pines are grown, not merely the stigmas and the twigs, and the trunks of the pines, but every tree within miles, the grass, the rocks, and the whole earth, are covered with a layer of pollen that paints them all yellow. When the rain comes, the streams are yellow, and where the flood has been out it leaves a deeper stain on the ground from the swollen grains that makes

men say that a sulphurous rain has fallen. It is while the pollen is flying that the scent of the pine-woods is most apparent. It is then that we fill the lungs with ecstasy, and declare how much good we are receiving. Each grain is, in fact, no more to us than the theoretical particles of which an odour is composed. Perhaps to some very tiny creatures the air seems full of flying pebbles or balls of resin.

The silver poplar, the black poplar, the tall Lombardy, the balsam and the cotton-wood have all swung out their incredibly thick and solid tails apparently grown in a few hours. They require a good deal of sun to set their powder flying, and it often happens that a cold wind brings the catkins down before the powder has been shed. The Lombardy poplar really comes from the Himalayas, and reached this country from Turin in 1758. Suppose that I say next that there is only one tree of its kind in Great Britain to-day.

I would not go quite so far as that. Every one knows that tall steeple-like poplar whose branches, instead of spreading outward like the oak, grow parallel with the trunk. That is *Populus fastigiata*, and its Latin name is unusually easy to understand. If you cut off a branch and stick it in the ground, it is fairly certain to grow; and even if it has been roughed into a stake or a gate-post, it will equally become a tree. Then is it a new tree or only part of the old one? If the tree from which it was cut was a male, the stake grows up a male and never a female; and because Lord Rochford only

happened to bring males here in 1758, all or nearly all the Lombardy poplars in this country now are males and bits of the same original male. There are found here very rarely now some female Lombardy poplars, perhaps introduced by some other acclimatizer, or possibly cross-bred with one of the other poplars.

Like the poplars, the willows have catkins of only one sex on one tree. It is they that give us the 'palm,' best loved of all catkins. They bear not hanging catkins, but, in token that they are something better than wind-lovers or anemophilous trees, catkins upright like flowers. We like them so well, at any rate the male blossoms, because after their silver stage they hang out golden stamens, evidently meant to be seen, and because they are fragrant with honey for the attraction of bees. Their pollen is of another kind than that of the alders, because they drive another trade. Instead of a dry dust that will cling to nothing but the sticky stigmas, the pollen of the willow is soft and mellow. It smudges the face of our little daughter with gold when she smells the 'pussy-willow,' and so it smudges the bees that, unlike the little daughter, have noses also for the female blossoms on another tree, as honeyed as these though they are but green.

We can smell the 'palm' trees far through the wood. It is like hot wax or a honeycomb that gives up all its odours at once and in concentrated form. If even the human nose responds to it at

the distance of several hundred yards, it must appeal to the delicate sense of an insect for a mile. Sight too might find it almost as far. When from the opposing height we have had the whole dark wood under view, the sallow bushes in full bloom have stood up not so much like vividly coloured things as like illuminations.

Sure enough there are upon the sallow at its blooming, specimens of nearly every insect awake. Blue-bottle and green-bottle flies buzz about in their short undignified way, and with them the drone-fly, earliest and latest of all summer's manifestations. He is not very wonderfully like a bee, but there are comparatively few of my acquaintance who dare so far rely on his fly-hood as to catch him in the hand.

If you were to take a bull calf, kill it without breaking the skin, and place it in a stone vault with the windows open, it may be that in time the drone-flies would lay eggs in it, and a swarm of rat-tailed maggots live in it till they in turn became drone-flies, and a person lacking in entomology, approaching at the right time, might declare that he saw thousands of bees. That at any rate was an old recipe from before the days of Virgil for obtaining a swarm of bees. Not many years ago the plan was tried by a Cornish gentleman, who declared it to be a success.

The real hive bees are here too, rounder of body and more stately of flight, not alighting with an impertinent jerk, but coming deliberately to

anchor like the important ships that they are. Besides the brown bees that we call our own, and which I prefer in my apiary to any foreigner, there are some yellow Italians that must have come nearly two miles, for Italians are not kept nearer. Then there are humble-bees, yellow-banded, furnace-tailed and yellow-headed. Far more important people these than the worker bees from the hive, for each of them represents a community in herself; each is a mother out for the house-keeping of a family that shall by and by be a great and flourishing city.

In sheer contrast to the fussing, industrious bees are the peacock and small tortoise-shell butterflies that sit and sip and bask with slow-winking, painted wings signalling their ecstasy. Theirs is a rare pleasure even in butterfly-dom, for it is a renewal of joy after personal annihilation. These gems knew the ivy blossom last autumn, and then laid themselves by in winter coma to be called only a day or two ago by the warmth of summer's new sun. Even in autumn they did not know any joy comparable to this spring riot of sallow blossom.

The full glory of the sallow blossom is not quite yet, but there is much fascination in finding now the few trees in favoured situations that have struck the golden note in advance of their rivals. The entomologist, who does not care for hibernated specimens, goes to the sallow by night, and there gets a few of the hardy early moths of the year. I can see them now as I saw them twenty years

ago, silently flapping their large thin wings on the catkins, that seem to glow like faint lamps in the dark.

And here comes ambling down the blackthorn grove the daintiest, freshest butterfly of the whole year, and so unfailingly early of appearance as to deserve the name of the very spirit of spring. Who does not find a sunny day in March made perfect by the brimstone butterfly? It has had its flight in autumn and has bestowed its feathered wings somewhere out of reach of the mould of winter, and it appears now as fresh as though it had been fashioned to-day in freshest butter—a fancy perhaps that has given the name of butterfly to the whole order.

The blackthorns are just bursting their crimson-brown cerements and are here and there covered with dazzling stars, but the brimstone butterfly ignores them all and goes ‘boffling’ on, covering an immense stretch of country and showing itself to a large number of connoisseurs of spring in a day’s journey. (‘Baffle-fly’ may give another clue to the origin of the name ‘butterfly.’)

For a moment or two it hangs on a holly bush, and then, if the under sides of the leaves are showing, you have the greatest difficulty in finding the insect, for its yellow, without being nearly the same colour, is quite undistinguished from the pale-bluish green of the leaves. By the time we have found it, and admired a little the smooth beauty of its wing and the chaste decoration of

one small reddish 'o' like a fungus-mark on the leaf-shaped wing, the spirit of spring is off again. It is making a search, which would puzzle most botanists hereabouts, for a bush that, when it comes into leaf, will declare itself to be buckthorn, for it is on that plant that brimstones' eggs must be laid if the caterpillars are to live. I may confess that I have never seen the buckthorn here; yet that it is to be found the punctual appearance of fresh-and-fresh brimstones in July seems to testify.

I cannot say that the butterfly succeeds in identifying the plant before it is in leaf, for I do not know that the eggs have been found before May, and then they are fixed on the leaves themselves. But what wonderful instinct is this that enables a honey-living creature to select from all the leaves of the forest that one which its larvæ must eat if they are to grow up into butterflies themselves?

MARCH

II

BEES—HUMBLE AND OTHERWISE

THERE is no more joyous sound than the deep hum of the first humble-bee as she winnows the red beech leaves on some bank that she is searching for a site for her nest. It is usually the yellow-banded bee that thus first presents herself. The big red-tailed bee comes next, and the yellow-thoraxed bee, not usually so large as either of these, but still a giant by comparison with the hive bee, generally gets up last.

A writer in the *British Bee Journal* says of the wild bees :—‘ I love them so well that I could even tell the species by their hum, as you may the birds by their song, or the butterflies by their flight, or the flowers by their scent.’ The ordinary reader may spend a few hours in the garden listening to the one or two bees that he knows, and he may imagine that he has reached the same height of musical appreciation. He will find most of the queen humble-bees of the neighbourhood humming round the flowering currant if it is well out and the

air is balmy and the sun shining. How many species will he reckon them ?

Every one knows the story of how humble-bees had to be sent to New Zealand in order that the colonists might raise red clover. Perhaps few know the whole story. It ought to begin with the sorites, invented by Darwin and elaborated by a later hand, to prove that old maids were one of the mainstays of England. Old maids keep cats; their cats catch mice that destroy bees' nests, thus saving the bees which are essential to the fertilization of red clover; red clover nourishes the beef of old England, but for which our valour might starve.

So when the New Zealanders began to raise the same kind of beef by planting red clover, they found that, through the absence of long-tongued bees in their country, it would not set seed. The obvious thing was to import humble-bees, and with that the story usually ends.

But there are humble-bees and humble-bees. The yellow-banded humble-bee with the white tail, which happens to have been selected for emigration to New Zealand, is very much given to biting holes through calyx and corolla, and thus taking a flower's honey without fertilizing it. Any one who watches a row of scarlet-runners or a patch of comfrey in blossom, will see blossom after blossom thus bitten, and bee after bee sipping the nectar without one thought of pushing its tongue through the proper flower entrance.

Mr. F. W. L. Sladen, one of those who understand bees in this country, was therefore responsible for sending as the second consignment to New Zealand the red-tailed humble-bee, which is not given to the nefarious habit, and henceforth the roast beef of New Zealand rested on a firmer basis.

Let us find this red-tailed humble-bee on the flowering currant. She is seen in a moment. Her name of course is *Bombus lapidarius*. You will find her later in the year heading a considerable nest in a deep hole on some stony bank, and if you attempt to interview her there, you will find that she is the fiercest of all our humble-bees. On the other hand, you may think that you find her inhabiting a moss-woven nest on the surface, and then you will find her a very mild-mannered bee. In the second case, you are dealing with *B. derhamellus*, quite another kind of bee. The quickest way to tell them apart is to see whether one of them has the hairs of its pollen baskets and some other of its leg-hairs red instead of black. If it has, it is *derhamellus*.

I would not attempt in this place to unravel the species that may be described as yellow-thoraxed. Suffice it to say that there are about twelve of them, more or less alike to the casual eye. The rest of our humble-bees may be put down by the uninitiated as varieties of our banded bee, *Bombus terrestris*. Added to those already given, they make up the list to twenty. Three times twenty are sixty, and that gives the number of

males, females and workers, each bearing its own distinct livery, that have to be known, whether to the ear or to the eye, before our knowledge of the humble-bees is complete. More than that, our humble-bees are very variable. In each sex of each species many well-marked varieties have been tabulated by entomologists, and often the work of one investigator has been undone by another, who has found that some of his specimens have been put under the wrong label.

Here, for a striking example, comes a bee that will not be found in your gallery of coloured portraits of the types of all the British species. It is neither yellow at one end, red at the other, nor banded in the middle. It is a large and heavy bee, of one uniform black all over. That is the extreme melanistic type to which several of our species run, and you will only be able to decide its species by attention to the proportions of its parts, either to the eye or through the microscope. It may be one of several humble-bees; it may be no humble-bee at all. That red-tailed one too, and yonder banded one, they are not humble-bees unless you extend the term to cover four more species.

What is this riddle? Any one would swear that the bees just pointed out were humble-bees if the others were. Still more would he swear it if he saw the suspected creatures entering a humble-bee nest with others apparently just like them. The bees themselves are evidently deceived by

these cuckoo bees that enter their nests, and there live and multiply at the expense of their hosts.

There have at present been discovered only four species of these cuckoo humble-bees, but as the genus is well spread throughout the world, and as these parasites usually very closely resemble their hosts, it is likely that there are other discoveries in store for some lucky or enterprising entomologist. At any rate, the knowledge that there are such beings adds to the interest with which we daily watch the flowering currant bush.

Apathus, unfeeling, is the name by which we know this genus of humble-bee parasites. They are generally to be known from the honest insects they personate by their darker wings and more shiny abdomen. By this latter characteristic the bee-keeper knows those of his hive bees that have taken to robbing their neighbours. He believes that the defenders strip off some of the hairs of the invaders in their struggles to prevent their entrance. It is strange that a similar mark should adhere by inheritance to these unchallenged thieves of the humble-bee.

As soon as the red dead-nettle is well in bloom it is visited by another bee, obviously not of the 'humble' persuasion. It is when it first appears a yellow-thoraxed bee, of a stoutness approaching that of the class just mentioned, but of far livelier habits, darting this way and that at speed and hovering before a flower in a way that reminds us of the humming-bird hawk-moth. When the

sun has played on it for a few hours it is a greyish bee with a white face and—but let me catch one and show you. Afraid of being stung? No, for the simple reason that I know this bee to be a male. There. You see that the whole of its face is a staring cream colour, next that the middle pair of legs are furnished with extraordinarily long hairs of which no one yet has learned any use—except one, as a means of naming the insect. We call it *Anthophora pilipes*, or, in the bosom of the family, ‘Old Hairy-legs.’

And where is Mrs. Hairy-legs? You would never guess. A few days ago she slept in her chrysalis underground. Hairy-legs came first to the dead-nettles or the white alyssum—the ladies must not be kept waiting. But now I see, Mrs. Hairy-legs is here also. She is that coal-black bee with yellow pollen baskets, for, unlike her destined husband, she is hard at work collecting food for her destined young. You don’t believe it? Ah, now Hairy-legs has discovered her. See him hover behind her on rapidly vibrating wing, all the ardour of love in his very hum. See him dart at her like a shot suddenly released from a catapult. Yes, that is certainly Mrs. Hairy-legs, and if you catch her, she will give you somewhat of a sting, a very sharp prick that hurts quite as much at the outset as our hive bee herself, but leaves a less poisonous result.

We could scarcely select a better solitary bee for open-air study than this same Hairy-legs.

It is so widely distributed that I have seen it within the boundaries of the city of London, hovering on a sunny day round the flower stalls in our streets at the time when daffodils are most in evidence. Only, as a rule, the males appear in such a public place. They are at all times both more numerous and more daring than the females. The flower sellers do not mind them, but they rather stare when a man comes by and calmly scoops them into the hand as they hover before the blossoms.

We must find a quieter place than Regent Circus for studying our *Anthophora*. There must be an enormous colony of them at Kew to judge by the number of females in the Alpine garden from the time of the crocus till the Solomon's seal is in flower. I have not yet found that colony. Probably in some sandy bank, or it may be in a wall with many nail-holes, a swarm of these black bees should be found digging their galleries or plenishing them with pollen mixed with honey.

Among them, sailing about with demurer flight, may be seen some grey bees more like Hairy-legs than his wife, but on closer acquaintance very different from either. It is really a black bee with white spots on it—yes, spots and not bands as most bees are marked with. These are upon the abdomen, the thorax being bordered with whitish hairs so as to leave a triangle of black in the middle. A demure hypocrite is this *Melecta armata*, for it is sailing about in this busy colony

for an opportunity to lay its egg in the pollen mass that *Anthophora* has accumulated for her own progeny. Once that is done, of course, the parasite wins, at any rate, from the *Anthophora* grub, for it hatches earlier and shoulders the other off in true cuckoo fashion. Yet wait. The cuckoo mother may have unwittingly carried into the nest another parasite on her back, and that may win the race both over the host grub and the cuckoo grub.

These entomological studies are apt to lead us far astray from any mere tribe with which we start. The parasite that enters on the back of the parasitic *Melecta* springs from the egg of a beetle, the ponderous oil beetle often met with upon the road by a good hedgerow in early spring. The oil beetle lays its egg in a likely flower, and the egg hatches into a leggy and active grub, which seizes the first opportunity offered to jump on to the first bee that visits the flower and to hang on to her hairs and not to leave till she comes to her own nest. Then the oil beetle larva buries itself in the larder, shortly abandons its legginess and lives the next stage of its life as a fat and rolling maggot.

It may seem natural that a slovenly parasite bee may be more prone to victimization by a sub-parasite than the industrious Mrs. Hairy-legs herself, and *Melecta* gets the credit for bringing in the oil beetle in most cases where it is found in sole occupation of *Anthophora's* nest. At any rate,

a *Melecta armata* has been found so covered with the parasites that it was unable to take flight. So in this case the nimble creatures had overdone the thing and perhaps all perished because the last comers would not heed the cry of 'Full up.'

Another bee that forces itself on the attention of even the most casual observer is *Andrena fulva*, affectionately called golden Andrena. When the female first appears it is a stoutish bee well covered with long silky hairs of a rich, almost dazzling orange. It appears in dozens and scores, settling on the sun-bathed ground and not fearing the earthquake that we are when we walk. It is a stingless bee, and so we can catch it and admire its feathered legs and general woolly appearance, and offering a finger to its mandibles find out how well it can bite. But by watching respectfully we find out more of its economy.

Under a sheltering and land-marking leaf on the edge of the gravel path or on the lawn, the little golden lady begins to dig a hole just the outside diameter of her body. As the hole deepens, a little pile of debris marks the opening of the shaft and the bee does not rest till she has a more or less vertical gallery nearly a foot in depth. Then she fetches pollen and makes provision for one grub, the egg for which she lays on the mass. She roofs that cell and successively constructs four or five others above it, each stored with the right quantity of pollen and furnished with an embryo grub to eat it. We note that

long before she has reached this stage, her golden duvet has worn off and she appears as a very commonplace brown bee. Let the reader discover for himself her male from among those of the sixty-three British bees that belong to the genus *Andrena*.

And what is this elegant little wasp that so diligently flies about among the burrows of the *Andrena*? It is *Nomada ruficornis*, as you may see by catching it and looking at its horns. Ah, you caught a big one and it stung you. I knew it would, but as its sting is but a feeble one I worked this little surprise for All Fools' Day. If you had caught a smaller one you would probably have had no sting, for the male, as in every species of wild bee and wasp except one, is smaller than the female. Lastly, be it known that this insect that we have been calling wasp, and which is so emphatically like one, is technically known to entomologists as a bee.

What makes it a bee? A solitary wasp when found will be seen to resemble our social wasps not only in colour, but in the power of folding its wings lengthways when it settles. The wasp at rest appears to have wings that are mere strokes and obviously incapable of raising the insect into the air. It is because each has been doubled along its length and folded together. It is a businesslike arrangement that suits the bustling underground habits of the wasps, though it would equally suit the hundreds of bees that also dig holes for a

living. Nevertheless, none of our bees have folding wings, and they remain the unfailing trade-mark of the wasp.

The solitary wasp when found will furnish an even more exciting exhibition than the leaf-cutter or the mason bee. The food it supplies to its future progeny has not the keeping qualities of honey. It consists of caterpillars, flies, gnats, or other animal substances, according to the species of the wasp, which usually, with the unerring skill of a trained entomologist, selects some particular species of some particular genus for its prey. Seeing that a dead gnat or caterpillar will go bad in a week or even before the grub that ought to live on it for several weeks is born, the wasp must adopt some system of cold storage or preservation, in order to prolong its keeping qualities.

The caterpillar might be supplied alive, but then its struggles would prove too much for the tiny maggot that begins to eat it. But if the wasp mother stings it lightly just in the right nerve ganglion, that will paralyse it and render it docile to the devourer and as little subject to decay as a man in a trance. They are not merely superficial observers but biological, distinguishing apparently between similar species by differences in the nervous systems, or, in other words, by the situation of the place where a sting will paralyse the victim without killing it. The insect thus deftly stabbed remains alive for days and even weeks, but all the time motionless and fit prey

for a young and tender grub. The grub, by the way, must be as expert an anatomist as its mother, for it has to feed for a long time only on such parts of the caterpillar's body as can be eaten without bringing its life to an end.

These amazing wasp-surgeons are by no means uncommon. In this country they are mostly in small sizes, but there is one that occasionally appears in the Isle of Wight whose prey is the honey bee. One of large size and more likely to be met with is one or other of the *Ammophila* genus, frequenting such sandy places as the dunes by Liverpool, Lowestoft, Deal, and other places. The *Ammophilas* or 'sand-lovers' are extraordinarily long of waist, the abdomen appearing to be so detached from the body that when the insect is flying it looks like two insects closely following one another. They are sometimes black, banded with red, sometimes black with yellow stripes, and sometimes the stripes only appear as dots.

There is no more interesting sight than a colony of these very busy wasps digging their holes in the sand, covering them with flat stones while they go hunting, and dragging home their prey with great appearance of fussiness and anxiety, like policemen quite new to their work. One of them has gained the almost unique eminence among animals of a tool-user, for it has been seen to keep a selected stone to use as a rammer for finishing off the tampion with which it finally closes down its living larder and nursery.

Other good large solitary wasps of true wasp livery will be found burrowing in decayed trees, a habit that earns for them the name of carpenter wasps; other smaller ones make neater and more workmanlike holes in sound larch palings or other woodwork. None of them has been studied in this country as they and their associates have been in France by M. Fabre and others, or in America by Mr. and Mrs. Peckham. In this small sub-department of natural history, then, there is a field for entertaining observation not merely through one summer, but through many years. Here is research work worthy of the highest science and within the capacity of the quite uninstructed but painstaking boy; food for the entertainment of an afternoon or for the absorbing attention of a lifetime.

APRIL

I

SONGS TO THE SUN

WHEN the April sun is shining through the bare branches of the orchard, casting blue shadows on the grass and persuading the bunches of blossom to open without delay, there is no song that so appropriately accompanies this foretaste of summer as that of the great tit. 'Peter, Peter, Peter,' he sings everywhere, for he is happily a common bird. It is a good swinging note that expresses not merely the happiness of sunshine but the vigour of spring. If you want the mellowness of summer, wait a few days till the cuckoo comes. His is the same see-saw between two notes but altogether in another key and measure. The great tit has been singing two full months when the cuckoo comes. A sparkling north-east wind is quite good enough for him, with plenty of work to do before he can get his tale of caterpillars.

The blue tit tries to outsing his big brother with a song of 'Silly me me me me,' the coal tit

has somewhat the same remark to make, and the marsh tit sings I cannot remember what, words that doubtless sound like English nonsense, but which convey a very good message of praise for all that makes life worth living. The long-tailed tit has a hymn of which no one can catch all the notes any more than any artist can catch all the tints and turns of his beauty as he flits racket-tailed across the blue sky or sportfully chases his tiny wife in and out among the yew branches. They will be nesting in the blackthorn half a mile from the nearest hen-roost, but they will line and quilt their nest with thousands of the softest feathers they can pick up when no one is by to see. The actual number of feathers counted in one nest by 'the accurate M'Gillivray' was 2379.

There is another kind of music in the raucous 'kyarrh' of the carrion crow, which one can hear further than the songster can be seen as he balances on a tall elm or swoops up and down in the presence of his more retiring partner. His call is obviously harsher than the 'caw' of contentment that comes from the innocent rookery where one bird of each pair keeps a very watchful eye on the nest while the other is foraging for sticks or lining material. A third member of the crow tribe, the rosy plumaged, blue-winged jay, brings the 'caw' down to a 'squawk,' and a fourth, the magpie, debases it to a chatter that rings wonderfully across the sloping field whose hedges of hawthorn are greening so brightly under the influence of early April.

WHEN THE LARK SINGS

The 'Summer is coming. I know it, I know it' of the thrush is a cheerful song that scarcely rises and falls with the fortunes of the day. Even when clouds float over the sun he knows it, he knows it and affirms it, affirms it as confidently as when the sun shines and sets all the minor poets singing. The blackbird, on the other hand, keeps his mellow, sympathetic notes for occasions that specially appeal to him. He welcomes the dawn with a dreamy, well-pitched rapture, and towards the setting of the sun his rich music again rings flute-like through the thicket. But he sings most cheerfully of all when a shower has just fallen, and when, before the last drops are down, the sun is shining in what we call April fashion. Does he rejoice to see the rainbow in the sky—or to think of the worms that the warm rain will bring forth?

When we hear the chaffinch and the yellow-hammer sing side by side, we are tempted to wonder whether the classifiers have done well to place them far apart, describing one as a finch and the other as a bunting. The song of each is much the same twitter, and seems to end on much the same note. At any rate, the construction is but one for the two songs, which resemble besides only those of the corn bunting and the greenfinch. The 'little bit o' bread and no cheese' of the yellow-hammer is universally known. Not so happy have been the attempts to vocalize the chaffinch's shorter song. 'Come my love and

meet me he-ere' takes many liberties with it. The last word is clearly 'ginger-beer,' and all the rest is mere stuttering on the first syllable. Thus between the two, these two birds demand a fair lunch. It remains for the greenfinch and the corn bunting to make constant insistence on the one omitted article, the 'che-ee-ese,' the shrill, dreamy shout for which echoes from the hedges all day long.

And if the chaffinch is a bunting, what, then, is this bird like a dowdy kingfisher sitting in an oak and singing like a tit? It is the nut-hatch, occupying a genus and a family all to himself, and it seems fairly clear that it has deliberately borrowed a song from the tits, having none of its own. So we must admit that the chaffinch may have borrowed also (with marked improvement) from a generic stranger. For the bullfinch, who might stand for the king of the finches, has in nature scarcely a vestige of that bold pipe with which the enslaved and educated tame bullfinch delights us. The hawfinch is equally silent, and the goldfinch sings, from lack of force, a good deal less notably than the chaffinch.

We are apt to overlook the robin in our catalogue of March music, because he has been singing so cheerfully all through the cold weather. Scarcely less optimistic has been the hedge-sparrow, who for ever sings a very sweet exordium and ends it on a frayed note that no hedge-sparrow yet has managed to splice on to a discourse. It

is as though he for ever chanted some such words as these: 'Whereas the summer is really and truly just about to begin,' and never managed to overleap the first comma. The jolly little wren, on the other hand, generally brings his energetic twitter to a satisfying period. We never realize quite how energetic his song is till we see him clutching his perch as though for dear life, his tiny body staggering and trembling with the strength of his emotion, his yellow mouth wide open in a barely sufficient effort to emit the ringing effusion of his soul.

But the first song and the last song of all to charm us in the open field, when the blue sky is wide open and the sun at its height, is that of the lark. His wing-work under the dome of heaven seems to pump his organ pipes full of air, so that he sings, as stop-watch critics have noted, by the four or five minutes together, surging from gentle to strong in each bar, and with a crescendo from the first bar to the last. Who does not stop to throw his head back and scan the almost intolerably bright sky to find the swimming dot whose motions are timed to that fountain of music? Still more we recognise the artistry of the lark when we see him gently lowering, lowering, with wider and wider oscillations, to his home in the field, and mark with what taste his song is altered to fit the new movement, swinging slower and wider with the actor's movements, till it stops as he drops to his home in the grass.

In the next field those pretty clowns, the peewits, are 'boffling' up and down, their broad-ended wings seeming ever about to fail them and send them tumbling beyond recovery, but actually bearing them with extraordinary deftness. The common name I have selected from many gives some faint idea of the weird sweetness of their call. It is just a symbol by means of which can be called up the shrill but beautiful complainings with which they greet our steps when they stray anywhere near their eggs upon the ground. They have evidently eggs just now in the rough field, where they tumble and wheel with an excess of anxiety that many a lady in town must own is not unjustified. Can there be any one in the world who, having seen a newly hatched lapwing, can still eat plovers' eggs? Can there be any farmer aware of one tenth of the bird's usefulness who can permit her to do so?

The reddish-brown ploughed field dips at an edge and makes a little glen thick with the ebony of blackthorn, on which the starry white blossoms are just opening in showers. A song of a new kind comes from there—a low vibrant throb that speaks of sunshine caught in a thicket, rather than the free sunshine in which the lark swims. It is nearly the same music that the pigeons make as they sprawl on the sunny slope of a roof. We hear it again in June when our migrant turtle dove has come to us from Egypt.

‘Doves of the fir-wood walling high our red roof,
Through the long noon coo, crooning through the
coo.’

The crooning from the blackthorn thicket is evidently a chorus. It keeps on incessantly at great volume yet rises and falls as voices are evidently added to or taken from it. Under the blossomed boughs, in the little sheep-track of a path that threads the thicket, not only the air but the very earth seems to vibrate with the exultant yet low-toned croon. I reach the edge of a pond, the surface of which seems to be covered with white bubbles blown here and there. Whiter than bubbles, they are like goose down floating on the water, and they swell into new whiteness and subside into comparative grey as the song comes and goes.

We have to walk with great silence in order to see the frogs well, swelling out their white throats and crooning their ecstatic song. At the least alarm, violent ripples take the place of the white bubbles, and the whole company goes down among the sub-aquatic weeds. Then we have to wait quietly, and one by one the heads pop up again, two prominent eye-cases and a third point above water for the nose. Then the throat comes up so white that you would think nothing could be whiter, but while you look it swells three times whiter, invades the chest and the neck to the back of the head, and the musical drum-like throb calls

through air and water to the other frogs to resume their chorus.

These frogs in the blackthorn dingle are late this year. The pond is already half full, as it would seem, of the spawn of earlier frogs, and as I listen to the rapidly growing chorus again, the short, high yelp of the toad breaks in. A hotter sound this than the March croaking of the frog, and the spawning time of the toads is usually a fortnight later than that of the frogs. But one year I saw frogs and toads both in the midst of their spawning on the same day. The sun had evidently delayed to shine till after the frogs' time, and then had come out strong with the call to frogs and toads together.

So excited and thronged were the rival amphibians that they did not know one another for scions of different houses, and you saw strange love-making between Montagues and Capulets and Capulets and Montagues. I doubt, however, whether cross-bred progeny of toad and 'hop-toad' has often if ever been noted. As it happened on that day, at about three in the afternoon, the toads all began to climb out of the pond and make for the bushes. Some carried frogs on their backs, but the latter, not relishing an advance into the interior, dropped off and made back to the water, where they met and passed toads that had torn themselves from their more aquatic loves to join the landward route march. I went to the pond a few days after. The frogs

were spawning, but of the hundreds of toads not one was to be seen or dug up from among the dead leaves beyond the bank.

Another time I found hundreds of toads issuing from a long brick wall bounding for, perhaps, a mile Osterley Park in Middlesex. A road runs next the wall, and the toads were flopping about the road shouting their mellow call, that of the female about a third lower than that of the male, making together a perfect babel of oily music. The sun had fetched them out from a maze of sleeping-places in the decayed foundation of the wall, and they were perfectly heedless of the fact that they were on a high road—a fact marked by more than a dozen bodies that had been crushed by the wheels of bicycles and motor-cars that had gone by. What made the concourse more mysterious was the fact that though I looked well, I could find no trace of any pond within hundreds of yards of the place, on the road side of the wall.

It is known, of course, that frogs and toads both breed in the water. But it does seem as though either of them could manage to produce young that would grow to maturity without an actual pond or pool. I have found frogs of all sizes in a walled garden of rank wet grass not far from where an old pond had been, but two or three years after the pond had gone and the garden had been enclosed.

The habits adopted by species of frogs throughout the world are many and various. The well-

known Surinam toad has the eggs placed on her back, and there the young remain each in a separate cell through the tadpole stage and until they reach the adult form. In Darwin's frog the onus of nursing is transferred to the male, who carries the eggs in a pouch reached through the mouth till the young frogs are able to take care of themselves. A tree frog of South America has a similar pouch, this time on the back of the female; another provides a slimy mass for the eggs in a nest of bamboo leaves, and there the whole tadpole stage is passed; in a third species the tadpoles attach themselves by their sucking mouths to their mother, and share her fortunes till they get their four legs. All these habits have no doubt been created by some such force of circumstances as the drying up of the ponds in which the great mass of amphibians spend the infantine stage of their career.

A short rapid rattle down in the wood reminds you of the roar of a fallow buck. It is not, however, the song season of that animal, and I know the instrumentalist. I can see his instrument in the gleam of a dead white branch among the green stipple of the live trees. With a glass I should be able to make out the musician from here, but it is not at all likely that he will have finished before we get down to the wood.

The rattle, repeated faithfully every two or three minutes, grows louder and louder. The branch chosen is like a violin in its vibrant response,

and any one who sees the great spotted-wood-pecker at work on his instrument for the first time must be astonished at the small size of the bird that makes so much sound. He does not seem nearly as large as a blackbird, though he is actually of about the same size. He has, like other wood-peckers, a red tassel on his head, and he is picked out with diamonds of black and white that shine like satin or silk in the bright sun that bathes him and the clear white branch at which he hammers.

The world is getting green now, but it is largely a deceptive green. You do not see that the snails have made free with the dark glossiness of the arum or the spiked leaves of the blue-bells. The stinging nettles are well armed against all but the caterpillars of the *Vanessidæ*, the ground ivy is protected by the essence that gives it the strong aroma we like for auld acquaintance sake, and the blue-bells and daffodils are full of sharp crystals that quickly bring sores on the hands of those who pick them.

Now is the time when we make a great onslaught on the snails and slugs in the garden by putting down traps that catch them by dozens a day. Cut a turnip, carrot, or other vegetable into inch-thick slices and place these near your favourite rockery plants and other things that slugs like, and in the morning you will find on the under side many a fat beast of whose presence the garden will be well rid. You will not catch them

with turnips when the fresh greenery of the year is well under weigh.

Sometimes a green or brown caterpillar is found curled up under the slug trap. It is a grub of last year that has hibernated somehow in the cold ground, and is anxious to begin eating again. The tiny new caterpillars of the year must be very far to seek, and they are certainly not very satisfying when they are found. But the birds from over the sea do not wait till the tide of insect life is full, so anxious are they to return to the groves of dear old England. They are ready to starve a little rather than let their great work get ahead of them, and in a very few days now they will be here with their dainty songs and spruce overseas manner.

Hark! The great tit again, singing his swinging song to let you know that even an all-day workman has breath to give praise. But it is not 'Peter, Peter' he is calling, unless you allow that name to be accented equally on each syllable. Nor is the bird the great tit that skips mouse-like among the brown twigs of the oak, sending down now and then a tiny scale that the swelling leaf-bud has done with. It is a dainty brown bird countershaded with pearl and of a slim elegance that our winters do not nourish. And its song, which for a moment sounded like 'Peter, Peter,' is 'Chiff-chaff, Chiffy-chaffy, Chiff-chaff.' The little brown bird is the first of many summer songsters from over the sea.

APRIL

II

THE HOMECOMERS

FOR a week, even for a month, the cuckoo has been reported from one part of the country and another. Every year he is heard long before he actually comes. Yesterday, a favoured farm hand both heard and saw him. As the man chopped poles from a withy tree, sending the white chips flying from his keen axe, the bird sat for a little time in a tree near by and gave his name a dozen times. We listened for him all day long and never heard him, but in the evening there came over the orchard from the west, first a martin, then another, and then a swallow, evidently one of our own swallows, for it stayed and hawked back and forth till the sun set.

It is a penalty on these birds that spend their winter in a softer climate that they should be regarded as foreigners. Just so much foreigners are the people of the big house who annually migrate to Italy in autumn, and do not return till

the cable tells them that England is warm and vigorous with spring. And the people of the village are perhaps impartial enough to think of the unfeathered migrants, too, as something not quite English.

Every swallow and even every cuckoo that comes to us in April comes back to its home. Comes back to the parish and the field where it was hatched, practices for the first time or once again the home songs of its parents, woos its English bride here that perhaps it never looked at in Africa, and rears its English family here.

Nor are these winter-fleers the tiny minority among English birds that we imply them to be when we speak of swallow and cuckoo as though these were all. On the other hand, if the species were added up I should not like to say whether the residents or the migrants would be in the majority.

Among the crows there are none that go away for the winter, though in the bordering family of the shrikes there is not one that resides the year round, while the well-known butcher bird is a summer bird, and the woodchat shrike when it does come comes to breed. The finches are an unbroken phalanx of year-round residents, and so are the buntings, though they all move about a good deal within the confines of the United Kingdom.

On the other hand, think of the tribe of the robin. Count with the robin the hedge-sparrow, a very valued resident, but you immediately cancel

them with the nightingale and the blackcap, which only come to us in April, and then the non-residents pile up a reserve of marks with white-throat, chiffchaff, willow-wren, wood-wren, lesser whitethroat, garden-warbler, Dartford warbler, reed-warbler, sedge-warbler, marsh-warbler, grasshopper-warbler.

Another more or less natural group of birds gives us the sturdy little stonechat all the year round, but we have to wait till summer for the whinchat, the wheatear and that best of all summer birds the redstart. The redstart naturally introduces the spotted flycatcher and the pied, which have no counterparts among our residents. Neither have the swallow, the two martins, that unique bird the swift, the goatsucker, nor the cuckoo. The wryneck fills a lonely rôle on the fringe of the woodpecker family, which gives us otherwise three species that are with us the year round, and the pigeons give us the same respective figures, though the turtle-dove—which comes to us late in spring—by its wide distribution and its persistent crooning is as much in evidence as the other three put together.

A month ago there was not a more melancholy-looking little bird than the winter-pipit. It was in from its cold meadows where the moon daisies dance in summer and mooning about the dung-mixens and the cow-yards, right under the nose of any one who went by, not making any but the most belated attempt to get out of harm's way.

Now, there flies up from the grass where the pale green cowslips are opening their honey-yellow petals a bird that seems bent on reaching blue heaven itself. Sixty feet up in the air it stops, bends its back till it seems like to break, makes parachutes of its wings and tail, and comes spirally down to its starting-place in a flood of perfectly ecstatic silvery music. That bird is the winter-moping meadow-pipit.

Down the road is an ash tree that I like to watch daily every April, till some morning it keeps miraculous rendezvous with a bird that has wintered in the south. Ah, there at last he is. Something tells me that it is he, sitting on the same twig of the same bough that he occupied last April, but when he goes up into the air I am joyfully quite certain of him. Up, up, he goes, then apparently dislocates his back and comes down on umbrella wings, singing, singing, singing till he reaches again the self-same twig from which he started. Apparently the same bird again as the winter-moping meadow-pipit, but this is the tree-pipit, constant to the habit of sky-rocketing from a tree instead of from the ground, and preferring to winter gaily in the south rather than moon about an English dunghill.

The bird that often seems the most beautiful of all is only seen in some southern counties on its way to the north. It is only thus that the redstart is seen in many places that seem eminently suited to the bird, but which, nevertheless, cannot

hold it on its way to other very similar places where redstarts were hatched last year.

More beautiful than the redstart, in a quiet and artistic way, is this one that I know I can show you to-day by the old mill. It always lingers there at least a week, as though it could not quite make up its mind to leave so beautiful a spot for another not more suited to its artistic and material requirements.

There it is on the cart shed, a slim bird mainly in yellow, but with a black 'chest protector' and grey head and back. It flies off with the tell-tale 'chizzick' of the wagtail, and we can find it again running with inimitable grace on the wet stones of the brook. Its real home is in such places as Tor's Steps on the Barle in Exmoor, or by Bolton Abbey in Wharfedale, and I never see it pass through our parish on its spring migration without thinking of one of those beautiful stickles in June when the grey wagtail runs over the brown stones and in and out of the cool water after caddis grubs and stone-fly larvæ.

The grey wagtail is not truly a migrant. Indeed, it seems to move rather northward than southward in winter. The pied wagtail, on the other hand, moves southward, but still within our country. The place of its nesting is vacant for the most part during the winter, and we welcome it back as one of the harbingers of spring. It is very nice to have this dainty bird again, running along the house

ridge and springing, all black-and-white daintiness, into the air to catch the first gnats of spring.

A true migrant is the yellow wagtail. One fine morning in spring, a whole company of them will descend on a field like a cloud of golden butterflies, and then we know for certain that the flood of northward migration has set in. They stay with us in flocks for some little time, assisting at the potato planting by collecting innumerable grubs behind the plough and making the dull earth lively with a gold that rivals that of the coltsfoot. The French call the bird *Bergeronette printanière*—Little Shepherdess of the Spring, for it has the pretty habit of running about round sheep or cattle for the sake of the flies that haunt their near presence.

Our birds are not given halcyon weather for their homecoming. The time at which they must travel in order to make sure of their nesting sites is one of the most windy and uncertain of all the year. Whole armies of swallows are sometimes wiped out in the passes of the Alps by hurricanes of snow and hail which no bird can foresee. The winds, especially violent at this time of year, often sweep the birds far out of their course, tiring them till they drop in the sea, and directing them falsely beyond our islands into the wide Atlantic, which not one short-winged bird in a hundred thousand can cross. Fogs bewilder them, so that they dash themselves to pieces against light-houses and the street lamps of towns, and, among

minor accidents that civilization arranges for them, the telegraph wires cut them down as they fly swiftly across them in heedless flocks. This morning I picked up a golden plover, thus stopped in his migration to the northern moors, and lots of poor people in the neighbourhood keep the pot boiling in spring from such windfalls. The birds must fall by the hundred thousand from this one accident of the telegraph wire alone.

Oh that man would be content to destroy our songsters only by the accidents of civilization. The tiny little bodies of our feathered nymphs are still more coveted by the people of the Continent for food. They are even valued as marks for the 'sportsman's' gun, and it is a standing marvel to Englishmen to see grown Frenchmen take a delight in shooting tits and willow-wrens sitting, and gathering every wild thing in feathers that they can see into their strings of trophies. They are generally known to pay very heavily for their 'sport' in plagues of blight and caterpillar, from which our soft-billed birds largely relieve us. But in spring and in autumn the Frenchman and the Italian have the chance to kill our birds as they pass to or from the countries south of the Alps, and that is a matter that concerns more countries than the ones in which the shooting is done. There is, moreover, far worse than shooting afoot.

Perhaps our womenkind were responsible for the great French massacres of swallows that took

place annually until a few years ago. Wires were set up as resting-places for the tired birds as they came in from the Mediterranean, and when they accepted the treacherous invitation an electric current tumbled them by the thousand dead to the ground. Now, however, France has joined the International Convention for the Protection of Birds, promoted principally by Austria, and our ladies must wear something other than swallows' wings in their hats.

Great Britain, whose example is generally considered of great value in these humane international movements, stands outside the Convention, and her ancient friend Italy takes the excuse to do the same. Italy has especial opportunities of waylaying the birds of northern Europe on their spring journey, and makes the most of those opportunities.

Nets are spun by the mile round Lago Maggiore and Lago Lugano during the spring. An average net is a mile long and fifteen feet high, and into one of these the tired birds fly by the hundred at short intervals during the three or four weeks of migration. 'Roccolo' hedges of hornbeam have been planted and tended by the square mile, and they are tenanted by blinded songsters and other lures for the free birds. Imitation hawks are sent up to frighten the birds into these shelters, which are a maze of network entanglements from which no escape is possible. The wonder seems to be that any migrant goes over the passes alive.

At one station in Upper Italy an ordinary morning's take is five hundred birds, ranging from thrushes to willow-wrens. If we were to give that single station an average of two hundred a day throughout the season of ten weeks, it would be responsible for fourteen thousand birds at each migration.

At Como and Varese 'redbreasts' are sold not in mere hundreds but by thousands in a day, their price averaging from seventy-five centesimo a dozen when the weather is cool to five centesimo when the small bodies are not likely to keep.

In October 1890 nearly half a million small birds crossed the frontier at Brescia, not as they come into Sussex in spring, on joyful wing and with glad twitter of anticipation, but in indiscriminate, shapeless packets of fifty, from which you could pick out flycatchers, whitethroats, garden-warblers, pipits, and titmice. From Udine, two hundred thousand are despatched by rail; near Montegrado, fourteen thousand swallows fell in three days, and 'on the stone-field Crao' no less than three million in one season.

Perhaps the nightingale that was strangely absent last summer from Honeysuckle Lane, or the redstart you have missed this month from the Lower Orchard, has been gobbled up in some Italian polenta. On the other hand, they may have been caught alive for a worse fate. Perhaps one or both of them took part in one of those 'beautiful' Resurrection festivals with which the people of

Italy testify their faith. 'When the priest intoned the *Gloria*,' says Baron von Berlepsch, the great Austrian bird champion, who writes of these sad doings, 'the congregation let loose the small birds they had brought with them, in the brilliantly lighted church, as a mark of the general feeling of joy at the blissful Resurrection. The wretched little winged creatures, dazzled by the light, flew at the candles, only to be burned and scorched and to perish in agony.'

Surely it is enough for our little friends to brave the perils of contrary winds and freezing blizzards, bewildering fogs and the allurements of light-houses, the attack of hawks and crows and the infirmities of weakness and cramp that must often spoil their marvellous flight, without adding the deliberate hatred of man.

To mark the reluctance of a whitethroat to cross as much as half a field in one flight, to pick up the body of some small unfortunate and examine the shortness and feebleness of its wing, is to be astonished at the power which sends them across a whole continent in order to 'be in England now that April's there.' It is distinctly one of the miracles of the year to find the pipit keeping punctual tryst with the ash twig that knew it last year, the two of them having been sundered by thousands of miles and innumerable life-and-death adventures.

There is no need for the catching and marking of birds to see whether it is indeed the same swallow

that comes back to the third beam in the cowshed at California Farm, in the parish of Peace, in the hundred of Comfort, Gloucestershire, England. Any one who cares a rap for birds knows it to be so. The flycatcher that only laid two eggs last summer and only one the year before that, in the broken plum tree in the Upper Orchard, has probably been nesting in that tree for the last twelve years. The martin that has the fancy to decorate its nest with a long feather and the swallow that builds in a hanging nest under the eaves as though it were a martin, declare themselves by their strange whims to be the same birds that built in the same places last year. I knew in Essex a mateless swallow that built nowhere, but came and sat all day long between its flights on a certain iron arch in the garden. When the swallows came again next year that swallow came and claimed its own perch, and resumed its solitary life. It had the right to show its affection thus for the gardener, for he was a humane man and a great lover of the birds. If the swallow came a third year it found the garden in other hands, and then it must have felt that the world was indeed made of sand. Perhaps it went off and tried to console itself with another mate of its own kind. That, at any rate, is what the widower gardener had done.

I have been round to all the known bird posts, and have found thus far that, in spite of Italian roccolo, the privateers of the air, and all other

impediments, the birds have thus far come back to the places that knew them last year. With a low seven-fold whistle in the orchard, the wryneck said, 'Here.' The redstart wagged his red tail from the dipping branch of the oak, the willow-wren sang its ditty from a bramble spray in Stitchwort Lane, the wood-wren showered its descending tinkle from the top of the same horn-beam that knew it last year, the nightingale of Honeysuckle Lane has not really been poached, and I heard him there again this afternoon.

In due time I shall hear the same old turtle dove crooning from the thicket top of a pollard oak, shall hear the same old night-jar spin its 'rattle note unvaried' from the larch copse, growl midnight anathemas at the same old corncrake uttering its harsh call from the mowing grass all night long. And then the tale of the homecomers will be complete and summer at high tide.

MAY

I

SNAKES

ON this beautiful May morning I go out with entire confidence to look for grass snakes. There is the very big one that hung out all last summer next to the water hole in the Upper Orchard. He was a wily old fellow who never gave you a chance to catch him, but I think I could catch him this morning, overcome with the delight of a sun bath so early in the year. Then there is the under side of the hedge by the Roman road where I have often found half a dozen at a time coiled and ecstatically flung among the primroses. They hibernate somewhere near and congregate there thickly for a week or two before each going off to its own summer domain.

The greatest spring congregation ever seen was in a field higher up the hill. There on a bank in full view of the public footpath a bush round a hawthorn stump yielded one year an amazing tangle of snakes. They were seen by a party of women coming down the hill, and they declared

that there were hundreds of snakes all in a heap like a magnified handful of elvers. I do not doubt that there were fully thirty, and that after all is a good number. As soon as the boys heard of it they went up there to kill snakes, but though they hacked the bush up and did a good deal of digging, not a scale was seen. Happily for themselves, the snakes had within the space of little over half an hour adjourned to the safer hedge.

There is a pleasant summer place for snakes at the entrance to the wood, where a spring issues from the rock and meanders through two acres of swamp gay with marsh marigolds and forget-me-not and odorous with horse mint. Here one day last June as a woman came to the stepping-stones a large snake actually disputed the passage with her. At any rate, it coiled itself and hissed instead of making off, and that was quite enough to determine the woman to go a little way round and let the thing have its way.

The big snake is not by the stepping-stones to-day. I had not expected it, for, though no place is more certain to contain a few of the frog-hunters in June, they are at present enjoying a more ecstatic life composed of little else but unlimited sun. There is a pond just within the wood where the tadpoles have hatched, but are not yet big. Last year, when these were about half-grown, there was a great commotion in the water one day, and I saw a snake about two feet long entirely under water, snapping at the tad-

poles. They seemed to be perfectly aware of the danger, for when the snake followed them up for another snap they broke in all directions like bleak when the pike is after them.

The grass snake, ringed snake, water snake—*Tropidonatus natrix*—is an accomplished swimmer. When long ago we were fishing in the lake one of them came swimming in among the little waves, as though it had come from the other side, nearly half a mile away. About twenty yards from shore it coiled and lay there as though it could easily sleep, 'rocked in the cradle of the deep,' but there was a wide bright eye gleaming above an outer loop where the snake's long chin came from the centre of the coil. But then its eyes are always so, there being no lids or other means of closing them. When we had sufficiently recovered our spirits to throw a tentative stone at the reptile, it straightened itself out for a stroke or two, made a sudden rush for the weeds in the shallow water and vanished. It had a fancy to go on dry land for a change and did so. It might have chosen another means of evading, by going down to the bottom of the lake, where it could remain with ease for half an hour without coming up to breathe.

I call this beautiful wood the Lily Wood, because, as you can see, it is floored for many acres with lily of the valley. We can see among them the taller fronds of Solomon's seal, a fit associate of the lily in the floral dominancy. Again, there are

patches of campion which will make the wood fairly blaze before the blue-bells have done spreading their wonderful nebulous intangible azure, like a very brilliant blue smoke among the trees. Here comes, too, a 'bloody man's finger,' as our country people call the purple orchid. If I live to be ninety I shall never fail to find the purple orchid richer and brighter every year. You seem to see it again and with a new brilliance when you have taken it in hand and felt the luscious weight and fullness of its sap. I have not nearly exhausted even the May beauties of my Lily Wood.

Hullo! there they go from their basking place close to the path. One, two, six or seven long grey bodies shooting through the dog's mercury, and rapidly reaching safety under the thick rods of the hazel. I caught one, however, as it made off to a too distant shelter, and another I hauled out from a shallow cavity under a nut stowl where it had coiled itself. One for me and one for you, dear reader, to put in a handkerchief and take back to your pupils and make them see its harmlessness and its beauty. But you must not mind its strong smell, the only means it has of persuading one who laughs at its 'fangs' and hissing to let it go.

The smell of the grass snake, that is the effluvium that it emits when it is angry, hangs on the hands through several washings. You can for the most part escape it if you notice that it has origin in a yellow oil that it exudes near the tail. If you have

the animal by the tail and also by the neck, it cannot coil over the hand and thus put its stain upon you, and you can carry it to where it can run in long grass and make itself sweet again. When I find my hand does smell a little I disguise it in horse mint before and after washing, and the smell is soon gone. The snake does not readily emit the smell again, and it soon grows so tame as to have no desire to use this unpleasant means of defence.

Holding my snake by tail and neck I cannot get it quite straight, though nearly enough so to measure it by a stick and find it more than three feet long. I find that the grass snake rapidly reaches this length. The great proportion of those you find in spring are as long, and few of them, big of girth as they may be, exceed three feet six, though I am prepared to find the one by the water hole in the Upper Orchard nearly five feet long.

Now see how difficult it is to hold a snake by the tail. If it is upon the ground it will very quickly get a hitch round some stick, and then you cannot pull it back. The big scales are pointed behind like the gills of the fish called 'miller's thumb.' I regret to say that I have seen a snake torn in half by its would-be captor when it had got half its length into a hole. I must drop the tail of this fellow, take it by the head and draw it through its entanglement right foot foremost. It comes that way as smooth as milk.

It is scarcely easier to hold him in the air. Every snake you catch has the same untaught trick of

escape. First, it climbs up its own tail and looks so very like biting your hand that you are almost certain to let it go. If you have presence of mind, however, you can shake it straight as often as it begins to come up, and then this snake that has never been caught before, and comes of a line none of the members of which have been so held for a hundred million years, inevitably tries another trick so efficacious that it might have been thought out by a college of scientists.

It hangs straight, then swings in a small circle that widens and widens till the snake is revolving round a cone, the base of which is a foot and a half in diameter. With all that leverage it is putting a screw motion on its tail, which slips out of your hand fraction by fraction and inch by inch till you can hold it no more. If you want to see more of your snake you must catch it again.

Now see the fury of a baffled snake. When I go to pick it up this time it flings itself back in a venomous coil, obviously ready for the strike, and hisses and hisses in a crescendo of fury. Such an attitude ought surely to scare any one. But as I still come on, the coil is readjusted, the spring tightened to its very tightest, and the hissing, if possible, redoubled. Finding its enemy still undaunted the snake suddenly attempts to slip past my hand and make off. I get in front again, and the coiling and hissing are renewed; I put a finger on its nose, and it does not bite. It seems to know that to put its threats into operation

would be a mistake. At any rate, after being so cornered and flaunted my snake becomes resigned to its fate. It gives up for the present any attempt to escape, and if I leave it so and move a little way off it is some moments before it very slowly uncoils and begins to go off by stealth.

I am not going to trouble it much more. I will only show you what might possibly have happened if the snake had proceeded to the extremity of biting me. I have got its mouth open with some difficulty, and invite you to put a finger in. Note the hundreds of very tiny little teeth all pointing backward. It is easier for you to put your finger into its mouth than to take it out. The snake can swallow good large frogs, but it cannot easily disgorge, and it would be awkward for itself if in proceeding to the very extremity of hate it were to anchor itself to an enemy as big as a man. 'That's all, Mr. Snake. You may go.' Off he goes; the most conspicuous thing about him, the badge of his harmlessness, the bright yellow crown at the back of his head, picked out and accentuated by two black splashes behind it. You need never give way to a snake so adorned that disputes the stepping-stones with you.

As June wears on, big snakes annoy the farmer's wife by haunting the marrow bed in the cowyard and the waste heaps of straw in the rickyard where her best hens lay. Before they leave, there are buried in the warm heaps of fermenting material strings of tough-skinned eggs about the

size of pigeons' eggs. You can dig them up there any year in August and early September, and if you get them late you will have a chance of seeing them hatch into young snakes. A reptile seven inches long comes from the narrow compass of one of these eggs. As soon as it hatches it coils and threatens just like its mother. Its proportions, however, are far more graceful. Its large and brilliant eyes occupy a greater proportion of its face, as all baby eyes should. It has the distinctive yellow crown of its tribe and the black patches that set it off, and one of these slender, faithfully miniaturized snakelings swimming through the dust with its head poised in a manner that any calisthenic teacher must approve is as pretty an object as there is in nature.

Last year I came to the wood rather early for grass snakes, and it was not till I had hunted long and far that I saw a reptile making off through the hedge bottom. There was no time to speculate, and in an instant I had seized it by the tail. In another second it had dawned upon me that it was not a grass snake, and with a cry of 'viper' I flung it down.

The viper comes from its hibernaculum earlier than the grass snake. It is comparatively an Alpine species, occupying all the year round these high dry banks rather than the frogging grounds affected in summer by the grass snake. The dry walls of our Cotswold country are its favourite stronghold, and in spring the vipers are found

basking in the rare sunshine within easy reach of their retreat.

I know a spot in the corner of a cornfield, near an abandoned cottage garden, where on a bright day I can find four or five vipers coiled at the edge of the long grass that the plough does not reach. Neither do the oats grow in that corner of the field, but the scarlet pimpernel rambles over the stone-brash soil and decorates the vipers' withdrawing room with their bright blossoms. It was a red-letter day when first I stepped into this enchanted corner and saw a great female viper stretched across my path, then a little further on the darker and more slender body of a male, then two others coiled in one nest.

Once I put my stick into this coil of two and succeeded in throwing one of them some yards out into the field. It was surprising to see with what unerring instinct the creature pointed back for 'home.' No matter how often I turned it or even twirled it about with my stick, the moment it came to rest again it went flowing back as true as needle to the magnet.

We hear of children and others handling vipers with confidence and escaping their fangs as by faith. George Borrow tells how he seized one of them unbitten, and it was one of the incidents in his narrative that every critic who knew nothing about vipers doubted. My first adventure with a viper was in this wise. Seeing the motion of some animal through the dog's mercury, I followed

it up and seized by the middle a snake about two feet long, of an ash-grey colour with a row of darker lozenges down its back. The back of its head was scored with a black 'x' and a mark which a more gruesome imagination than mine would have called a skull above the crossbones. There was no golden ring at the back of its head, but I, calling upon an imperfect memory, thought that I must have heard that one sex of the grass snake was without this ornament. And as the snake instead of being squat and fat, as writers say the adder is, was slim and elegant, I took it to belong to a harmless species. So I allowed it to twine itself in and out of my fingers, and even to push out its tongue against my cheek. It is this flickering tongue of forked black velvet that many people insist on calling the snake's fang.

I lodged my snake in an oak that the ivy had climbed, and as it coiled there took its photograph. It seemed to have black eyes looking in rapture to the sky, and as I peered at them and tried to get them to look at me I was aware of another pair beneath them that glared at me like garnets. The black eyes seen first are sham ones, and I thought that here was an excellent apparatus for fascinating small creatures.

The snake, tired of being teased and photographed, now proceeded to climb the tree, and with the aid of the ivy strands it went up very well. It could have reached, no doubt, the chaffinch's nest that I marked up there and

proceeded to climb to. I overtook the snake about half-way up, took him and tied him in my handkerchief and threw him down, afterwards carrying him home in the breastpocket of my coat. I showed him to several people, handling him with freedom in order to exhibit all his points, then as he coiled and threatened on the table I once more stroked the tip of his nose with my finger. His patience was exhausted, and like lightning he opened his mouth and bit me. But as he must have damaged his fangs by biting the handkerchief on the way home, I cannot say what the bite of a viper is like. I kept him about a fortnight, and when the fangs had begun to grow again I was able to open his mouth and show them to some young friends.

One more story to the same effect. There was a little girl living with a friend of mine in Essex who was exceedingly fond of animals, and, as animal-lovers do, had a way with them. Once, in her rambles, she came upon a snake carrying a nestling bird in its mouth. She prised its mouth open and took out the little bird, doubtless boxed the snake's ears for its cruelty, and brought its poor little dead victim home. From inquiry of her, and a consideration of the fauna in the neighbourhood, I believe that the snake in question must have been a viper.

I cannot find you our only other snake, the smooth snake, for it is of very local occurrence—Hampshire being its headquarters—and I have

never seen it wild. Once I saw it in a cage at the Crystal Palace, where it was labelled as a viper. It is slightly like that reptile, being in browns and greys instead of the olive green of the grass snake, but the double row of dots down its back have not run into the well-known zig-zag pattern. Neither has it the skull and crossbones nor other marking on the top of its head.

If you want a still more harmless 'snake' than the grass snake and without its objectionable smell, look any day on this raised bank and, if necessary, turn a stone or two, when you will find slow-worms or blind-worms like models in bronze come to life. Make bracelets of them and let them press in and out among your fingers. If they be not overfull of the slugs they ate overnight they will do you no offence—as to harm, it is completely beyond their power. You tell me, of course, that they are not snakes, the chief distinguishing point being that they have eyelids that open and shut. They belong to the family of the lizards that you can see and often catch as they scuttle for safety under the gorse bushes on the common. Preferring a grovelling to a scampering life, the slow-worm has lost its legs. Why slow-worm? why blind-worm? The first no doubt because, having lost its legs and not having the facilities for walking on its ribs that the snake has, it *ought* to be slow. On a bare surface it *is* slow, but it can push itself about among grass and small stones with no mean speed. Blind perhaps because, by comparison

with the snake, its eyes are small. Every movement and habit, however, shows that the eyes are good.

In Latin this worm is named better. *Anguis fragilis* or brittle-worm, because, like the lizards (of which you remind me it is one), it can escape capture by snapping off its own tail, the tail jumping about like a snake in itself, while the owner bestows itself in a safe place. Many of the slow-worms we catch have but stumps of tails slowly growing to replace the elegant organ that has been discarded in some sudden panic.

MAY

II

WHEN ALL THE WORLD IS YOUNG

SOMEWHERE in the May-smothered hawthorn bower a bird is singing or calling. It is a long, sweet scream, something like the 'dreeze' of the greenfinch, and it has the ventriloquial quality not by any means uncommon with birds, so that I am convinced now that it comes from high up in the trees, now that it is in the bracken, now that it is before me and now behind me. Yet it would be a very small bird that would be able to move from one position to another without being seen. Thus we have the double mystification of not knowing where our quarry is, and of imagining it to be some exiguous wren rather than what it is.

There it is at last. An orange-tawny squab of a newly fledged blackbird, fat as butter and sitting back on its long legs, head thrust between its shoulders so that a minimum of effort is sufficient to open the beak, and let out a plaintive scream for more food. The slim mother haunts through

the thicket, and when I am quiet enough and removed enough, she comes with her beak full of chopped worm and tries to stay the clamour for a few minutes.

The long lush grass in which ragged-robins and moon-daisies are springing only just ahead of the bents; the smother of fool's parsley or Satan's oatmeal flung against the hedge; the hedges themselves covered with drooping green and aromatic with blossom; the golden gorse, the myriad-fingered bracken, the waist-high horsetails are all full now of young things. We do not see or hear a hundredth part of them, for the majority of them are very wary of making themselves known. An age-long tradition of danger has crystallized into instinctive habits of concealment which every summer rejustifies and strengthens in the next generation.

As I pass by the only path through a bog bright with rejuvenated bog-bean and butterwort, a very furtive bird starts from my very feet and goes off broken-winged in evident design on the part of herself or her Creator to lead me astray from the place where my foot is. And there under the shade of a thin bush of bog willow, in a grass-lined cup, are two quaint, long-necked birds apparently dead. I take one of them in my hand and with long limp neck the head hangs over the edge of my palm, as the necks of dead fowls hang over the edge of the poulterer's counter. The eyes are closed and even the body runs a little

cold, as though to make the fact of death unquestionable.

But I know that the young snipe are shamming dead, even as their mother shammed hurt as she hobbled away. Or is not that word too light to describe a stratagem of such vital importance? Is it not even better to say that my approach threw the mother into a real paralysis of fear, a halting between the desire for personal safety and fear for her progeny, that made her actions cancel one another and really almost brought her down from the wing? If I had chased her, the personal note would have increased at each removal of danger from her chicks, and she would have ended by recovering the full power of her wings. There need then be no conscious affectation that could be described as sham in her case.

Then the snipe chicks are the children of snipe, with the same sensitive nature, that, when they grow up, will be put by the cosmic force to the same protective use. The family nerves throw them into a trance beyond their control, an almost more than miniature death, perhaps as distressful to them as actual dissolution, and only tolerable to the system because it often saves it from actual death.

There in the pine tree by the lake is one of the causes that has turned the ailment of the snipe into a means of defence. Two old hooded crows in French-grey and black are wheeling and hovering

near the cloud-like foliage, within which I can make out one by one the fat caricatures of young birds. It is not their nesting tree. The family is out for its first flight, and the old birds, having seen me long ago, are trying to get the young ones to move on to a safer place. But the latter are tired and like the place where they are, and this morning of the whole year Farmer Moriarty would have a fine chance of getting even with the hoodies by shooting with luck the old birds first, and then destroying their young at his leisure.

Farmer Moriarty has a fine brood of quarter-grown turkey poults running in the field with their mother. The young things are running here and there, enjoying this wonderful life to the full, pecking new young grubs from the grass bents, and adding to the joys of dinner the zest of sport by chasing flying and jumping things. An indigo shadow falls on the fresh green of the field, and the mother calls wildly the order to concentrate. She makes off for the hedge, her chicks following with all the speed of their baby legs. The indigo shadow deepens and falls; a huge bird strikes the field behind the last running poult, then bounces and falls on the chick. It rises labouring into the air with the chick in its talons. The mother turkey rushes at the marauder, even follows it on the wing to the height of the tall hedge, and almost catches it before it gets into its stroke. But her anger is unavailing, and the first toll from Farmer Moriarty's turkey flock

has been taken by the peregrine to her brood on the Eagle Rock.

There are farmers' friends also among the birds of prey. We do not know what the kestrel sees as he hovers in the wind high above the meadow. Doubtless it is some imprudence on the part of a young vole, an incautious skipping from the parental to another clean-cut hole, or an exposure on the bare space usually reserved for nocturnal gambols. Down he swoops, and a superfluous mouseling goes to stay the clamours of the young kestrels. By night, the little owls rejoice at the abundance and tenderness of the same and other young things.

When we see a young rabbit struck down by Mother Stoat or a song bird snapped up by the sparrow-hawk, we cry involuntarily, 'Nature red in tooth and claw.' But the young whitethroats are being fed just as bloodily on the hope of the oak tortrix, the young wagtails are destroying the progeny of the stone-fly, the young tits are spoiling the geometric increase of the aphides that unchecked would soon make the world solid with green fly.

Nature is full of compensating balances that automatically come into action in proportion to the need for them. You can almost tell the number of caterpillars there are by peeping into a willow-wren's nest to see whether the eggs are five this year or six, for a plentiful year of caterpillars calls for and gets large broods on the part

of the insectivorous birds. So when Scotland was visited some years ago by a plague of voles, the voles found themselves visited by a plague of owls.

When voles overstep the bounds of their usual increase, they soon swarm over fields and parishes and counties, as thickly as you can see them at midsummer in the corner of the field whence the barn owl fetches them for its brood. The task of keeping them down becomes far beyond the resident owl population, often reduced almost to zero by the gamekeeper. Then, as happened in Scotland at the time of the last vole plague, numbers of owls arrive from the Continent, where somehow they get news of the need for them.

The owl organism so thrives on the unaccustomed plenty of food that clutches of eight and nine eggs are laid, and two or three broods are brought off in the season if the vole manna last so long. Then, their great work of destruction done, the tyrants are liable to have a hard time for lack of victims. Nature will no more suffer superfluous owls than superfluous voles, and the feathered army, expanded at the special call for its services, must be contracted again into normal limits. Starvation attacks not only its winter numbers but their fecundity in spring. Two or three eggs are once more enough for a clutch and one brood enough for the season, until their numbers become normal to a normal supply of voles.

Most of the rodents are given to gigantic increase. The hamster and the lemming are well-known

Continental examples, the latter often saving man from the full rigour of its fecundity by swarming from its native hills and in countless armies crossing the country post haste to fling themselves into the sea. It is one of the most marvellous of animal instincts, though perhaps its explanation need not be recondite. The lemmings eat as they go so thoroughly that a reindeer or other grazing animal that comes after them can only get a meal by killing the animals and biting their stomachs out. If the rodents worked the problem out by logic, they would know that there was no turning back. Sustenance has ever been found in front, and when the sea is reached, who knows that it will not yield food on the other side as many a river has done ?

Another rodent gives us the proverb, 'To breed like rabbits.' Our friends in Australia know what that means, and one often wonders why the rabbit does not more often run to the proportions of a plague in England. True, we heard not many years ago of farms being given up in Essex, because it was practically impossible to save the crops from these wild and unprofitable grazers ; but in general the farmer seems not to have the least idea of the hundreds of pounds worth of damage done by these creatures. He shoots at sight the stoat or cat, either of which is worth a good many trusses of hay to him alive, and when he finds a half-eaten rabbit carcass he 'tut-tuts' at 'that blessed fox' almost as though he had lost a lamb.

Very early in the year the first maternal doe retires a little apart from the warren, and scratches a nursery burrow scarcely a yard deep. In it she makes a nest with her own soft fur plucked off, and when the naked little rabbits are muffled in it, she comes away and closes the mouth of the burrow with earth except a small hole at the top of her 'stop' to give her babies air. Whenever she goes to feed them she must dig the door away and replace it when she goes grazing again.

Some people do not like naked babies, except their own, but every one likes the little rabbits when they come from the 'stop' and follow their mother, fully clothed in the short grey fur of their tribe, and bearing on their heads perfect miniature rabbit ears. They are in everything impertinent copies of full-grown rabbits, sitting at the openings of their burrows a good deal longer than the more prudent old ones, standing on their hind legs and stretching up to take a good look at you, and giving with their tiny heels the danger signal before they bolt within.

By going quietly, you can often cut off a small rabbit from the hedge in which it would be safe, especially if he has a little cover in the field and can be persuaded that if he 'quats' you won't see him. But when this advantage is gained, it is by no means so easy as it seems to catch the little fellow. You can out-run it by three to one, but you must be very smart if you can out-dodge it. Five times you are about to put your hand on it,

but it breaks full back and is away, then just before you get the sixth chance, which you persuade yourself would be surely successful, the hedge is reached.

When Mother Weasel leads forth her family of kittens for their first romp in the growing grass and the blue-bells, may my best friend who is not a sportsman be there to see. I met a family party of this kind once in Epping Forest. Six or eight little weasels (I did not see their mother) were playing in the undergrowth of a thin bush riddled, as such places generally are, with shallow mole runs. They seemed to be playing a game of touch, above and below ground. A wide-eyed little face would peep out from a hole evidently on the *qui vive* to see its opponent before being seen. Then perhaps there would be a pinch behind, and one little weasel would leap forth pursued by another. They would roll over in wrestlers' embrace and then perhaps vanish as through a trap door. In far too short a time, the family had passed swirling into thicker bushes, and I never saw another weasel family at play again.

It is, we know, sometimes dangerous to interfere with these weasel schools, many authentic stories being told of how at the squeaking of an assaulted member, all the others launch themselves on the enemy, running up his limbs and seeking to attack him in the region that their hunting experience tells them is vital, the jugular. A grown man has found it necessary to run for his

life when a school of weasels has thus attacked him.

We have little foxes in the Gorse Field, though by strict preserver's right they are not ours. The vixen drew out the earth in March, but it was only one of two or three that she had her eye on, and she ended by laying down her cubs a mile away, close to the ruins of a Roman villa where some centurion made his garrison duty in these parts as pleasant as may be.

The fox's ideas of housekeeping are something like those of a large number of Londoners, who having made one 'Ivanhoe' or 'Balmoral' quite dirty by three years' occupancy, move on into a brand-new one. When a vixen has a litter of cubs in an earth, it is often less than three fortnights before the too abundant contents of her larder make the place uninhabitable, and then she moves her family to other quarters.

The earth in Gorse Field runs clean into the limestone, the steep bank of the hill making thus a green amphitheatre into which the tall thin crack opens. The green grass of the year fringes the rocky portal and almost hides it, leaving only an indigo slit like any other shadow on very green grass. That is a sunlight picture. When I go in the evening to see the young foxes there is less than that, and I have to use the sight of a little yellow clay peeping through trampled grass to give me the exact locality of the entrance. The field is here full of these scratchings, which young

summer industriously covers with green blades as fast as they are renewed. The rabbits are responsible for nearly all of them, and perhaps as much as the fox for this particular one.

The grass of the little amphitheatre is gemmed with flowers, still mostly of the yellow of spring, nor should I be able to see in this half-light the bugle, the prunella and other beauties in blue and purple. The purple orchis, however, is visible enough as it lifts here and there its pink-purple 'bloody man's thumb' through the lush grass. The bush on my left is happily of hawthorn, and the cream of its bloom is as clear as the almond scent that is refined and sweetened by the approach of night. A blackbird perches in an ash overhead and sings his clear, fluty melody. He might be the orchestra of the piece for, while he sings, behold there is a little fox on the mound before the hole.

He did not come. He simply appeared. He was not there, and then he was there, a goodly little fox nearly as large as a full-grown rabbit, no longer looking, as he did when younger yet, like a little chow-chow puppy, but now in fairly exact miniature of his parents.

The first time I saw him thus, I knew him to be the largest of his litter, and beyond reasonable doubt a dog. In his mother's absence, he has the guardianship of his brothers and sisters, and every evening he comes first out from the den to sniff the air and see if all is well. Now he skips a little and whisks back into the crack, to tumble out

again followed by four other little foxes. They do not stop to look at the evening, but one is pushed head-over-heels down the hill, another pins him by the throat. Presently two others are standing up and wrestling like Cornishmen, and soon after, two chasing one another round the hawthorn pass within two yards of my outstretched boot. Between whiles, they take a momentary rest on the steep of their den, and then they often all look together in a particular direction. Luckily it is not my direction, for they are looking towards the quarter whence their mother should come. If she saw me as she came up, there would be no more games to-night, and to-morrow, perhaps, the little foxes would be located elsewhere.

Here she comes up the hedge, with something in her mouth. The rabbits that she meets on her way make no effort to get more than just out of her way. They seem to know that she is not in hunting mood; moreover, it is very seldom that the vixen levies toll on her near neighbours. Often the rabbits will continue to inhabit the side passages of a burrow that the vixen has chosen for laying down her whelps.

She has brought them a small rabbit, or it may be a rat or a young squirrel. In this time of young things it is mostly the young that suffer. And now the little kittens of foxes are changed to raging demons. They fling themselves on the quarry and pull at it in five directions, growling

through clenched teeth with a collective moan like that of ferrets when they feed. There is nothing quite so much like this worry of the young foxes as that last act which will terminate their lives when the hounds 'break them up.'

JUNE

I

CATERPILLARS INNUMERABLE

THERE is a row of young poplar trees at the bottom of our sea-side garden. The leaves are shiny and tender, scarcely able to hold themselves up in the heat of the day. No envious tooth has yet marred their fair symmetry. But at night a feathery puss-moth visits them, three inches square of wing and downy as an owl. In the morning there is a little brown tent about the size of a pin's head on this leaf, two on another, a fourth yonder, and others no doubt on other poplars, willows or sallows within a half-mile radius.

The puss-moth's egg is unlike that of most moths or butterflies in that instead of being a spherical body attached to the leaf by a tangent, it stands on a flat base and is dome-shaped, just like a spot of liquid that has been spilt there and left to harden. And it is chocolate-brown against the tender green of the leaf on the surface of which it is laid for all the world to see. I can see the

eggs on sundry poplar trees about the place as I walk by, and after a few mornings the egg is broken and a small black grub takes its place boldly on the upper surface of the leaf. It seems to be secure from molestation of bird or ichneumon fly, and to have no need of hiding itself as other caterpillars do.

A closer examination reveals a wonderful elaboration of parts in this bit of black thread. At one end there are two little tufts like the ears of a cat, giving it already some right to be called puss-moth, at the other end are two longer projections like tails. As soon as the little animal has reason to be worried by our too close inspection there is an impatient wriggle of the tailed end, and from the tails shoot out tiny little red whips which make a kind of lashing motion over the middle segments of the creature. If I had been about the size of a sparrow and had been looking at this tiny worm with the idea of eating it, I think that this wonderful whip-behind movement would make me look for my meal elsewhere. Some writers imagine that the whips have a physical energy sufficient to whip off the ichneumon fly when she settles or attempts to settle on the caterpillar with the intention of laying eggs within its body. They imagine that a creature of so primitive an intelligence as an insect could not be scared by threats but must be driven off by actual force.

With every change of skin the puss-moth cater-

pillar becomes more terrible, but also, strange to say, more protectively coloured. From black it becomes green and, as its bulk increases, gets at each change a greater complexity of shading to break up the surface, and harmonize it with the varied lighting of foliage. At length, when the caterpillar is four inches long and nearly an inch in diameter, its mainly green body is decorated along the sides with white o's like portholes, the head is tucked into two or three double chins by the telescoping of the neck segments, a lurid scarlet band is drawn round it like a scarlet shawl round a woman's face, and over that a brown shawl with a staring white border covers the whole back, and is gathered round the aldermanic waist. The creature sits with its head up, apparently regarding the world through two dead-black eyes, which are really only daubs of paint. The two tails stick up barred with black and white, and when the creature is irritated it bends head and tails together and sends out the red whips in venomous curves. Few countrymen dare to pick up the monster when they meet it.

This caterpillar has another wonder in store, in the iron-hard cocoon-case it spins by incorporating gnawed fragments of wood with its silk. We must leave that and other wonders, however, for future exploration, for there are many other caterpillars. Carefully bestowed on the under sides of poplar leaves we find the green eggs of poplar hawks. Rarely scattered on sallow or apple leaves are the

paler eggs of the eyed hawk, and on the privet the equally handsome pledges of the privet hawk. The hawk-moth caterpillar is at once recognized by its hairless skin and single tail like the horn of the rhinoceros, but at the opposite end of the beast. When the privet hawk runs towards its full four inches of length, its coloration is a marvel of ingenuity. The apple-green of its otherwise conspicuous bulk is broken by seven oblique white stripes like the white midribs of privet leaves, shaded with parallel dashes of violet-purple, so as to appear to stand out from the green as midribs really do.

I sometimes dream of caterpillars a yard long. They do not exceed in size those we know, by more than the hawk-moth caterpillar exceeds the tortrix. A friend of mine who had never seen anything larger than the drinker was astonished to see as he stood in a potato field a beast in the likeness of a caterpillar, but five inches long. It was smudged with V markings in green and brown and violet and black and roughed all over like goose-skin, and it took its own presence in an English field in the calmest manner possible, munching the potato leaves with the usual caterpillar gusto. A second beast of the same size allowed itself to be picked out from the brown and green potato leaves, and my friend was induced to realize that it was no dream, but that he had found two death's-head caterpillars.

We can scarcely mention the puss-moth without

going on a long journey among the hawk-moths, of which I have named but a few, leaving out some of the strangest, such as the elephant hawk. On another side the puss-moth touches the lobster, for that is a still stranger example of protection by aggressive appearance. The lobster caterpillar does not end behind in prolegs like a respectable caterpillar, but has a large flat tail upreared like the business end of a scorpion. The backs of its segments are cut into all manner of rugosities, and the creature is in the brown of the leaf scales of the beech, on which tree it feeds. The real legs of the caterpillar, those carried next the head, are abnormally long, and when the animal is alarmed it throws head and tail together, till it looks like a particularly venomous spider ready to put its long legs round the enemy, and poison it out of hand. It is suggested that when the ichneumon fly sees this it flees in alarm, and that even the birds do the same.

These are the giants among caterpillars, but they are not nearly of so much importance as many lesser ones. There has never been and never will be a plague of eyed hawks on our apple trees, which are devastated nearly every year by a far humbler caterpillar, with black dots on a dark grey ground, called the little ermine. This creature comes not as single spies but in battalions. We find them everywhere in summer, done up by hundreds in silken webs of their own contriving, camping on branches of fruit trees or other timber,

the leaves of which they speedily strip. This is one of the creatures on which our Board of Agriculture has declared war, and it is the subject of a leaflet all to itself.

Less maggot-like in appearance than the ermine, though at times scarcely less destructive, is the lackey. Last August, Lackey Mère decorated a twig of one of our willows with a close band of eggs like redskin beadwork. All tits, wrens and tree-creepers notwithstanding, the decoration held through the storms of winter, and as soon as there were leaves to eat, produced from every egg a tiny caterpillar. Now, there is a big white tent on a limb, by no means the first to be stripped, and an army of caterpillars within the tent, each striped with blue and red, so that, if one should stray, no bird may imagine for a moment that it is good to eat.

An army caterpillar not given to travelling under canvas is the buff-tip, striped somewhat after the manner of the lackey, but having stronger bristles. As you walk along the town avenue you see their pellets on the pavement, and looking up find that many branches have been stripped, while one of them that is half stripped is thick with fat green-and-yellow caterpillars. A slight shake will bring down a shower, but you had better make sure that they all fall on the ground. It is disconcerting to find a little later in the middle of afternoon tea that a great fat, cold caterpillar is leaving your collar for the recesses

of your neck. When they are quite full-fed, the buff-tips come down apparently with the intention of getting themselves squashed by the feet of our fair damsels. In some Continental countries it is said to have the full processional habit, marshalling its army in fours and marching from one place to another with the honours of war.

One of the most striking of our sociable caterpillars is the small egger. I have seen their conspicuous tents four or six times as common as milestones in the hedges along a high road, and that for many miles through Buckinghamshire and Oxfordshire. The web they weave is as tough as scribbling paper, so that some force is needed to tear it asunder. But the caterpillars are usually obliging enough to be present in large numbers on the outside of the envelope, which they cover thickly on the sunny side at the hour of the sun-bath. Until it has changed its fourth skin the caterpillar is comparatively dowdy, being coloured in subdued reds and browns, but at that stage a striking transformation occurs, the new skin being brilliantly marked with scarlet, edged with white. When, among the dowdy ones basking on the outside of the tent, one or two of the brilliant ones are seen, it is difficult not to think that here are two distinct species playing some strange rôle together. Evidently, when the scarlet and white have been donned, each caterpillar becomes able to take care of itself, the

colours being staring enough to startle any bird in Christendom, and the community soon breaks up.

The egger family is a distinguished one in its caterpillars as well as in its moths. But whereas the latter are very strong of wing and hard to catch or even see, the larvæ are conspicuous and often found. The drinker demands admission to the group. What naturalist's heart has not leaped a little at seeing in spring his first drinker larva stretched out on a grass blade, and who that has collected a dozen of them and fed them on grass kept fresh by having the ends dipped in water has not had much delight in the egg-like cocoon that the full-fed monster spins, and the big yellow moth, probably never seen in the wild, that emerges?

Some of them, however, nourish in their bodies unseen the maggot of the ichneumon fly, eating greedily of the animal's fat, but carefully abstaining from its vital organs. The caterpillar gets flabbier and weaker, and at length, when the moth should come forth from the thinly woven cocoon, or before the poor beast can attempt to weave a shroud, the small cocoons of a fly burst from its body and from them go forth other ichneumons to their fell work.

The drinker and many of the eggers are notable as large caterpillars early in the year, because they began life last summer and have spent the winter in caterpillar form. There is a fine monster

in a sort of lavender smoke with lots of hairs and black velvet rings round the body between the sections. We find it on the heather, where it is finishing a sort of three-course meal of bramble, hawthorn and ling. It is well known to the children of the village by the name of 'lucky farmer.' This is the northern egger. The oak egger is much like it, and the fox-moth caterpillar in rich chocolate with orange bands is a worthy connection of the family. These aggressively coloured worms make very sudden appearance on the grass of a mowing field or on the short turf of the common. Where no caterpillars were apparent the day before there is one to every square yard to-day, and to-morrow perhaps none again.

The pride of the heather is the fat green caterpillar, bright as the shoots of the young heather, running to warts all over and with the prominence of each wart of a deep yellow thrown at you by means of black rings. Put it on a plain ground and you cannot help asking why it should be so aggressively marked, but replace it on its heather bush, turn once round, and you will have to look very hard to find it. The bumpy outline and the yellow spots somehow match to a T the stippling of the heather needles.

The last caterpillar, which we affectionately call 'Buttons,' is the offspring of the emperor moth, a creature as distinguished as, and sometimes confounded with, the purple emperor butterfly. It spins a clever cocoon of staves running from end

to end and kept together by wattling, but so loosely woven at one end that when the moth pushes from inside, the staves open and it gets out without the trouble of gnawing. The moth maybe happens to be a female. Place it in a box on the window-sill and if there are any males within a mile, you will have them all calling upon her. M. Fabre, writing of a *Bombyx* (fox-moth family), so rare in his district that in three years he was unable to get a cocoon, though he had all the school children in his pay to search for them, thus describes the assembling of the males to the female he had at last obtained :—

‘The mother *Bombyx* grew ripe. By a chemistry of which our science has not the least idea, she secreted an irresistible essence which would bring her visitors from the corners of the sky. On the third day the bride was ready. I was in the garden, by this time despairing of success, when, about three in the afternoon, the sun shining warmly and brilliantly, I saw a crowd of moths whirling about the open window. They were the lovers come to visit the fair one. Some were coming out from the window, others going in, others resting on the wall after their long journey. Some had come very far, across mulberry orchards and woods of cypress. They came from every direction, but more and more infrequently. I did not see the beginning of the assembly, and now the concourse was almost complete. . . . In the room there was a cloud of males which I estimated at sixty.’

The Kentish glory is another moth famous for the power of its males to find a female exposed far away, and the sight of these magnificent creatures beating up wind one after another straight to their goal (or their death in the entomologist's net) is one of the amazing sights of nature.

The females of these 'sembling species are often very heavy of body and little able to fly, and some which have probably practised the art for more ages than the others are entirely without wings. Such is the little vapourer, whose caterpillars gnaw our trees in the heart of the towns. Hatch out one of these ungainly females, and in a short time you will have a little army of terribly ardent males shivering their red wings on the window-sill where you have put her. Again, in the winter months we are astonished at seeing a very fragile-looking moth flying in the bitter breeze among timber or fruit trees. He is seeking his wingless female that clings like a very fat grey spider to the tree on which she lived as a caterpillar, on which she will die as a moth made happy by destiny fulfilled in the shape of a few hundred eggs, which will continue the work of annoying the forester or fruit grower.

Caterpillars? They are everywhere; on the grass, in the trees and apparently in the air; for as we walk along we get smothered in their hanging strands of silk, and covered with the trapeze performers whose lines we have broken. On the

grey fence round the coppice there are caterpillars encased in grey splinters of wood, just as caddis grubs encase themselves under water. There are others living their grubhood inside the leaves, that is between the upper and lower layer of the leaf as it lies flat. Others snip a bit of leaf and roll it into a jacket, under which they can walk like green snails, and thus escape the attention of birds with an eye for colour, and a very large army of them roll the leaves into little hollow cigarettes, in the interior of which they live while they eat the inner folds.

‘But really,’ asks the reader, ‘are these riff-raff worth mentioning?’ Well, has he ever watched one of these leaf-rollers in the act of constructing its cigarette? Does he not wonder how it is done? If he were given a sheet of iron one-eighth of an inch thick and twelve feet by nine, as much cotton as he liked and a pot of glue, how long would it take him to roll himself up in the iron as neatly as a caterpillar does in the leaf, without hands and solely by spinning web from its mouth? Here in every tree and on every hedge, often under our very nose and unseeing eyes, is being performed a piece of work as wonderful as that excellent effort of Victor Hugo’s imagination, the single-handed salving of a rock-fast ship, in *Toilers of the Sea*. (And as the prospect of watching a leaf-roller at work is certain to exceed the delights of reading further about mere peacocks and red admirals, here the chapter ends.)

JUNE

II

IN THE HAYFIELD

‘**W**HAT a crop of hay,’ says the townsman wading through the grass that reaches his waist and holds his feet with a clutch like that of water. Rabbits are lost in it, but if you make the right call, that of a fellow rabbit squeaking, they stand bolt upright and so just manage to show you a bright eye peering through the grass. The kestrel poises overhead, then passes on, knowing the futility of searching for the sign of a vole moving under that thick jungle. Foam of marguerites and hedge parsley leaps up at the pink-and-white dog roses, so that the very bushes seem about to be overwhelmed in the tide of grass. It is green and lush under the damp purple of the clouds that some say have spoilt this June day, and it does not seem as though any agricultural art could induce another blade to grow in such a concourse.

But the farmer shakes his head and says that the grass has not half grown. He overlooks the

patches of bird's-foot trefoil that gladden the uneconomic eye with their clear yellow and flakes of dragon's blood. He is not deceived by the ranks of tall sorrel or the waving yellow plumes of an occasional melilot, or the powdering of moon daisies, or even the waving heads of timothy and sweet vernal. He says that the grass has no bottom, nor ever will have if we do not get the growing weather that is our right from May to July. Sun and rain together make growing weather. We have had weeks of all sun and now we are having all rain.

When for a few hours the rain holds off and the sun comes out, a nice problem presents itself: whether to use the sun for the growing of grass or for the making of hay, and as the rare days of sunshine have less and less infected us with hope, we have more and more given the benefit to the grass. If the weather should break again, it would not spoil the grass, while it would sadly interfere with haymaking. The doubt has saved us again and again, for not even the finest day, accompanied by a change in the moon and all other indications of a permanent change, has been followed by enough fine weather for the making of even a scanty crop of hay.

But at last the day of the hill field has come. The chatter of the mowing machine has silenced the whitethroat's scolding, has excited the upright curiosity of distant rabbits, and sent near ones scampering. Here come the strong, silent horses

walking by the wall of grass, which mysteriously falls down beside them as the hidden knife travels through. Now it is the turn of marguerites and red sorrel, as the team comes over the low round of a dry bank ; now the ragged robins and the big mauve orchids have it as the knife dips into lower ground. The white spray of hedge parsley is shaven from the edge of the rose bush and the garlands flout the blue sky without answering bloom below them. For all the gay blossoming is not merely laid low but extinguished by the green that falls on them, as they fall on the bleached green of the field.

Happily there are parts of the field so tumbled in 'tump' and hollow that the machine is unable to negotiate them. When its clattering efficiency has departed, I am able to renew youth by following the steady swing of the scythemen as they cut down the flowers in the way that pleased me nearly a generation ago. The clean, cool swish of the scythe is only a note of silence, after the rattle of the machine. Its method of destruction is orderly execution instead of massacre ; its rhythm gives an idea of deliberation that we half expect to see result in the acquittal of some flower or grass at the instant before the steel strikes it. But no, the scythe can only spare by regiments, and the sweetest, rarest flower goes down in the swathe, where it has chosen to grow among mowing-grass. In one part of the field I can pick up bee orchids almost by the armful.

Yonder, however, a mower has actually cut his swathe short in mid field. He has skipped a portion full half a dozen yards along, and has cut in again beyond. I know the sign of old. Not mercy, but fear, has prompted this departure from what looked like an inexorable sweep. It is an almost invisible menace that has put off the emblem of Father Time and of Death. The grasses and the flowers stand there as calm and as sweet as in any other part of the field. Then a knautia bobs as though a partial breeze had struck it, and we see a tiny yellow body fly to and fro just where half the moon daisies of a root are standing, the other half lying low. It is there that our friend entered a danger zone scarcely less visible or less real than the marked area across which bullets fly. At this point the wasps poured out from their nest and made the stand that every patriot must make somewhere, or lose his country.

A little further on, the smaller city of the red-tailed humble-bee has been taken in the mower's stride without his having perceived it. The laden merchants, returning one by one, have now accumulated into a small crowd, anxiously seeking their lost nest, and angrily exclaiming at the monstrous thing that has befallen it. Where now is the fabled instinct that, according to some, guides the bee straight home? They are searching an area of a hundred square yards for the little nest they have lived in for weeks. I end by finding it first, a little heap of dry moss that the scythe almost

shaved as it passed over. Thirty years fly away as I press gently and hear the whine of the bees within the nest and feel the moss thrill with their indignation. I simply must take the roof off and have a look at the jumble of egg-shaped cocoons and honey cells that stands so far below the effort of the hive-bee.

Have there been any joys in life sweeter than those of following the mower and picking up the secrets that the grass had hidden and which he pitilessly lays bare? Sometimes it is a lark's nest that would never have been found except by means of the scythe; once it was a pipit's nest containing one ungainly chick, a cuckoo, that the mower scientifically spared just as his scythe was about to cut it in two; sometimes the more considerable embryo brood of the corncrake or partridge delighted me more than a heap of diamonds. And then, to see the surprise of a snake as it glided from the standing grass on to the cropped verdure no longer capable of hiding its sinuous course; to tease it with a stick and see it hiss and hiss and make more and more ready to strike without actually reaching this final act of baffled hate; lastly, to earn the abhorrent wonder of the mowers by picking it up by the tail and carrying it for a yard or two. When I came to know the grass snake quite well I used to break down its ridiculous bluff by offering a finger to its pretended fangs, when it would become mild as milk, merely watching for an opportunity for escape

when its docility should have put its captor off guard.

‘Found any mouse nests?’ I ask the scytheman with affected nonchalance, not forgetting that he is the same man who used to find them for me when they were extraordinarily precious. He replies as of yore, without the least affectation, by telling me that there is one three swathes from the ash where the coats and the cider-bottle are lying in readiness for lunch. I get there in time to see the mother run off like a shadow, her body flattened so as to be almost covered by the stubble of the grass. The young mice within the closely woven ball pink and sprawling, with eyes like bruises, seem as precious and as hard to deal with as when I wore knickerbockers. They are just something to look at, like the sunset. Shall I confess that they are a little less interesting than they were one summer when I had a young hawk to which they were an acceptable change of food? A young nephew who is with me wants to take them out and kill them. When I veto the proposition, he clearly thinks that I am unable to appreciate young mice at their proper value. His looks raise an uncomfortable feeling that once upon a time I may have had the same barbarous instincts. ‘Here’s another mouse’s nest,’ calls the mower from the middle of the field. One suffices at my age, but the nephew rushes off at speed to see if it is in any way different from the last.

Now the whole field is down. Purple self-heal, yellow bird's-foot, starch-white moon daisies, flaming sorrel, and blue geranium have disappeared. A circle of uniform green or with only islands of rose-bushes lies there ringed by a sky whose blue has once more been smudged out by clouds. The grass is down, but who can say when the hay will be up. Only this morning, the farmer said with the air of saying a new thing, that the weather was really going to mend. To my certain knowledge he has said it thrice before. It seems that he will have to say it again.

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It is strange how industrious we feel when an opportunity occurs for interfering in some one else's business. Because I saw the hay cut I feel impelled to offer my services in the carrying of the hay, and indignantly spurning the offer of lighter work, I undertake the task of pitching the cocks into the waggon where my friend the farmer is making the load.

On a glorious summer day, with the lark carolling on high and bees streaking the vault of heaven, how delightful are the simple labours of the field. To push one's pike into a neatly arranged hay-cock, hoist it over the shoulder, and place it on the waggon; perchance to see a shrew or a vole run off startled when the dome under which it was sheltering is removed—what unalloyed bliss!

When ten cocks or so, five on each side, have been packed on the load the bed of the waggon is

full. Now we must lift our pitch a little higher, and, watching the loader, place them more or less where he wants them to stay. Higher still goes the load, with the effect that each pitch seems about twice as heavy as the last. Sometimes when a fair bundle of hay is overhead, down falls some or all of it, scattering dust in the eyes of the perspiring pitcher. Finally, every inch of the pike handle has to be utilised, and instead of hoisting a little bundle of sweet-smelling hay, one feels as though the very soul was being wrenched out by the inexorable tool.

After pitching a few loads I leave off and take stock of my injuries. A patch of skin has disappeared from the inside of each thumb, there are blisters visible at the roots of many fingers, and I feel, though I cannot see, where the handle has been taking bites preparatory to further havoc. Moreover, it seems as though I had been converted into a porcupine, for I bristle with the spears of an atrocity called lop grass—twisty, double-pointed things that, whichever way they fall, proceeded to bore through the cloth and enter the flesh. Such is one form of idyllic summer labour in the fields.

Then I go to the task of unloading the waggon at the rick. A few days ago, I saw a woman acquit herself well at this post, and the work looked easy and graceful. But alas! we must know a great deal about the building of a load before we can take one to pieces. Standing on a mass of

hay some twelve feet by six, I drive in the pike and try to take up a pitch. The morsel I seize is locked tightly under the surrounding hay, and finally under the piece on which I stand.

Pitching was awful, when a load rather too heavy had to be thrust up from the shoulder. But here it is like trying to lift the world with the muscles of the stomach. Even when you pick up the proper flake of hay—that last put upon the load—you have hard work to poke it up to the rick above you. And the seeds, including the detestable spears of the lop grass, fall far more heavily here than in the field. For they fall on the next bundle, which, when it is, in turn, lifted, sends down the accumulation and also its own quota. The atoms stick on the perspiring skin, and cover one with withered herbage, causing all sorts of expressions of horror when, later, town people come to see it.

The undoing of one load has quite undone me. Some one tells me that I have earned twopence in half an hour, which, on dividing the daily wage of half a crown by the number of loads usually carried, I find to be correct.

I descend to the last rung of the ladder of the idyllic labour of the field and go to work with sundry women and an old man with a weak heart arranging the little cocks for the pitchers to pick up. One of the women has her hand bound with a white rag.

‘Got a bad thumb?’ I asked.

‘No,’ she replied. ‘But I do get terrible

blistered at this work, and I be trying to kip it off as long as I can.'

It is true. Even that slight work produces its own blisters, and bites holes in my skin where the other forms of labour had not bitten. However, while the women work or the day lasts I must work on, especially as the disgrace might come to us of having the waggon catch us up.

I work next the old man with a weak heart and presently he begins to talk.

'That was allus my job,' he says, nodding towards the waggon unloading at the rick. 'I could do that all day long and not feel it so much as I do this. Ay, I was as strong as a donkey in those days.' Then, pitching his voice a fifth higher, and sending it through his nose, he repeats, 'As strong as a donkey.'

When I have heard most of what he wants to tell me about the illness that has laid him low, we begin to talk of agriculture.

The rent of the farm amounts to about seven-and-sixpence an acre, which is fully twice as much as it is worth, for it is dry and shallow hill land. The next farm, where the land is much richer and kinder, is let at the same rent, for, whereas my friend has been twenty-five years in one place, the next farm has been re-let several times, and each time the rent has been re-adjusted by operation of the open market.

'Still,' I say, 'it is a mystery to me how so much hard work fails to bring profit to landlord

and tenant alike. I should have thought that, with a year to do it in, it would not be hard to get ten shillings off each acre—in this field, for instance.'

'Ah, but there's plenty more as isn't worth half a crown,' he replied. 'That's wur the kill-cow do come in.'

'And talking o' mysteries,' he says presently, 'it fair beats me to think how we did live when I were a boy. My mother had nine children. Her husband had just a shillun a day. A shillun a day' (high up and through his nose).

'And wheat?' I asked.

'Wheat flour was clane out o' the question. What we lived on was barley meal at sixteen shillings a bushel. That's the very price it stood at. Tea was four shillings a pound, and we didn't get much o' that.'

'No, not much on six shillings a week.'

'Of course, we most of us went to work. I went when I was seven, and got twopence a day. An' then we got Irish tatars and salt. Gurt Irish tatars as big as this' (holding up two fists each as large as most potatoes I have seen).

We worked on, both of us appalled at the question how the family was brought up on so much of this food as five or six shillings a week would buy. It was only last night that I saw the ducks fed on the same food—barley meal and potatoes.

'There was whate in plenty—for the rats and mice, but not for us,' continues the old man.

‘The varmers could get nineteen and zix a bushel for it, just as it might be to-day. They zaid they ’d kip it till they could get a sovereign.’

Here he pauses, and looks at the horizon as if the sequel lay there. Then he strikes me confidentially on the chest with the back of his hand and impressively whispers :

‘Almighty zent the peace. Down went the price o’ wheat to zeven and zix. Oh,’ he adds, almost in tears, and throwing up his arms a little, ‘wasn’t there a jubilee then. Didn’t we just shout and holler when we knew the blessed pace had come.’

There is an untaught art about the old man’s recital that could only be produced by having lived through the terrible times of which he tells.

JULY

I

A NIGHT OUT

THE long hot days followed by nights almost as warm, though not so garish, bring about a reversal of instincts almost throughout the natural world. The rabbits that in winter fed by day and retired at dusk now feed by night and keep out of sight between dawn and dusk. Birds, cheerful enough at dawn, mope in the thick leafage at midday and long for the evening. Snakes no longer seek out the sunniest places, and only reach their fullest activity as the sun goes down. Only those torrid beings, the insects, are active at midday, and at this time of year the great majority of summer lepidoptera are night-flying moths.

The night-jar is spinning his long-winded rattle-note in the larch copse. It is always a marvel to me that he can hold the one note so long, especially as in my own experience a note with an r-r-r in it is the most expensive in breath that we can be called upon to produce. But he rattles on without

stumble or halt, and even when he ends on one note starts without a pause on another, and keeps that up, too, till the very listener grows breathless.

The gloom has come on so that I can only just see one of the night-jars come out from a thicket of guelder-rose and sit toad-like upon the ground, uttering the 'co-eek' that is their other vocal sound. Then she rises by a miracle from her feeble feet, and on noiseless wing skims over the gate near my face, and goes hawking down the meadow. She skims closely along the tops of the grass whose white champions are shining their brightest in the dusk, and no doubt snatches many a moth that the flowers have called to their banquet. Then the other night-jar joins her and there is a love-game, one chasing the other with wild 'co-eek,' and clapping the wings above his head like applauding hands.

It is nearly ten o'clock, but with industrious hum a big humble-bee still goes about her work at the blue bugle, which, in the twilight, is of a dull ashy colour. It is not only a workable hour for the humble-bee, but perhaps one of the best as far as honey goes. The hot days dry up the nectar in its cup, and it will be noted that the hive-bees bring in more of both honey and pollen in their first working hours of the morning.

A bat wambles across the open sky, a large bat flying high, and no doubt a noctule out for its usual evening hunt of only one hour. Yes, there is a small party of them round the chestnut tree

where, no doubt, the May-beetles are to be had easily enough to-night. Every now and then a bat falls a foot or two, or even ten feet. Thus it pounces on a hapless beetle, whose 'bones' you can sometimes hear crunching under the captor's teeth, and whose elytra on a very busy evening can be seen falling as the bats shred them off from the softer portions. They utter tiny shrieks in the ardour of the chase, and I wish I could send up to them the jungle cry of 'A happy hunting.'

The tiny bat skimming the branches of the trees and the tall hawthorn hedges of the lane is almost certainly the pipistrelle. It is mostly after gnats, but one pursues and catches a brimstone moth quite near my face. I see it wrap the prey in its caudal pouch just for the instant necessary to tuck in its head and get it properly between the teeth. Our little pipistrelle, unlike the noctule, flies all night.

Nobody draws for elvin story any other bat than the long-eared. Draw them as large and as long as you like, and the ears of the real creature shall astonish you every time you come to see them. If we take a candle and interview the long-eared bat in the manor attic we may see a very ordinary bat hanging head downwards from a rafter. And while we look, it erects one astonishingly long ear like a sail upon a barge, then the other, and the two wag at you in a most eerie way, casting huge shadows on the wall behind as they play with your flickering candle.

Feeling that this common bat must be about, I draw beneath an ash that is still a little sparse of leaf. He and they are there, not merely catching their food on the wing, but snatching it from the leaves or beating it out and catching it as it is flushed. I can see the whole familiar fairy-tale silhouette, the big ears seeming to twitch with excitement as the animal dashes on something whose shell I can hear cracking in its jaws.

Down by the lake I look for Daubenton's bat or the water bat, skimming the water in clever circles, real night-swallows, as any insect that knew them both would acknowledge. Sometimes the clumsy desultory little barbastelle, flying like one that has had too much to drink, joins the pipistrelle at its work among the trees, where also can be seen the whiskered bat, the most arboreal of them all, fetching the moths out from their cover almost as the spaniel fetches a rabbit from a bush, or skimming within an inch or so of the ground as it searches perhaps for female ghost moths. There are many others and perhaps one or two more for the keen night naturalist to discover beyond the fifteen or so that are already known in our islands.

And here comes old flower-face, the tawny owl, 'sweeping wavy in the dusk lit by one large star.' Dear, soft, cuddlesome, sharp-clawed and sharper-beaked flower-face, let us have your story as it is told in the *Mabinogion*.

Arionrod laid a 'destiny' upon her son Llew

THE WATER BAT'S HAUNT

Llaw Gyffes that he should never have a wife of the race that now inhabits the earth. So Llew Llaw Gyffes's uncle Math, the son of Mathonwy, took counsel with Gwydion and made a damsel from the blossoms of the oak, the blossoms of the broom, and the blossoms of the meadowsweet, the fairest and most graceful maiden that man ever saw. And they baptized her and gave her the name of Blodeuwedd or Flower-face. Soon she was married to Llew Llaw Gyffes.

Then while her husband was away came Gronw Pebyr and made love to Blodeuwedd, and when her husband came home she, at Gronw Pebyr's instigation, wheedled from him what was to be his manner of death.

The spear that must slay him would have to be a whole year in the making, and nothing be done towards it except during the sacrifice on Sundays. 'And then,' said Llew Llaw Gyffes, 'I cannot be slain within a house or without. And I cannot be slain on horseback nor on foot.' Finally, she learnt that he would have to be standing with one foot on the edge of a roofed bath and the other on the back of a goat standing outside.

In that position Blodeuwedd placed her husband at the end of the year, and Gronw Pebyr flung the specially prepared spear at him, whereupon Blodeuwedd's husband flew up in the form of an eagle and gave a fearful scream. 'And thenceforth,' says the story in that place, 'he was no more seen.'

And you, oh Flower-face, were chased by Gwydion with your maidens till, looking back in the fear of flight, you fell unaware into the lake. All were drowned but the guilty Blodeuwedd, and she was turned into unhappy, hooting Blodeuwedd the owl.

The eye, with the imagination behind it, plays strange tricks in the dark. It is not merely that we do not see the things that are there, but we see things that are not there. Something reveals a blackberry bush. Perhaps the eye smells it, perhaps it is not really a blackberry bush, but a patch of bracken. At any rate, we see it, and not only the leaves stretching out, but the fruit which will not be there for another two months. In the darkness of the grass a paler streak appears. The eye swears that it is a stream, and not till I have sat down and groped at it with one foot can I be persuaded that it is merely a path. It does not matter that I am in well-known country. Trees become haystacks, bushes are men, desperate footpads waiting to leap on me, a newly-broken log is a prone body with staring white face, a mean barn is a church richly ornamented. Many things are shown by the night that I did not imagine by day to be there.

The sense that is not deceived by the dark is that of scent. It has apparently a double force by virtue of the resting of the eye. On the other hand, savours may be fresher by night than by day. At the crossing of the stream there is a delicious

message from the meadowsweet, though here I can also see the cream of the blossom. So, too, the wayfaring tree whose blossoms are not merely white, but almost luminous in the dark. But there is nothing but the scent to disclose the honeysuckle, and it comes from the depth of the wood with an insistence that would almost persuade a blind man that he could see. I have smelt the delicious savour of field beans by night for nearly a mile, and by day I have never managed to catch it at more than five or six hundred yards.

Stand still at midnight in the middle of wide open country and listen to the silence. It is an astonishing thing. The blackness is the blackness of velvet which absorbs sound as completely as it absorbs light. That is not true though, for in the midst of night tiny noises come a long way. Once a chained dog gives tongue, and I know from the direction that he is two miles away. It is like a tiny ripple on the black pool of silence, which immediately closes over it and makes it as though it had not been. Then a kestrel somewhere turns in his sleep and says one querulous word. The silence grows deeper than ever, to be torn in shreds by the hoot of an owl close to my ear. It is the most startling of all noises, and the owl is said to use it for making a mouse jump so as to disclose its whereabouts. The poor thing must jump and fall dead.

Going by the lake, where the unfailing scent of water mint greets me, I hear a faint chatter

out on the water. The ducks are perhaps talking in their sleep. I know one of the voices for that of a shell-drake telling his wife that there is really nothing to be afraid of. Fowlers can tell every species in the dark by striking a match at the edge of the broad, when out of the darkness there comes a sort of roll-call answer from individuals of many flocks. Perhaps the fox can tell. As I am coming from the lake I catch a whiff of his trail. Possibly, knowing his superiority in the dark he allows me to walk within a few feet of him.

The scent of the gorse is hushed. It needs the hot sunlight to bring out that. The white scut of a rabbit flashes, and the dry prickles crackle as he gains the interior of a bush. Perhaps I have inadvertently saved his life, for in a neighbouring cave, blacker than the black of the landscape, two luminous eyes stare, then oscillate and vanish as some cottage cat swears to itself and goes off.

I am now high under heaven on a dry bank of the hill, whence I can see by daylight many miles in three directions. But now I can only see with my ears. The rumble of a train five miles away tells me that there is a trail of white smoke between Chapel Hill and Oakton, or a trail of smoke that would be white if there were light to make it so. The train passes or a whiff of wind takes the sound elsewhere, and silence falls again so thick that I hear a leaf rustle as a beetle crawls over it. Then out of the far quiet comes the tick of a horse's hoof on the road.

At first I catch only the heaviest beat in each bar, then a short of dotted common time by which I know that the horse is trotting. Shortly it drops to a walk, and I know exactly how far away it is. The well-fed and somewhat aged beast is going up Bindles' Pitch. He draws behind him a low-wheeled vehicle with a comfortable farmer in it.

Late at night for Farmer B—— to be out, for that's who it is for a shilling. Four good miles away and not a ray of light to aid me, but I can see Farmer B—— dozing behind his grey mare, on whose neck the reins have fallen as she bows her head to the slight work of climbing Bindles' Pitch. I think I could make out an alibi for Farmer B—— if they should accuse him of being ten miles in the other direction at this moment. Now comes the top of the 'pitch,' and the grey horse begins to trot again. Just as I can almost hear the sound of wheels he turns off, and the sound of his trotting grows dim. He has taken the way to Farmer B——'s house.

There will not be any more noises on the high road for an hour or two. On the hill under the larch trees night seems to be holding its breath, so tensely silent is the world. As I go near a holly bush a clatter within sends the heart into my mouth. It is only some small bird disturbed on its roost. A tiny pipe far up the sky tells me that it has gone up towards the stars. Will it fly in that direction till it bursts and falls, as a

blinded bee does? It is thought that a bird disturbed at midnight is unable to find a new roost that night.

Only under the mighty impulse of the annual migration do our day birds become night birds, our fluttering birds flying birds, traversing thousands of miles of air high above the clouds and in the pitch dark. In the usual sense, they must be completely lost then. If they reasoned about it, out of sheer fright they would drop into the sea. But instinct or the faith that removes mountains leads them on and makes them perform miracles. You might take the willow-wren and construct from its model a flying machine a thousand times as efficient, yet that flying machine would be left behind in all points if it attempted to join in the willow-wren's flight from the Cape to England in April.

With such an illusive topic, what wonder that I have lost myself? These woods, familiar enough by day, have put on a garb of entire novelty. Instead of screes, there are banks of thyme; instead of pools, sand hills; instead of bracken, ragwort and willow-herb; instead of beech, mangroves; instead of maples, cocoanut palms. I think I am coming out on the north side by Buckholt. I begin to construct the landscape on that theory. Of course. Yonder is the haystack, felt rather than seen as an extra thickness of air. That notch in the sky is the entrance to the avenue by which I shall soon return home. That——

Touch wood, and like magic, the whole scene is changed. The haystack becomes a tree, and a calf shed springs up where there had been a willow. The avenue is the gap of a dead tree in the wood, an open field wheels into position and occupies the place of a larch copse. All because one familiar object in a world of mystery has been identified. As soon as I touched the top rail of a gate, unsubstantial in the dark as all the rest, I found myself to my surprise at the south end of the wood instead of the north. It is the gate of the outermost field of Dingle Farm.

Here are the white champions again, faintly swimming out of the night in a field that only memory knows is of sainfoin. The night-jar no longer flies over, though he may give another rattle just before dawn. By persistent peering I can see quite close to the path the tops of the grass, though nothing of the rest of the blade. It might be a sudd floating on the sea, or the topmost fronds of a tall forest. And though it is undoubtedly grass it has no colour but grey. When I grope and find flowers they too are grey. Grey geraniums that I know to be blue, grey prunella, grey rest-harrow, grey basil and centaury.

Over the wall from the champion field stretches a high and open ploughed field. Here is seen the first colour of the day, for the strong red soil just shows a glimpse of its quality. Somewhere at the far end of the ploughing wails a lapwing. A grey moth, traceable in flight because it has

white underwings, alights on the wall and in a twinkling has withdrawn for the day into its chosen crevice. A bat that may have been chasing it seems to realize now that the hunting hour has passed, for it flies overhead almost in bee-line for its hanging-place in the manor attics. Almost imperceptibly the message of dawn slides into the sky. 'Strange her eyes; her cheeks are cold as cold sea shells.' The dawn comes, indeed, with a faint opalescence, a running of grey rose into grey blue, like a very wet water-colour painting of mother-of-pearl.

Often there is a pale moon in the sky at the same time that the sun rises, but this night there has been no moon. But while the fate of day and night seem to be in the balance a wood owl hoots for the last time, and immediately afterwards the crow calls. Though mankind sleeps for another hour or two, day has begun.

JULY

II

THE MYRMIDONS

I AM never sure when I am in a pine wood in late summer whether or no I can hear the tramp of the ants. On the whole, it must be that we do hear an innumerable tiny ticking as hollow leaves are trodden on and pine needles tilt and fall back, a million scrapings of the bark each one of which would be grotesquely inaudible as the ants clamber here and there upon incessant forage, even the twitching of their jaws as they keep them in practice with imaginary work and the singing of the air as it is drawn into twenty million spiracles. If it is so, it must grow upon us so gradually as we come into the wood that the full din is never apparent. We shall need the aid of the micro-phonograph to settle the question.

Sometimes people come into our wood, and as they are picking a primrose, or walking with eyes on the ground, or chance to look at the right spot on a tree trunk, they see an ant. One solitary ant, but of such a size that it might be three or

four of the largest kind of ant yet seen rolled into one. Later they may see two or three of these big ants at once, meeting and racing past one another on their respective but mutually serviceable business.

If the observer should be a boy scout he *might* be able to determine which of two ants passing one another was going to the nest, and that one he could follow home. More often we ramble on and happen on a still more crowded stream and finally upon the nest.

In the main ant street, about ten yards from the nest, the whole ground seems to be composed of ants. Looking carefully we see that all are going straight along the street in opposite directions. They have cleared the ground of rubbish, and it even seems as though the accumulated pressure of their innumerable feet had smoothed and polished it into a sort of macadam. Such crowds could not pass one another without some sort of order, and when I have watched them I have usually come to the conclusion that the rule of the ant is the same as ours, namely to keep to the right. The rule is not invariably kept, but then neither is it among men. I should say that the average ant crowd observes the rule of keep-to-the-right about as faithfully per head of the population as the average crowd of people in the Strand.

There are roads running not only along the ground but up the trees. Most of the ant's foraging indeed is done in the trees, and those on the ground

are for the most part going to and from distant trees. Some bring down small caterpillars or flies, others have merely collected honey or honey-dew from the aphides up there. Mr. Edward Step says that the honey carriers coming down can be distinguished from the honey fetchers going up by their greater portliness. Possibly it is so, though the ant that is merely carrying honey for the community necessarily has it in the crop, which I should have thought would show no outward extension.

Caterpillars are so seldom seen being carried down the trunk of a tree, and some of them would be so difficult to manipulate in that position, that I think a good many must be thrown down on the chance of a ground forager picking them up. It would be interesting to climb a tree and spend an afternoon there seeing all that happened.

And here is the nest. I knew it in February when all the sticks of last year had vanished, and there was no more than a slight elevation of earth like a trampled mole hill. From the centre of this there oozed on a sunny day a kind of brownish trickle of ants not unlike an ooze of golden syrup, the parts of which shone like drops of bare honey, though it was but the transparence of young ant carapace. Only two score they seemed, and their whole sphere of influence was not a square foot above ground, for they just sprawled and basked for the two hours that the sun was hot, and then returned to their gloomy cellars.

And now the trodden mole hill is buried fathom deep in a huge pile of tiny sticks thirty feet in circumference, and the pile of sticks seems to be covered in turn with a solid mass of ants. But when I dig a small breach in it with a stick it seems to be composed throughout of ants, for they rush up from the depth, slipping on the tumbling fragments, and boiling rank over rank till the hole seems solid with ants, and then for those who are looking for it a tiny spray of liquid shoots into the air from all over the heap. The ants are standing on their hind legs with the abdomen upmost, and are shooting microscopic streams of formic acid at the invader of their city. If you put your hand within six or seven inches of the hill it is covered with the poison in such minute doses that, though there is no sign of moisture, the pungent odour can be smelt on the palm for hours after.

Dig a little deeper into the heap and the huge 'eggs' are discovered, larger than grains of wheat, and apparently tossed there anyhow in a heap under the sticks. They are, of course, pupa cases, and at this time of year contain not merely young worker ants but winged males and females.

I have never seen the wood ants swarm. It should be a sight like the swarming of bees. Even the little red and black ants of the field produce many hundreds of 'flies' nearly as big as bees. On a given hot day, the whole community is given over to the vital holiday feast. There

is no work done, there is no war on foot, not even a war of defence. The little workers are rushing everywhere in a plain mixture of helping at a great departure, and anxiety at losing the big brothers and sisters they have kept by force in the nest so long. The honeymooners climb to the tops of reeds and grasses and launch themselves by dozens into the air. I do not say thousands, though most people who saw the air full of flying ants at swarming time would call it thousands. There is a rain of dark fat bodies with whirling wings of gossamer that flash in the sun, and a usual incident of the day is the gathering of starlings and other birds to gorge themselves on the unusual insect provender that the ants' holiday has produced.

Each flying queen is the designed seed of a future nest, and in view of the millions that any one of them might produce perhaps it is as well that they should have many enemies. I could take you without difficulty to a field of twenty acres, so full of the ant heaps of the yellow ant that you could walk across in any direction without descending to the ground. The short-flighted queen has no doubt the best chance of establishing a nest, and those that are ambitious to colonize afar seldom survive the lengthened gauntlet of birds. Once alighted, the princess loses no time in snapping off her wings by deftly pushing the tips against the ground, then she hides her now thoroughly ant-like body underground. Like the

queen humble-bee, she has all the drudgery of making a nest and rearing the offspring of her first eggs into helpers, so that she may devote the rest of her life to the sole work of laying eggs.

A little drudgery in early life is nothing for even a princess of an industrious species like *Lasius niger*. But it comes completely amiss to the heiress of a race of slave-makers so used to being waited on that they cannot even feed themselves, but starve in the midst of plenty if their slaves are taken away from them. The young queens of some such species take with them from the parental nest a few slaves to get the new house going till there are warriors to go out and capture more slaves. That is the most comfortable way, but it has not occurred to all slave-making ants.

Atta sexdens is an ant that not only keeps slaves, but expects them to cultivate fungus for food. A departing princess of that species takes with her a little of the mycelium from the family tree, and condescending to plant that, soon has something to keep her going. The princess of a less provident species lives for about a month by absorption of the muscles that worked her now discarded wings, that is, the material migrates within her body to supply other cells, as does the material of a tadpole's tail or the food packed between the flakes of a salmon's flesh. Not even a slave-making ant has yet reached such a state of dependence that it cannot do its own digesting.

Let us follow a little the fortunes of *Atta sexdens*.

Her first children are but sketches of what her race will be when she comes to be better fed and cared for. Still, there are soon a few who can work. They rear what grubs they can and some of the eggs, now becoming numerous, they eat. Another way of making both ends meet is to cast grubs that they cannot feed on to the fungus heap, where they contribute to the nourishment of that succulent vegetable. Often, no doubt, the colony perishes before it can get firmly on its legs, but with ordinary luck the dog lives on its own tail till it is fleet enough to catch a rabbit.

A third means by which the young queen of a slave-making species begins life opens to us a view of the probable origin of the cuckoo or slave-making habit. The female enters the deserted nest of a colony of her own kind or of another kind. She is thus at least as much better off than a mere tramp as the man who has a house is better off than a man who has none. There is the added chance of something remaining in the larder, and of there being even a few slaves knocking about.

If a colony is found that has just lost its queen, the way of the adventuress is quite smooth, and this is probably the condition that led to the founding of the very first slave-owning community. Ants that have lost their queen will accept a fresh one of even another species. Say that once a young queen of our wood ant *Formica rufa* (to go no further than our own land for an illustration) wandered into a nest of *F. fusca*, where through

the previous demise of the *fusca's* own queen, she was received as the all-important mother. In due time, the young *rufas* appeared and increased till they overran the nest, and from honoured guests or foster sisters took the rôle of domineering masters. Then as the slaves, in the ordinary course of nature, died off, their loss was so severely felt by the masters that they went out and attacked another *fusca* nest and brought home new ones. That particular strain of *Formica rufa*, in fact, may have become the progenitors of a new species, *Formica sanguinea*, the British slave-making ant.

F. sanguinea is so like *F. rufa* in general and minute form as to appear even to careful observers identical. The distinguishing difference is found with a good pocket lens on the shield-shaped front of the head, which in *sanguinea* is slightly notched at the shoulders. It has only been found as yet in the southern counties, and even there is scarce. Mr. Horace Hutchinson knows of a nest somewhere in Ashdown Forest.

When we have seen a queen ant with her wings on, we have seen the insect complete. As a winged insect, it falls to be classified with the bees and the wasps among the hymenoptera. Myrmidons all, in the devotion of each worker to the common cause, and in the vast numbers they produce as summer runs its course. It can surely not have been mere coincidence that made Homer give to the faithful and numerous followers of Achilles the name, myrmidons, so near to *myrmiz*,

the Greek for ant. The compliment, if deliberate, was one that the ants and bees well deserved.

I marked in April the place where a yellow-thoraxed humble-bee went to her nest in the long dry grass, and though I opened the tiny dome of moss and discovered her there victualling the one cell like half a nutshell, she or some other came back and continued the nest. Now, it requires some fortitude to break the nest open, and let out the cloud of bees that very much want to know what is meant by such a trespass. They are not so fierce, however, as the red-tailed bees, and when the nest is open they lie about for the most part on their backs with their tails in the air ready to sting if they are touched. Some say that they feign death, but the attitude reminds us forcibly of that of the wood ants when their nest is attacked, and they prepare to squirt poison.

The nest is a very jumble of cells in all stages of completion, resembling in the final stage the cocoon cases of the ants done in yellow wax and many times the size. Some contain fat white grubs, others indiscriminately mixed with them, dark and rather insipid honey. The humble-bee does not ferment and cook and flavour its honey as the artistic hive-bee does. The cells are stuck together loosely where they tangentially touch one another, so that they make a sort of single comb, for the openings are all on one side. The triangular spaces between the cells are often jammed with a mixture of honey and pollen, and

there is usually a grub feeding on it, perhaps the grub of the rightful owners, but perhaps that of one of the cuckoos that victimize the bee.

If we search very carefully, and armed with a police description previously supplied, we may find the doyen of all the bee-cuckoos, one that is got up with an almost complete resemblance to its host. The host is *Bombus virginalis* and the cuckoo *Apathus campestris*. A parallel description from the South Kensington catalogue will give some idea of their similarity :—

B. virginalis

Densely clothed with black pubescence, the collar orange-yellow ; wings sub-hyaline, their apical margins clouded. Abdomen—the second segment with bright orange-yellow pubescence, that on the third and fourth black ; on the apical segments it is fulvous yellow.

A. campestris

The pubescence black, with the thorax anteriorly and the scutellum clothed with yellow pubescence ; wings fusco-hyaline. Abdomen shining, the fourth and fifth segments with yellow pubescence laterally.

The main description is followed in each case with the details of several varieties, for humble-bees are by no means constant to type. That our nest will show, whether or no we find therein a specimen of *Apathus*, the apathetic or unfeeling cuckoo. Some are queens, some workers, some drones or males. We can find out which are the latter by getting stung by the other two and

squeezing with impunity the last. The workers are exceedingly variable in size as well as in colour. Here is one lying on its back, and no doubt possessed of a sting, that is not one fourth the length of the normal. I have never seen quite such a midge working the flowers, and it may be that these tiny ones are given duties that keep them entirely at home. They possibly come from the grubs we have seen living on the intercellular pollen mixture, or, at any rate, are the result of stunted feeding on account of bad weather.

The humble-bee is but a poor breeder of myrmidons by comparison with the social wasps and the hive-bee. The underground humble-bee with yellow bands and a white tail has the strongest nest, though the underground red-tailed bee and *Bombus sylvaticus* frequently run to several hundreds of bees in the nest at one time. But a fully developed wasp city has been shown to number forty thousand when its four months of growth had reached its climax. It is superior organization that does it, for the humble-bee does not yield in industry to any insect that flies, and commonly begins its nest before the wasp.

Orderliness and economy of material have been carried by the wasps and the hornets to a height undreamt of by the humble-bee. Cells are built side by side, so that the six walls of the centre one form each one wall of the six cells abutting on it, and this system, as the reader well knows, is continued through a comb of perhaps a thousand

cells. The cells are not built of thick dollops of wax mixed with pollen and honey, but of exquisitely thin paper which the reader may see the wasps preparing on any exposed plank of wood that has not been recently painted. The whole nest, instead of being dumped down inside a heap of moss, is anchored to the roof of a cave excavated to fit it, and surrounded with walls of wood-paper with air spaces between. Thus it is kept dry in the wettest weather and of an equable temperature, wood and air-space having been proved to be one of the most non-conductive of materials.

We do not attack the myrmidon city of the wasp so nonchalantly as the poor village of the humble-bee. It is necessary to prepare for our visit by placing within the doorway a grain of cyanide of potassium, the fumes of which will kill in a few hours every wasp that goes in, comes out, or stays within. Then we can quietly dig up the nest with careful spade and trowel and inspect it as the wasps built it. Perhaps the chief surprise is to find that the cells hang mouth downwards, and the grubs have to maintain themselves in position by the friction of their fat sides against the walls and a sucker upon their tails. There are plenty of other marvels that are best found with the eyes.

I think that, on the whole, paper must be in terms of labour a cheaper building material than wax. Some say that the bee requires to consume

twelve pounds of honey for the production of one pound of wax; others have put it at much less. But the bee having been appointed worker in wax rises to the occasion and brings in even more constructional ingenuity than the wasp. Her combs are vertical, and that arrangement enables her to build the cells not only with party walls side by side, but with their bases abutting. They are back-to-back habitations, and so mathematically constructed that not only does the same amount of material suffice for two cell bottoms, but less is required for two than would be required for one. The vertical double comb even in wax is a great improvement on the horizontal single comb even in wood.

A still greater advantage that belongs to the hive-bee springs in the first place from the nature of its diet. The wasp eats, at any rate, in the grub stage, aphides, caterpillars, flies and other creatures that we are never grateful enough to her for removing. It is a provender that will not store, whereas the nectar of flowers on which the bee lives can by a skilful and cleanly confectioner like the hive-bee (though not by the disorderly humble-bee) be kept over the winter. The result is well known. In the hive are preserved through the winter not merely a queen but an army of some ten thousand workers who, at the first turn of the year, persuade the mother to lay eggs from which to nourish fresh colleagues from the winter store. Two months before the first humble-bee

has come forth to her arduous labours, there are young bees helping the old ones, now laying down one by one their life's work, to forage in the early flowers and raise constantly increasing hundreds of bees of the year.

In April, before the humble-bee has got one daughter to assist her, the hive queen is laying a thousand eggs a day and accelerating towards three or four times that number. In May, the hive is boiling over with sixty or seventy thousand bees, with as many more in the cells, and by swarming it divides itself into two parts, each of which seems by a miracle as multitudinous as the original whole. Ten days later, the old hive will often send out another swarm, and the first swarm may itself swarm before June is out. So the hive that I may show you with two bees for every one of the strongest wasp nest may represent but a third of the increase from the loins of one queen.

When the eminent bee-keeper, Dzierzon, lost all his hives but ten, he raised their number in three years to four hundred, an increase that is perhaps not, as men say, 'the limit,' but shows fairly well the multiplying power of the honey-bee. When the bees of an ultra-prolific race, like the Cyprians, raise queens preparatory to swarming, they sometimes run to the number of thirty in a single hive, and each of these under favourable circumstances might become, with a handful of bees to give her a start, the mother of a full hive. Yet in a wild

state the hive-bee is rarely more common than any one of our three or four commonest humble-bees. The mere fact of having one's eggs all in one basket, even though it be a large and a sound one, may prove inimical to success.

AUGUST

I

IN THE SEA

ON the first day of the townsman's holiday at the sea, or at any rate for the first hour, he is content to lie on his back and watch the waves dashing up the shingle, or lapping with the sob of a disappointed ambition. As a passive accepter he allows their message to beat into his tired but happy brain. Possibly he interprets them by means of a little mathematical 'shop,' and no harm done.

The waves that are beating merely inches high on our summer strand ran in the deep sea, not as men say 'mountains high,' but when the wind had fetched them four hundred miles, thirty feet high. These monstrous deep-sea waves race along at the rate of a mile a minute, and the distance between their crests is some two thousand feet. Running into shallow water (say merely a hundred fathoms), they begin to slacken speed, and at length wave after wave can only crawl in and throw itself dead on the beach.

Now watch this. The retardation of each wave having been the same, it follows that the time interval between them will remain as it was, and we have only to take out our watch and time them to know what waves these were when they raced (more or less) mountains high in mid-Atlantic. Thus. Twelve seconds between waves; squared is 144; multiplied by $5\frac{1}{8}$, and we have waves measuring 738 feet from crest to crest. (Where-upon we fall into a mid-day sleep in which all the glad sounds and sensations of an August day by the sea are like things seen through tissue paper.)

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Everything that we see on the seashore is strange and new to the dweller in the back country. The plainest link between the life of the sea and of the dry land is the snail, and the snails of the sea constitute fully nine-tenths of all the animate forms we shall find. Going down the cliff path we see lots of land snails, in fact, most of them seem to be more common at the edge of the sea than in the lanes at home. But when we get to the beach we find such a wealth of species and so many forms not even faintly represented on shore that the most casual observer must find that the sea is the headquarters of the great molluscan order.

The first band of the shore below high-water mark is occupied with great uniformity by a genus of stomach-foots or gasteropods called *Littorina*. The common periwinkle is the best-known type, but before we get to the rocks occupied by the winkle

we find right at the edge of high-water mark a shell of the same shape, but perfectly smooth and usually rejoicing in olive or orange or some kindred bright colour. The characteristic shape of the *Littorinas* we find to be a large round body whorl and a tiny sharp spire. The eye that has once taken the characters in cannot be mistaken when other shells conforming or otherwise present themselves to view. But the point about the smooth one, *L. palliata*, as it is called, is that it is almost an amphibian. Many individuals must sometimes live for days at a time out of water, and it is scarcely fanciful to say that this snail is about to follow our garden snail, exchange its gills for lungs, and take up a purely terrestrial life.

L. litorea, the common winkle which we find a little below the line where the smooth 'sea snail' is common, has proved itself a traveller of some merit. A gasteropod of the Old World, and thus as much a British shell as any we have, it has travelled along the existing or prehistoric shores of Iceland and Greenland, and within the last two centuries has invaded America from the north, getting with difficulty round Cape Cod, but now having reached Newport and New York.

A little below the winkle line, but overlapping it somewhat, we find a shell of quite another family, the purple or dog-winkle. It is exceedingly variable in colour, now yellow, now white, now brown or red, and sometimes striped not merely in two colours but in three, red, white and black,

like a very special brandy-ball or lollipop. This, too, is a British shell that has invaded America, where it has established at Bar Harbour a well-known colony rejoicing in vermilion stripes.

It is an interesting and sub-consciously stimulative exercise to analyse the subtle but distinctive differences of shape that mark off the many genera of shells. These soft-bodied gasteropods which most people imagine to be mere formless dollops of slime leave behind them mementoes as enduring as the skeletons of mammals, and far more plainly indicative of their species. In spite of the protean colour-scheme of the purple, we can tell it at once from the winkle or the whelk by a difference of shape that almost escapes analysis. The main distinction is in the body whorl of the shell, which in the purple grows smaller towards the opening. While we are learning to memorize the difference between the purple and the winkle, we can verify our verdicts by taking the shell up and looking at its under side, for the purple has a groove at the forward end of the shell for the extrusion of the siphon.

The siphon is a portion of the mantle of the animal folded into an extempore tube through which the owner can get a deeper and more vigorous draught of sea water and oxygen over the gills. Generally speaking, the gasteropod that has a siphon is carnivorous, while the one without is vegetarian.

Let us get a good big whelk from the fisherman's

boat if we wish to extend our studies a little further, for the big whelks live beyond low-water mark, where they are usually attracted to pots containing fish or other meat bait, and then hauled up as lobsters are.

The live whelk placed in a pail of sea water soon extends his horns, his foot, and his siphon, and comes out for a crawl. We see that he carries on the end of his foot a slab of horn called the operculum, which just closes the door when he withdraws into his shell. If we get him to crawl on glass and then look at him underneath, we can see that overlapping the foot is the edge of the mantle not unlike the edge of a man's coat surrounding his waistcoat. If we made a dissection we should find that the gills are contained in a pocket of the mantle, not unlike the inner breast pocket wherein we keep the most valuable of our papers. In a ticket pocket in the same garment the whelk keeps a smaller set of gills, the function of which is to taste or test the water for purity or other desirable quality. In other words, the whelk's nose is in its ticket pocket. We will not go further to-day into its more intimate anatomy.

If we do not find many whelks in the rock pools we find plenty of shells. Many are neatly drilled with round holes, showing how some mighty sea monster made a way into the citadel and ate the occupant. That same monster we may find in the shape of a fellow gasteropod, or, at any rate, we

can find its shell. It is as though a shell had been made something like a small whelk shell, of good thick material, and then had been scored both ways while it was soft, cutting it all over into diamonds or lozenges like a golf ball. This shell has a deep siphon-notch, showing with reasonable probability that its inhabitant is a carnivore. But how did such a dollop of slime gain entrance to the whelk's shell ?

As we have seen, the shell of a whelk is hard and almost continuous, the operculum making it entirely so when the animal is within. There is no way but to bore a hole through the shell, and this the hungry dog-whelk, *Nassa reticulata*, proceeds to do. Protruding its snout, it puts it against the shell of the whelk and waits. The slightly acid moisture acts on the lime as we may find a drop of lemon juice would do, dissolving it or splitting it up into its airy constituents and letting the robber's snout through. The dog-whelk then pushes in its tongue and scratches out the flesh in morsels.

More surprises in this dollop of slime. A tongue that will scratch off flesh as a wild-rose bramble would can scarcely be made of slime. Reader, you may have seen through a microscope or seen on a magic lantern sheet an object called 'the radula of *Patella vulgaris*.' It is like a coil of rope set with hooked barbs. I might have said a coil of barbed wire, but the barbs are far more frequent, are set in regular rows of several abreast in two or

more sizes, and are hooked like the claws of the cat or the thorns of a bramble.

Where is that 'radula of *Patella vulgaris*?' Behold the common limpet. That is *Patella vulgaris*. If you are callous enough to wrench one of these from its rock and, following the lead of the little red mouth, probe it a little with a needle, you can extract the radula like a reddish thread nearly two inches long, and, nicely coiled under the microscope, it will give you again that astonishing picture of super-barbed wire. If we draw the tiny thread through our fingers we can feel the rasp of the tiny teeth, and understand a little how the whole snail tribe files up green leaf and tough bark for its food. There is a distinctly different pattern of dentition for every family of gasteropod, and a slightly different one for every species.

We should need many months of days far more strenuous than a hot day in August to catch and examine all the stomach-walking molluscs. There are the tops, of a new and most beautiful style of twist and exquisite colouring, of which we shall find some in the lower pools, the pelican-foot and its allies in gravel, the smooth and daintily painted *Natica* burrowing in sand, the little English cowrie, the body of which envelops the whole shell when the animal is out, yet entirely withdraws through a narrow crack when it is in, the staircase, the turrets, and many more.

Not of course the barnacles. They never come

unglued from their native rock or limpet shell. Their shells open with three or four doors at the top and thence come out, not the horns of a snail, but a rosy-red casting-net composed of feathery and frond-like legs. The net is flung and withdrawn, and in its meshes comes back the tiny animal food on which the barnacle lives. Huxley well said that the barnacle is an animal that stands on its head, and gets its living by kicking food into its mouth with its legs. It is of the crustacean order, and therefore a shrimp, a crab, a bee, anything but a mollusc.

Other months would be needed to cope with the bivalve shells. As we walk over the rocks at low tide, we are surprised to see jets of water thrown into the air from round holes about an inch in diameter. If we walk more slowly we may see that the holes are filled with a body like a white cucumber. A closer look shows a double nose at the top. It is a double siphon, one barrel for the injection of water, the other for ejec—— ‘Splash’ goes the fountain into the air as the startled animal draws its cucumber body back into the hole. If we can get one out without ruinous injury we find that here is a remote relative of the oyster, having two very fragile shells that fail to cover the animal however tightly they may be closed, wherefore we call them ‘gaper’ shells.

A better type of the bivalve is the cockle, whose shell we pick up long before we have the oppor-

tunity of seeing how nimbly the animal can jump in the soft muddy sand in which it lives.

The shell of the cockle tells its life-history to any boy scout. The thicker it is the rougher the sea from which it came, wherefore Cornish cockle-shells will be found to be much thicker and stronger than Dawlish cockle-shells. The inner surface of the shell has tell-tale marks upon it—pits where the two strong muscles were attached that open and shut the shell, and a thin line all along to show where the mantle joined the shell. This line runs into a deep bay at one end, and that is where the siphon poked out. If we find no bay in the mantle-mark, we know that the bivalve whose remains we are examining had no siphon.

Away with the univalve gasteropods and the bivalves. We may find a shell like a tiny elephant's tusk, open at both ends. It belongs to another order of the everlasting molluscs, the scaphopods. The little lamp shell with the lower shell very concave like the old-fashioned lamps, so shaped to hold the oil, has a yet more illustrious history. It is a brachiopod, and, if that does not amaze you, it is called *terebratula*. Many millions of years ago all the bivalve molluscs were brachiopods and *terebratula* is a famous name to geologists. In our day, the pelecypods (oysters) rule the bivalve world everywhere, and the brachiopods are virtually extinct. All honour then to little *terebratula caput-serpentis* for upholding so long the dignity of its ancient family.

Speaking of fossils, what do we make of the ammonites and the belemnites, by some called thunderbolts, that we crack out of our blue rocks at Whitby and often elsewhere? They surely are extinct. Yes and no. A mollusc whose mantle had developed in front into ten arms covered with suckers like the single one of the limpet elaborated the ammonite shell at the proper season to cover her eggs. She sat in it, perhaps, as the nautilus does to-day, and drifted across the prehistoric sea bearing her eggs with her. But later, it would seem, like a lady with a fashionable hat, she over-elaborated her shell till it was useless for its purpose, and after dragging the costly ornament about for a few million years the race that gave us our countless ammonite shells became extinct. Not only do nautili and devil-fish of more reasonable habits survive in our seas, but they run to enormous size. Some of them make two or more mouthfuls apiece for a whale, and some have been encountered weighing many tons and having tentacles fifteen and twenty feet in length.

The dry lecture is interrupted by the discovery of a stranded squid. It is dead, but we can squeeze from its siphon a jet of sepia, renewing it again and again by pouring in water and pouring it out again, richly coloured from the abundant tube within. The flesh of the animal is of the same flabby consistency that belongs to the other molluscs, but the trunk of it contains a hard part,

the pen or cuttle-bone which we use as an ink eraser. The thunderbolt or belemnite fossil we asked about is the pen of a prehistoric cuttle-fish, and the ink has been found surrounded by the fossil remains, so little injured by the passage of a few million years that it gave full satisfaction as sepia to an artist who painted with it.

So much for the mighty kingdom of the garden snail. Now we fling off boots and stockings and go for a paddle in a rock pool. It is glass clear; there is no outlet to the sea; no sooner do we stir up a cloud of sand than it settles again, so that we should see the movement of the tiniest atom. Yet we must search it long and keenly if we are to find all the animal treasures it contains.

A little submarine eddy near a bank of bright green seaweed draws attention to apparently a piece of water in the water, something scarcely more visible than a flake of sunken ice. It is off again and again when we try to get a hand beneath it, and once the eye is removed from it the invisibility of the pool swallows it. But if we catch it, we find that this ghostly creature is clothed in mail, and furnished with the most delicate and elaborate of legs, antennæ and mouth-parts, with the last of which it can be seen tucking bunches of sea salad into its gullet in the most business-like way. And every one knows that when a prawn is boiled its transparency turns to the most aggressive of opaque reds, visible half a street away.

Then we see tops and whelk-shells scuttling along the floor of the pool at too great a pace, and discover the common but perpetually admirable hermit crabs. We take up a bunch of seaweed and find that it grows on the back of a spider crab, thus rendered invisible in its work among the seaweed. Nay, we look at the seaweed and find that it is not vegetable but animal, a colony of coral-like animals that yield amazing comedies and tragedies under the microscope. That scented, fernlike thing, the flustra, is the best zoophyte to begin with; it reveals the first antechamber of its infinite beauties to the pocket magnifying glass.

Fish are a surer attraction. We seldom approach a pool so quietly as to see the blenny actually sunning himself out of water. He has plopped into his own element and gone to hide himself under a stone, whence presently we disclose him and have a most exciting chase round the pool. He blows out his head into a most terrifying object, glares with his garnet eye, expels his breath with a loud pop, and if he has the chance gives you a shrewd nip with his jaws.

Another good fish to chase (forgetting all the years that may be our misfortune) is the rock goby, a smooth black brute with a shining white throat and a distension of stomach that betrays the typical sea appetite. And there is the serpent-like gunnel, flattened from back to belly and spotted with a fierce indigo that makes most

children afraid to touch him. Doubly armed, for the agility of the gunnel to evade pursuit is truly wonderful.

The little soles met with in the shallow edges of the sea waves are just like the sand on which they lie, say, like bits of paper to which grains of sand have been fixed all over. The older soles are a far less perfect match, till we remember that they live not in the shallow sunshine, but in the depths where the shadows run together more. Follow the little soles into the deep sea and we are in an enormous world almost unexplored. We can dredge up a few monsters or their integuments, haul a few out with rod and line, wait for the waves to wash up prizes like the lesser forkbeard or the wonderful opah flaming with all the colours of the rainbow. But at the edge of the sea we stand for ever on the border of a world of life richer in wonder than the land behind us, and contrived to yield its treasures so slowly and spasmodically as to last many lifetimes. Like Newton, we can only hope to pick up a very few shells before it is time for bed.

AUGUST

II

PLANTS ON THE MOVE

ON the rocky scarp of my mountain where I lie and watch the bees busy at the thyme there is a gentle breeze moving. I look down at the village almost a mile below as the stone drops, and pity the people who must stew in a currentless shimmer. There comes up ever so gently on the ascending warmth an airy white flake, so airy that I can only see it when it gets a dark mass behind it, such as a cavity in the rock or a juniper bush. The little balloon, wavering hither and thither, steers on the whole a straight course almost to my feet, where a sharp edge of rock catches it for a moment, knocks off its tiny hanging car, and lets the rest bound up and fly on through the blue mountain sky.

The car of the balloon which has fallen at the foot of the stone that dislodged it is the fruit of a lowland thistle come all this way to establish a new sept far from the maternal tree. You might tell what species it belonged to by the structure of

the balloon or even, the balloon having gone, by the fluting of the seed case. There are hundreds of them in this particular trade, the members of the great composite family numbering in Great Britain alone fully a hundred and thirty species. This particular fruit, aided by a very gentle rising breeze, has travelled uncommonly far for a thistle, the majority of the balloons we see careering in all sorts of unexpected places up and down the land having lost their cargoes within forty or fifty yards of the parent plant. We may find that there are some other seeds apparently not so well equipped for travelling that succeed in colonizing many thousands of miles from their home.

Nearly all the best flying seeds belong to the composite family, and nearly every member of that family migrates by the air. The habit has in a measure been forced upon them by their very compositeness. When the flowers, for the purpose of better attracting the insects, took to growing all together on one head with a communal arrangement of bracts by way of calyx, we may say that in quite an impersonal way the question arose, What was to be done with each flower's own calyx. The scheme of a dandelion would obviously be spoiled if a hundred and fifty green calyces poked out all over and reduced the radiant gold of the 'blossom' to something little different from the grass of the field. The florets are safe in their numbers, and do not require the protection of a calyx for each of them. The calyx is not wanted,

and there are only two courses open to it. Either it may vanish altogether as four out of the five toes of the horse have vanished, or it may be converted to some other use. It has elected the latter course, and has become what we call a pappus.

The pappus is in abeyance during the flowering of the dandelion. When that has been accomplished, and the fruit is safely fertilized, the pappus grows, the dandelion seems to blossom anew, but this time in white. A huge white bubble occupies the site of the late golden flower. It is composed of as many smaller white bubbles as there are fruits; the fruits are attached to the parchment platform below them by the lightest possible tacking, and at the first puff of wind each of them goes sailing away as the car of a tiny and wonderful balloon.

An objection that the evolutionist often meets with when he has pointed out some such obvious fact as this, is that, useful as is, for example, a full-blown balloon such as the dandelion has, no advantage would be derived from the possession of the first slight hairiness that was the forerunner of a full-grown pappus-to-be some million generations hence. The objection has very little force in this particular case. Some of the composites have still very small pappi, not nearly sufficient to fly upon, and yet in every case it can be shown that the flower derives benefit from them. The flower-head of the leopard's bane is only a little woolly, but the ripe florets take ten times as

long to fall a given distance as the fruits by themselves would do. They are borne on stalks, some three feet high, and capable when blown by the wind of giving the seeds a very useful jerk in the right direction, so that, what with that and the force of the wind, the seed usually manages to travel a good six feet from the parent plant.

The bristles that take the place of plumes on the fruit of the scabious are enough for the wind to take hold of in the same way, and also serve to work the seed into any little earth cavity, and thus effectually plant it. The reader will not be able to examine any seeding composite, however elementary its pappus, without congratulating it upon having done better with its calyx than merely cast it away. The fruit of the oat-grass and some others having an equipment not unlike the bristles of the scabious, by twisting their awns together like springs that suddenly disengage, get along the ground a few inches in a series of little hops before encountering an obstacle under which the same force buries the seed.

Ordinary smooth round seeds that are jerked out by the wind do not leave the matter by any means to chance. The long, wiry stalks on which they grow are eminently calculated to give their jerk at just the right time to send the seed the greatest possible distances. If we examine the common sage or any of the dead-nettles we find that the lower lip of the calyx is beautifully shaped for giving the projectile an upward guidance that

considerably lengthens its parabola. Some calyx tubes, as in the allied genus *Teucrium*, are actually rifled so as to give the shot a spin, on the principle adopted not long since by the makers of our rifles and ordnance.

So much for the sling which, like the balloon, is dependent on the wind for its functioning. The artillery method practised by a great number of plants attracts human admiration more quickly. Every one knows the geraniums and the long beaks they produce at seeding time, from which they are known as cranesbills. These beaks are purely shooting arrangements to be likened to the barrels of cross-bows, from end to end of which operate elastic springs to shoot the seeds. There are five elastic straps attached at one end to the tip of the beak, and at the other each to a fruit at the bottom. The elastic strains and tightens on the fruit, and at the right time the latter is released, the strap curling sharply up in the direction of the barrel. In late summer you find every beak decorated with five curled straps and apparently a fruit at each end. Long ago I collected a handful of these ripe fruits and planted them. Not one came up. I had collected merely the empty catapults, for each carpel has a slit in its envelope from which the seed is slung at the instant when the elastic rolls up. The stork's bill explodes in much the same way, but the elastic remains on the seed in a twisted form that enables it to hop along the ground and bury

itself. In John's *Flowers of the Field*, edited by Clarence Elliott, we read that a twisted capsule, if moistened and laid on a sheet of paper, 'will, in its effort to straighten itself, soon crawl an inch or more away from the spot on which it was laid.'

The geranium shoots its seeds about three yards. An exotic artillerist *Hura crepitans*, like a box of brazil nuts, goes off with a bang, like a pistol, and shoots its seeds fifteen or twenty yards. The reader can find for himself what are the accomplishments of others of our common shooting plants such as the broom, the balsam, and the yellow wood-sorrel, common in every greenhouse.

Goethe gave in his *Travels in Italy* the following account of the artillery performances of *Acanthus mollis* :—

'I had brought home several seed capsules and put them away in an open box, when one night I heard a crackling noise, and immediately afterwards a sound like the impact of small bodies against the walls and ceiling. I could not understand it at first, but found afterwards that my pods had burst and scattered their seeds all over the place. The dryness of the room had caused the fruits to ripen in a few days to the requisite degree of elasticity.'

Thus we can hear the broom pods crackling on a hot day as they shoot their seeds and colonize a further stretch of the field. We can take a pod or two home, and fixing them in the centre of a table measure the energy with which they burst.

But to shoot a seed even five yards is not to get

it planted a thousand miles away. It is enough to secure fresh soil for the seedling, and also to secure in a time that is short in comparison with a geological age the colonization of the largest piece of land in the world. Even the thistle which flies its seed only forty yards would take a thousand years to travel twenty miles. And a tree that only bore fruit at the age of thirty, and then parachuted its seeds like the sycamore, would take half a million years to colonize from Land's End to John o' Groat's. How are we going to get Claytonia, the perfoliate chickweed, from America to Europe in a single season ?

It is suggested by Kerner von Marilaun that some of these shooting seeds are designed to go off at the right time, so as to shoot a passing animal and so get transported in its fur or feathers. The case of the squirting cucumber is a strong one. In this fruit the skin presses on the liquid contents, against the resistance of the stalk which acts as a stopper. A slight jerk from a passing animal upsets the equilibrium, the stopper flies out, and a stream of seeds in jelly, something like the contents of a gooseberry, shoots the intruder like a spring gun. Anything locomotive thus hit must, of course, carry a seed or two a considerable distance before dropping them.

Most plants, however, that rely on animals to transport their seeds adopt far simpler means. Of all the flowering plants, one in ten have fruits capable of hooking themselves at a touch to

whatever brushes against them as they sit ripe on their stalks. We only have to walk through a field, or better still through a wood, to find our legs or skirt covered with what we generally regard in a lump as burrs. Some are harder to get off than others, and that is all that most of us care to know about them. There are galium, hound's-tongue, dog's mercury, avens, agrimony, corn-buttercup, enchanter's nightshade and a hundred others. The boy scout merely takes a glance at your trouser-leg and knows the very field you have been in, while you are quite unaware of the terrible infection you may be carrying. You and your spaniel jump into a train, thence into a ship, and perhaps girdle half the world before the seeds on your clothes or pelt fall off and come into their new kingdom.

The burr has scarcely yet been evolved that will stick to the feathers of a bird. The genus *Trapella* gives one excellent example, but curiously enough that plant is one of the rarest and most local of plants. On the other hand, the plants that are most widely distributed throughout the world seem to be highly qualified in another way to get their seeds carried by birds.

The three commonest plants throughout the world are probably purple loosestrife (*Lythrum salicaria*), gipsy wort (*Lycopus europæus*), and self-heal (*Prunella vulgaris*). I must leave the reader to fathom the secret of the gipsy wort. *Prunella* will be found to have a sticky fruit against which

the glossiest feather would scarcely be proof, if it touched it at just the right condition of atmosphere, and it is a fruit that by its tininess and lightness would not call upon the bird about to migrate for an immediate preening. *Prunella* has probably done the journey from England to South Africa many times.

The seeds of *Lythrum* and many other waterside plants fall into the water and make a film that closes at once on any solid body that meets them. Not in themselves sticky, they are highly so by the suction that a damping gives to such light particles, and as waterfowl and waders are among the most active of our migrants, the purple loosestrife must, like the *prunella*, owe much to the birds for its extraordinary distribution. When no water bird touches them, the autumn floods take them and wash them out on some meadow bank many miles from home.

It is hard to find any plant that has not some visible means of migration. It is as imperative for plants as for animals to care for their progeny, and there is no more necessary care than the provision of new soil wherein to grow. An obvious method differing from all the others just named is the surrounding of the precious seed with a fleshy fruit bribing the birds to their duty, just as the honey bribed the insects to carry the pollen.

It is strange that man has made so much of fruit, that is of the fleshy surroundings of fruit, as an article of diet. It is of the essence of the

stratagem that these pulps should be a species of cheap fraud, just a little flavour and a good deal of water, always perfectly cheap, and sugar, which is a kind of plant by product. There is no comparison in nourishment value between the flesh of the plum and its kernel. As far as they dare, the plants make the pulp of their fruit unwholesome. Wild fruits are sometimes emetic and sometimes purgative, so that the bird that has carried them off will not destroy the precious seed that they have been bribed to plant. Even the deadly nightshade which we fear so much is not fatal to the blackbird. In fact, the bird seems to enjoy it and thrive on it. Even if it entirely consumes the seed of some plants there will be some sticky remnant to be cleaned from the bill, and thus fall at a distance on new ground. That is the well-known method of travel adopted by the mistletoe, and there is no doubt that it is as well used by the black bryony, the guelder-rose, and others.

I see the ants laboriously trundling along great seeds towards their nest, and I laugh to find once more the plants at their moving. So that is how the great celandine has got so far down the lane? These little beans (though they do not come from a true pod) are well endowed with a wart of fleshy matter called a caruncle, and the wise ant knows no better way to come by this acceptable article of diet than by carrying the whole seed a good way, and often all the way home, before it nibbles off

what it wants, and leaves the rest to grow into a new plant. For the same reason they do the often far heavier pantehnicon work of the snow-drops and chionodoxas of the garden, of the violets and periwinkles, cow-wheats, pansies, Canterbury bells, and many others.

The meadow saffron is the abomination of the farmer for the bad effects that it has on his cows. He will go to a good deal of expense to get rid of it, but it usually manages to make one or two successful blossoms, and has at least one good way of getting from one field to another. When it sends up its ovary to the field surface and opens it, the seed within is sticky as mistletoe, and if a cow tread on it she carries about with her the germ that may become a plant that shall be her own or her daughter's undoing. The greatest blossom in the world, the *Rafflesia*, which has no leaves, only a parasite root, but a blossom eighteen inches across, gets its seed-carrying done by elephants. Says Mr. G. F. Scott Elliot, quoting Goeze: 'When the huge flower decays, it forms a sticky pulpy mass like broth and full of seeds. An elephant strolling through the forest will step in it, and will, of course, naturally scrape its feet against the next conveniently projecting *Cissus* root which it happens to encounter.' The *Cissus* root is the actual place whereon the *Rafflesia* is designed to grow. Thus, the elephant performs for *Rafflesia* the same duty that the mistle-thrush performs for our mistletoe.

The possession of winged or burred seeds would be little to the advantage of the ivy-leaved toad-flax. To shoot them out as the violet and oxalis do would be just the same as dropping them to the foot of the wall or cliff on which the parent grows, and the foot of the wall is out of the habitat. The best that the toad-flax can do is to prevent the seed from falling, to be sure that it will find a lodgment at the right altitude. So the flower-stalk bends and searches among the rocks till it finds a crevice into which it thrusts its precious burden. Not content with furnishing the seed with a spade to dig its own grave, it digs the hole and puts it in.

If our arrangements for our progeny are elaborate our progeny need not be numerous. The orchids, which are so careful about their fertilization, are singularly careless in the matter of seed distribution. Each one of them produces enough seeds to plant an acre, but they are so tiny that in the great majority of them the vital spark cannot live till germination. They blow in the wind almost like grains of larch pollen, and it is by means of the wind that they are sent abroad. But the other plants that provide more substantial embryos and more complex means of distribution overwhelm the orchids in spite of the number of their seeds. The fact that even our thistle, with a perfect balloon for each seed, must produce so many seeds shows what a perilous business this moving is even under the best of conditions.

SEPTEMBER

I

THE WHEAT-FIELD

'Yellow with bird's-foot trefoil are the grass glades ;
Yellow with cinquefoil of the dew-grey leaf ;
Yellow with stone-crop ; the moss-mounds are yellow ;
Blue-necked, the wheat sways yellowing to the sheaf.'

THUS sang Meredith in the 'yellow verse' of his *Love in the Valley*. The wheat plant has for some time contained all the good things that will soon be reaped in the grain. It has been pouring them, as all plants do, into the precious seed, the sole hope of the plant when this year's work is done. The last to go in will be the finishing touch of cereal excellence now accumulated in the blue neck of the stalk. Even if the wheat should be cut now, the process would go on, the grain would ripen in the stooks, and the farmer would save more of it than he will if he leaves the crop till it is dead ripe, as nevertheless most farmers do.

The wheat is now nearly a year old on its roots, for the British farmer finds little profit in spring

wheat. Wheat that lies in the ground through an English winter employs the time in making good and long-penetrating roots on which to rear a crop that shall do it justice and bring the farmer joy. There is no searcher-out of the good things that the soil contains like winter wheat. In the village school they teach the sprouting of a monocotyledonous seed by putting grains of wheat to germinate in water. Up goes a little green plumule and down goes a little root, and the child imagines that the growth of the wheat is fully illustrated. A heap of wheat on the ground would so sprout, and if one of the grains should bear progeny it would be probably on a single ear at the end of a single grass. But give it room, up to a square foot of soil for each grain, and time to tiller and make preparation, and your single grain will send up fifty ears and bear a total increase of over four thousand grains.

In the actual wheat-field before us we find that each plant has many heads, though seldom so many as a dozen, nor has each plant more than a six-inch circle for its own domain. Hence we get this paradox, that if we could properly plant each acre with forty-four thousand grains instead of one hundred and seventy-six thousand we could get a very much greater crop, say eighty or a hundred bushels instead of forty or fifty. In fact, a crop equal to a hundred bushels has been grown experimentally by planting and replanting wheat as we do apple trees, each in its measured space.

Not merely two hundred thousand grains, but over three million grains to the acre have been sown to get this laughing crop of blue-necked, yellowing wheat. The old estimate of 'one for the crow and two for the hoe' is always very much exceeded when wheat is being planted, and when we think of the thousand accidents of wire-worm, damp, drought, frost, wind, mouse, mole, slug, rabbit, and the others, it is a marvel that on so slight an expenditure of seed so uniform and opulent a crop can be raised.

With a whirr of thunder, a thousand-winged horde of sparrows and finches flies up from a corner of the field to perch and roll along the hedge like a brown cloud. They attack the wheat in the majesty of its fruition, and even the bushels that they will take between now and the harvest can in a measure be spared. The partridges run along through the forest of corn, and grow fat on the grains that the sparrows drop. When the stooks are up, wood-pigeons will come from the wood and fill their ravenous crops many times a day. Voles and rats will lay them up stores for the winter, showers and streams of grain will be lost on the way to the threshing-machine, and yet there will be left a mountain of bread for the feeding of those who have no idea of the perils that attended its growth.

Any Cockney knows and appreciates the meaning of these palpable robbers, the birds and the rats, and even the repulsive rust and smut that reduces

the fat grain to ashes and corruption. But we seldom try to compute the potential bushels that go to feed those brilliant robbers, the poppies and the purple knautias that dance so shamelessly above the level of the golden ears. Their beauty rejoices the eyes of the farmer less than ours, because they are unbidden guests. They creep into the corn-field by all manner of means. Some are sown with the seed, and these have a perfect knack of keeping step with the legitimate crop, ripening their seed at the same time so as to be carried into the granary with it and, unless the winnowing and sifting has been very elaborate, to be carried out of the granary with it in the seed sample and placed in the field under the best of all conditions for a renewal of the cycle.

The weed seed that is left on the stubble at harvest runs a very good chance of being swallowed by the birds under autumn and winter appetite, of being buried too deep under the ploughing, of germinating too quickly and then getting dried up or frozen, or of fermenting into decay instead of into life. Those who have planted seeds in boxes know how many are the chances even under these conditions of something going wrong. But the seeds that go out with the wheat are sown just when the seed-bed is ready, and are given every chance, according to the skill of the farmer, to grow into good healthy weeds.

When the miller receives wheat for grinding, his first operation is to clean it of other seeds,

and at this operation no less than fifteen per cent. of the bulk is screened out. If the average weed seed is only a third the size of the wheat, this means that nearly every other seed in the sample that reaches the miller will produce a weed instead of wheat when it is sown. Needless to say, samples for seed have to be cleaner than that, but in spite of every care some seed is inevitably drilled in with the wheat.

Other weeds and more of them get into the field with the manure. It has, no doubt, rotted and heated in the cow-sheds and elsewhere before it is spread on the fields and ploughed in. Before that, if it reached the cows in the form of hay, it was hastened into premature germination by the heat of the stack, was scorched and wilted by the same heat, swallowed and digested by the cattle, decimated over and over again by dangers more or less unknown to seeds in a wild state. Yet if even one per cent. is able to run the gauntlet and reach the arable land, it will very soon account for a great robbing of the legitimate crops. I think it will be seen, however, in most districts that few weeds found on the arable land are of the same kind as those that grow in the hay-fields.

The worst weed in the wheat-field is the cooch, catch, or twitch, a wiry insinuating weed that it is almost impossible to eradicate. It takes its roots six feet down in stiff clay. If you cut off and burn all but the last inch, that inch will find its way to the surface and continue the war. In a

hedge it will send its zigzag stems up ten feet and then blossom and set seed. A piece of cooch that had been dried for several years came green, and began to grow again when it was put into the ground.

The tender wheat has little chance without the assistance of man against this villainous compound of Artful Dodger and Uriah Heep, this creeping, rampant grass. Yet the cooch is of the nearest possible affinity to the noble wheat itself. Some of the first wheat grains cultivated by man have been found on the hearths of the ancient lake-dwellers in Switzerland. Even failing them, a microscopic examination of our wheat shows with reasonable certainty that it is descended from the goat grass, a cooch that still grows in Italy. The goat grass of the lake-dwellings was also cultivated in India, and may have come thence rather more like wheat when the Aryan invasion came into Europe.

It is not surprising if the old primitive wheats of twenty thousand years ago, or, as recent theory puts it, of seven hundred thousand years ago, have disappeared. Very great improvement of the wheat is a fact of living memory, and the school of the wheat may now be said to have been transferred from England to America. In the experimental centres of the United States and Canada, hundreds of different varieties are tried annually, and, sad to say, the pupils from England no longer stand at the top of the class. The

hard wheats best liked in America, and known by the millers here to be the best, do not produce crops of sufficient size to please British farmers. Lately, the agricultural school of our own University of Cambridge has been engaged in producing a hybrid between the prolific soft wheat and the better but less productive hard Fife wheat. After hybridization, selection was carried on for some years, and now it is said that success has been secured. Another grower announced a year ago that he had produced a spring wheat of rapid growth and great cropping power. If it is not a fact yet, it is an ideal that is certain to be realized, and, far as the goat grass has gone, it will go immeasurably further.

It will never be quite known what weedy companions the wheat has picked up in its journeys over the world ; what weeds of cultivation it took from Europe to India, from India back again, from England to America, and vice versa, or what exchanges it has made with the antipodes. The scarlet poppy is probably British, a rare plant that might have been extinct by now, if it had not been for agriculture. It is seldom found except on or round the ploughing. The scabious has an air of oriental magnificence, but that may be only because it has been unwittingly cultivated for so many thousand years. It is evidently most at home in limestone regions, and has probably been transplanted elsewhere in limestone farm produce. It would be hard to have to give up our

veronicas, and so many of them grow in our country that we may reasonably claim that they are indigenous.

Chickweed, the greatest wanderer of them all, has had its claims investigated and has been declared to be of British origin. It belongs to a large genus, *Stellaria* (of a large tribe, the carnation tribe), of which so many members are at home in our country that it must be regarded as the headquarters. Pimpernel, on the other hand, has so lonely a position in the British flora that it may well have been an immigrant a few thousand years ago in some sample of foreign wheat.

Most people know well the odd little perfoliate weed called *Claytonia*, to which we have so far refused to accord the honour of a familiar name. Its general make-up proclaims it to be an alien, and its advent into this country was well within historic time.

In many corn-fields, notably in Norfolk and the Isle of Wight, a conspicuous and handsome weed appears in great numbers. It is the purple cow-wheat, *Melanpyrum arvense*, the latter name, which belongs to many species, being given to signify that it is a weed of cultivation. The blossom itself is pink, yellow, and red, and the bracts add to the scheme of colour by appearing in rosy pink instead of green. It has the advantage of producing seeds of the same size as the wheat, with which they get cast into the bags at threshing time and are thus sown again upon the land.

Another cow-wheat, the common yellow one, has seeds resembling the cocoons of the wood ant, and it is said that these insects carry them off in mistake for what they look like, and thus plant them at a distance from the parent colony.

We are getting into bad company when we reach the cow-wheats. They and the rattles and the red bartsia are enemies of the farmer in a double sense. Not only do they rob better plants of standing room and manure, but their roots pierce the roots of the grasses and rob them of the food they had manufactured for themselves.

Almost as bad as parasites seem the convolvulus and the buck-wheat or black bindweed, for they can only live to mingle their seed with the grain by climbing and hanging on the stalks. In places, every stalk is wound with the spirals of the clinging weed. There is no more cutting them free than there would be cutting free so many victims that an octopus has grasped. They must grow together, not only till the harvest, but till the threshing, and the seeds of the hangers-on are so nearly the same size as those of the host that it is a difficult matter to winnow or sift them out.

The tare of Scripture is no doubt the darnel grass, a widely distributed species that grows so thickly in Malta that that is probably its headquarters. It has got all over the world with the wheat, and is universally disliked. 'Among the hurtful weeds,' says Gerarde, 'darnell is the first.' Virgil before him christened it *infelix*

lolium. The seed is poisonous to man and beast, though, its poison being an intoxicant, it has been used by not too scrupulous maltsters as an aid to the fermentation of barley. 'The new bread wherein darnell is,' continues Gerarde, 'causeth drunkenness.' A mixture of the seed with wheat spoils the colour of the flour, turning it black. Surely, at the harvest darnel ought to be gathered into bundles and burnt. In places where this weed is common it has been given the expressive name of 'cheat.'

I have not nearly exhausted the list of plants to be found peculiarly and almost exclusively in corn-fields and on cultivated land. There is the cockle, whose name was given in the early edition of the Bible to the tares that later research has decided to be the more pernicious darnel. There are succory, pheasant-eye Adonis, corn-flower, the very persistent corn-buttercup with burred seeds, and many others. But the wheat-field is not only a botanic kingdom of great interest but also an animal fairyland.

We do not realize the wealth of animal life that the wheat contains till the sheaves are removed, and we see the voles darting stealthily through the stubble. Even the kestrel that sees most things of the kind can make nothing of them as he hovers over the wheat-field. The stalks are far too thick to make for good hunting. An occasional rat is seen loping into the hedge or back into his illimitable jungle, and the farmer

knows very well that there are rabbits making a summer camp far under the forest of stalks that are at once food and shelter. Like the tares, the rabbits must stay till the harvest, and then comes a terrible day of reckoning. As the reaping-machine goes round and round in ever-narrowing circles, the rabbits cower into a more and more crowded sanctuary. Presently, the man in the seat spies them, and with a good stick or stone manages to kill one. Then they begin more and more numerous to break cover and to attempt the gauntlet through half the village gathered for the rare slaughter. Some, but not many escape, and it is wonderful amid such a hullabaloo that the clearest headed of rabbits should preserve any idea whatever of the direction wherein safety lies if only he can reach it. They are exceedingly quick over short distances, and turn with great speed from those who have run to head them off. It needs the co-operation of many men to overcome one rabbit with hand weapons, and bunny is better off fighting twenty folk with sticks and stones than when he bolts from the island of standing corn within reach of one cold and merciless gun.

The rabbits' arch enemies also inhabit this summer jungle that comes to so sudden an end in September. For some weeks the young foxes have made it their playground and living-place. From the top of a tree I have several times got them under the field-glass in their trampled rod

in the middle of the twenty acres. They are getting fine animals now and, if the truth must be told, the feathers of many a treasured fowl are to be found round that trampled space that only the reaping-machine will fully reveal.

You will see the weasel slipping in and out of the corn on his errand of tyranny over the voles and mice. The stoat, too, with his half-emancipated family, knows this month in the wheat-field for one of the best times of the year. At other times of the year these wild animals have known the rough hill-fields, with brakes of gorse and bramble, where the scent of man rarely intrudes. But far more remote and wild is the interior of a corn-field between the last hoeing and the harvest.

SEPTEMBER

II

HORSE-TAILS

IT is furiously hot on the common where, nevertheless, the perfoliate yellow-wort stands up in its dress of bluey-green the very emblem of coolness. Here, too, the bee orchis and the rarer fly open their rounded blossoms at the top of lush green spikes, as though no drought that ever was could touch them. Thyme and marjoram fill the air with their fragrance, and among them skip blue butterflies with undersides of daintiest lace over blue-grey; great peacock butterflies come out of the blue sky with a click of the wings in search of musk thistle or hemp agrimony; dragon-flies dash hither and thither after smaller flies, their prey, and waiting drone bees far up in the air make a hum as though the whole sky was a vibrating gong.

The sun is undoubtedly the life of the insect world, and of all else, but when it glares so strongly on the common, man flees from it for a while into the cool of the wood. There we are content with

second-hand visions of the sun, in the green light that pours through the beech leaves, the flecks of gold on the trunks and the uncovered parts of the floor of last year's leaves, the cool of places that the sun has scarcely visited to-day, the aroma of those places where he rested for an hour at noon, the brisk activities of the horse-ants coming down the tree-boles from the golden world above, loaded with their living spoil.

The upper end of my pond in the wood is filled to the extent of about an acre with horse-tails. In early summer their modest and scattered shoots broke the surface of the water, for in those days the pond was fuller than now. The little shoots even bowed and went under as the giant trout pushed their stalks aside as they foraged at that end of the pond. Primroses gleamed in the red leaves of the wood under bare twigs, and the primrose-spotted bank descended to the edge of the silver water that seemed lifted into little pimples where the horse-tail shoots came through. There was none of the wild tangle of amphibious weeds that has come since to mask the division between land and water.

All sorts of modern things pushed the horse-tail from the muddy margin into the water, for willow-herb, flag, and forget-me-not are immeasurably parvenu compared with *equisetum*. Old as the horse-tail is, however, it sometimes fights a good battle with the moderns, not only in swampy places, but in dry spots far removed from

water. Many a potato field knows it, and a mile from the pond it grows, if it does not flourish, in dry stone brash nine hundred feet above the level of the sea.

Driven from the lake's edge by flowering plants of a new model, the jointed canes, with their old-world whorls of twigs for leaves, have the acre of water all to themselves, so far as rooted vegetation is concerned. And what are those minor parts that I have just written down as 'twigs for leaves'? If we seize the plant and pull both ways at its trunk it comes apart at a joint, the lower or socket part of which is fringed with tiny teeth. These tiny teeth are the leaves—all else is trunk and branches. But because the plant's leaves are so poor, all the rest of its anatomy does leaf duty by remaining green and full of stomatae wherewith to take food from the air. And the trunk and each branch seems to get the idea some dozen times in the course of their length that they really are deciduous leaves. For the socket and joint arrangement is like nothing else in nature so much as that by which the leaf is cast from the end of the twig when autumn comes.

If we set out to make a model of the horse-tail we should be compelled to do it in steel. Nothing else could be drawn so thin and preserve its rigidity. The stiffening material that the plant employs for its airy structure is flint in the form of silicic acid. The skeleton of every twig, nay, every cell, is composed of this enduring substance,

and if a plant be burnt with care all the tiny girders that kept it aloft remain, a system that no human artificer could copy even to a scale ten times as large. One of the effects of this construction, though surely not a primary object as some books suggest, is that browsing animals cannot eat horse-tails.

Now, the season of full luxuriance has gone by, and the plants lie here and there across the line of their growth. They are forming little banks across the lake to catch the mud and débris which the stream brings down. By such tactics these ancient plants rapidly silt up the pond and—provide for their own extermination. For when they have formed a given depth of soil in the shallow water, their enemies the sedges and other more terrestrial forms step in and snatch the dominion. The horse-tail, like many another pioneer, is ousted from the place, and, if it can find such, goes forth into some other barren swamp to teach pampered things how to grow there.

Now that so many stalks have fallen the horse-tail forest is no longer an impenetrable mystery. I find, what in June I only suspected, that the water-voles have their foraging ground within it. They have been so secure all the summer and the letting in of light has been so gradual that they take little heed of our party on the bank. Even the shrill cry of a child, 'There's a vole,' does not in the least agitate them. The object of the excited remark sits calmly on the fallen branch his teeth

have gnawed so white, and washes his face as nonchalantly as though the brake still hid him.

He has beautiful golden brown fur, tousled here and there, with beady eyes watching, mouth twitching, and hands, but not arms, peeping from bushes of long hair. Though he takes no notice of us he hears before we do the tiny paddle that a friend makes as he swims up. He faces quickly round, and gives his friend clearly to understand that the branch on which he sits is his own, and will not hold two voles. So the other sheers off a little and goes off, ploughing silvery furrows in the water with his nose. A third vole is soon seen, and even a fourth, and as one or the other is always doing some new quaint thing they fully entertain us for all the time we have to spare. While the descending sun makes rosy the open lake and paints rosy ripples among the shadows, we watch our voles till we imagine them beavers playing the old part they played when horse-tails, already of very ancient growth, were a greater power in the land than they are to-day.

What is the connection between these flowerless, fruitless canes of the horse-tails and the vetches, poppies, foxgloves that drive them into the wood and press them into the swamp. What have the short-flighted flies to do with the butterflies of all colours, the bees banded with gold and orange and equipped with most special apparatus for collecting honey and pollen? The eye of faith, resting here and there on the landmarks of

fact, can see it all and find it wonderfully inspiring and interesting.

No one needs to be told that the horse-tails are survivals from a very ancient age. They existed, as our coal-fields testify, long before anything in the shape of flower came on the earth. Whatever flower a horse-tail may be said to have, was the only flower that could have been found when the coal measures were being prepared. How just, then, that the soul of man was not asked to expand in such a world.

The 'blossom' of the horse-tail looks like an abortive shoot or a spray that some mischievous barber has subjected to the operation of singeing. The place of each jointed tress that gives the horse-tail forest so much beauty is occupied by a mere knob on the surface of the shoot. On closer inspection, the knob is like a round-headed nail driven into the stump, and on the under side of the nail-head are placed little groups of spore-cells containing a dust not unlike the pollen that is in a hazel catkin or flies from the stinging-nettle. It is not of course pollen, but each grain is a spore from which the new plant springs in the same mysterious way as a fern or a mushroom.

Yet in these spores you can see the beginnings of the higher system of reproduction. Under the microscope they reveal an astonishing elaboration of structure for such small things. Each has four arms, long and clubbed at the end like the antennæ of butterflies, and usually worn wrapped

round the body like the threads of a screw. But at fruiting time, the arms straighten out and then coil slightly again, so that two or three neighbouring spores link arms with one another, and thus leave the parent plant and try their poor luck at spreading the species.

That was the flowering plan, if such it can be called, favoured by all the trees and plants in the age when the horse-tail was at its best. It was the good old plan that had been in vogue for the last million years, and not to be altered by such conservatives as our friends in the swamp.

Our friends were to have the opportunity of learning, however, that nothing lives for itself alone. The accumulation of nitrogen and other valuables in the sporangia attracted something to feed upon them. We cannot say what the somethings were. They were earlier than the fly, and bearing the same relation to a fly of to-day that the horse-tail bears to an orchid. Here was an evil thing only to be met by a victim so helpless as a vegetable by passive resistance.

So the old horse-tails found. Not so the new horse-tails, the degenerate ones willing to compromise with the enemy, to throw away their proud exclusive state and enter into trade relations with the insect scum that could not yet be called flies even, let alone bees and butterflies. Thus from the greed of the insects grew not only the illimitable improvement of the flowers, but the beatification of the insects and the education of

the soul of man not yet within several million years of his birth.

The flies seldom finish off a sporangium so cleanly, but there are spores to link arms and fly away about their business. But now arms are apt to be linked by spores of distinct plants mixed in one sporangium by the flies coming dirty-legged from one plant to another. These, in spite of the fact that they are as yet asexual bodies, will produce a stronger progeny, or one better able to exist in some locality mid-way in dryness or other quality between those of the parent plants. For reasons such as this the greater number of successful offspring will result perhaps not from the plant that best succeeds in avoiding the flies, but the one that is most eaten. There is even a premium set on attractiveness, and straightway the vista is opened to all the floral beauties of our own day.

We know how responsive are our own bodies to stimuli from outside. One look at the horny hand of toil will give us a satisfying example. From everything we see, it appears that the vegetable organism is far more susceptible than the animal in this physical respect. The endless variety of tumid and hairy growths fetched up in the trees and plants by the bites of gall-flies is a striking example, and it will be seen that every tree responds in its own special way to the assault of the pruning knife or the nibbling of rabbits or cattle.

The flies that tore the plant in robbing it of its spores perhaps induced a flow of sugar to the place, though how it could get sugar from the flinty horse-tail is a little of a mystery. That plant thereby became more attractive to nectar-loving insects, and in a thousand years or so an insect arose with the rudiments of a sac wherein to carry honey to its progeny. Among the flowers that offered honey and extra rich pollen, those succeeded best that turned some of the neighbouring leaves into a different colour, so that the bee could see from afar, and *per contra* the bee succeeded best that was not colour-blind, as the flies apparently are.

Then there began to be bees with the rudiments of a special contrivance on the hind leg to carry off loads of pollen. This robbery the flowers have to put up with, or can only meet by making the pollen hard to brush off from the back or the breast of the bee till it is picked off by the stigma of another plant. The bee has evolved a pollen brush that is almost thorough in its work, but still enough clings to the hairs of the body to achieve the object of the flowers. Few bees are so proficient in cheating the flowers as the hive-bee, wherefore some of the flowers have formed a special alliance with some of the more careless bees by evolving on the one side a tube too long for the hive-bee's tongue, and on the other side a tongue long enough to reach to the bottom of the special tube. A particular bee has been given the

key to a particular floral lock. You will never see a hive-bee attempt to probe a primrose or the tubes of the crimson clover.

The step from green leaves to coloured for advertising purposes was easy enough. The milk-wort of our own day has a few leaves coloured in addition to its regular petals, and these extra leaves do not fall off when the purpose of the flower is ended, but turn green and take up the chemical functions of ordinary leaves. That there is no great fundamental difference between petals and stamens is shown by the water-lily, which has petals with anthers on them and stamens without anthers as though they had half a mind to be petals.

When a descendant of some early spore-bearing plant had devoted a whorl of leaves to the stigmatic function, the next whorl to the provision of pollen and glands at the base for the secretion of honey, the next whorl to advertising purposes as petals, and a fourth as special wraps for the tender parts of the blossom (sepals), it had marked a very great advance upon the spore system of its ancestor. Its attendant insects, too, were far different from the promiscuous rabble whose robberies had started the whole movement. But both flower and insect had still far to go. Further adaptations to the visits of favoured insects have given us and are giving us such things as the petal of special shape to shelter the stamens of the sage, stamens with a wonderful trap arrange-

ment by virtue of which the bee paints its own back with pollen just where the next stigma needs it; the box of the toad-flax that only the humble-bee can open; the spring paint-brush of the pea, the pollen pistol of the broom, the gummed pollen mass of the orchid, and a thousand other contrivances.

Each advance has needed a new instinctive intelligence and new adaptations on the part of bee or butterfly, and with them has gone an increased buoyancy of life that has made the flower insects more beautiful, more industrious and more interesting in the details of their life. The flowers that the bees farm, the flowers that have made the bees, have won from such as the horse-tails all the best soils of the earth. They oust them daily from further fields, drive them off the mud, through the shallow water where the hemp agrimony holds sway, even out of the deep water where the water-buttercup drives its trade with insects from the mainland. The horse-tails win the water to mud, others win the mud to dry land, then come the flowers covering the place where the pond was, and lo! the pioneers, the aristocrats of the coal measures, have disappeared.

OCTOBER

I

WILD FRUITS

THE hawthorns, which were the glory of the month in early May when covered with creamy, almond-scented blossom, have been overlooked all the summer. But on a day in August when the world was wild with blossom, a hawthorn at the southern angle of the spinney caught the sun and tossed it back from crowds of fruit just turning reddish brown. The first colouring was all on one side like that of rather dingy apples. But the brown soon covered the whole fruit, then turned to flaming scarlet, which is now deepening as the days go by into a richness that bespeaks ripeness.

Hips and haws are undoubtedly the chief of the wild fruits that last into the winter. Familiar as they are, they are so little understood that in most country places they obtain the one comprehensive term 'hipseyhaws.' The child is not quite certain which are hips and which are haws. It is only in late autumn, when the grass is long and wet

WILD FRUITS

and we fight rather shy of the fields, that the haws become good to eat. Then there is a good thickness of rich yellow flesh on the hard stones that, as in most wild fruits, take up too much room. No one has thought it worth while to take the hawthorn in hand, and make of it a fruit as superior as the apple or pear are to their wild prototypes. It belongs, of course, to the great rose family that has given us apple, pear, plum, peach, cherry, strawberry, raspberry and many another of the joys of civilized life.

Most children know the candy-like sweetness of the flesh that the hip wears between its shiny red skin and the itch-provoking seeds. The greenfinches know it equally well, for you see them sitting plump and bonny in their livery of ripe greengage colour carefully chewing the fruit of the rose for the goodness that is in it. If you cannot catch these sad-eyed marauders at work, you can at any rate see the soft hip-skins still on the twigs, from which they have sucked out the inside through the outer end.

No ecstasy of the year exceeded that with which we gazed on the arched sprays of the wild rose in June. Most of us admired the pink rose of the sweetbriar or the woody dog-rose most, but there was another beauty as sweet, if less attractive, in the creamy blossom of the field rose. Has our gratitude been so long-lived that we cannot remember from which hedge the best sprays waved their garlands? The bright red, urn-

shaped hips are there to remind us. We can count them in their roughly triple arrangement and, in a measure, reconstruct the pink glories of the tall hedge that we could not rob even if we would. The hips of the field rose are rounder and darker, and they stand in clusters of from fifteen to twenty on the tops of round bushes out in the field. This *Rosa arvensis* is obviously the natural cluster-rose, and the parent of such garden beauties as the weeping Ayrshires, the Dundee Rambler and Bennett's seedling. The queen genus of the great rose order has been made to produce for us something quite as useful as fruit.

A fruit that becomes conspicuous in the copses almost as soon as the elder berries have been formed, and before they have been dyed, is that of the mealy guelder or wayfaring tree. In a way, this is a conspicuous bush all the year round. It carries through the winter, on the stiff thick ends of its twigs, knobs of tightly rolled flower-buds clasped with protective sheaths. They brave successfully all the assaults of frost, snow and thaw, but do not open till the bush has covered itself with downy leaves. Then the nights of May are fragrant with the blossom which is so conspicuous by night as to seem to shine. It would be a very dark night when we should be unable to see the wayfaring tree in blossom, and it may be this sightliness in the dark that has given it the name.

The blossoms pass and are forgotten. Then in

the same stiff upright way the berries are exhibited on the ends of stiff thick paint-brush handles. They are flat and crowded so closely together as to make you think they have been flattened by contact with one another. At first they are brilliant pinky-red on one side, and greenish-white on the other. Then the red grows deeper and deeper, berries here and there turn black among the scarlet, and bit by bit the bunch is thinned as the ripe fruits fall, till with the leaves it disappears.

And then, after the mealy guelder has passed its best, what are these other berries drooping among crimson currant-like leaves, themselves as brilliant, thin-skinned, and full of juice as red currants, but almost twice as large? Surely we did not miss their blossoms in spring. In order to see how the blossoms grew, a little reconstruction is necessary. If these long thin twigs that the heavy berries bend down so were relieved of their weight, they would travel through nearly a hundred and eighty degrees, and point straight to heaven at the top of the bush. Give them blossoms there, and the casual wayfarer would hardly ever see them. We did see them, however; the blossoms of the wild guelder-rose like nothing so much as a 'cake' of wasp-grub, all the centre cells empty and an outer ring of big queen grubs sealed with pure white caps. Each of the insignificant blossoms of the centre has set its luscious-looking berry, while the other big-petalled ones were barren and

constructed solely for advertising the nectar of the community.

The near relationship of common and mealy guelder is startlingly shown when the stone of each is exhibited. Both are flat, the stone of the mealy guelder carrying out the shape of the fruit, but that of the other appearing as a complete surprise on account of the generous rotundity of the fruit. The high-bush cranberry is one of the wild fruits of Canada that are accounted good to make jam of. An Indian describing the fruit to a settler put the cap on his definition by saying that the seeds were 'all same as a bug.' In fact, the high-bush cranberry and the guelder-rose are the same shrub, and, little as it is known in this country, a rather tart red-currant jelly can be made of these handsome fruits. When raw, they are so astringent to the palate that it is scarcely a wonder that they are classed as poisonous.

The handsome spindle-wood ripens its berries a little later than both the guelders. The starry, greenish-white blossoms are exquisitely but mildly beautiful in May. The three-lobed berries begin to be noticeable when they turn slowly towards a bright crimson-lake, which they reach in September. Then the crimson lobes split and show within the astonishing contrast of bright vermilion seeds, one in each lobe, an arrangement that has somehow earned them the name of 'pin-cushions.' By this time the leaves have taken on the crimsons and purples of the dogwood

tribe to which they seem to be allied. The leaves drop off rather easily, and when the berries are at their best there are just enough of them to make an accompaniment to their gaudy scheme of colour, and not so many as would hide them from the most casual eye. Like the Furies, the spindle-wood genus is called by a pleasant name—*Euonymus*. Its vermilion seeds are poisonous to us who never think of eating them, but only medicinal to the thrushes which do eat them.

‘Happy, happy time, when the white star hovers
Low over dim fields fresh with bloomy dew,
Near the face of dawn that draws athwart the
darkness
Threading it with colour like yewberries the yew.’

There is no gloomier tree than the yew, no more brilliant berry than those which are set like fiery stars on its branches. There is only one berry with such sticky flesh, the mistletoe; but the yewberry is sweet as well as viscid, like a piece of confectionery set on this strange shop-counter. The seed that peeps out in the midst of this ring of jelly is poisonous, and so most children leave the yewberries for the thrushes that simply revel in them. Such gobblers never think of spitting out the stones at the time of feasting, but eject them later when the emetic principle asserts itself, thus scattering them abroad where there are openings for young yews.

The strawberry has long since gone, and only the

blackberry and the sloe of present berries are truly edible. Some would deny that of the sloe, which even with the bloom of ripeness on it makes an astonishingly sour mouthful, setting the teeth on edge and compelling a wry face in the most stoical of us. But a few cold nights of autumn or the first frost will knock the bitterness out of it and render it eatable enough, while we need not say that, as sloe cheese or the flavouring element of sloe gin, this little fruit redeems the reputation that belongs to the plum family.

Otherwise, our autumn berries are inedible and often poisonous. A month ago I stooped in the tangly undergrowth of the wood to pick the first dewberry. It had but one big black lobe of flesh, as the dewberry sometimes has. The calyx stuck out round it like a gladstone collar, and everything seemed fairly in order. But the stalk on which the berry was set reached down among the leaves of dewberry and other things, till it passed through a quartet of leaves without stalks and declared the plant to be the poisonous herb Paris. Thus does it lie about among honest fruits for the undoing of the unwary.

There is a plant in the woods that is able in the depth of winter to remind us of spicy South Sea islands, coral strands, parrot fish, and all other tropical luxuriance. It is the spurge laurel, with its long palm-like trunk at the tip of which is borne a crown of evergreen, highly polished leaves. The height of this coco-nut palm is only three or

four feet at its best, but it is a wonderful miniature. In the very early spring, even in January, there are greenish blossoms like long lilies hanging from the under side of the crown like crown imperials; but now, the coco-nuts are there, lately green, but now turned purple-black. A sad poisoner is *Daphne laureola*, as well as its cousin *D. mezereum*, a wildling of ours that has been almost exterminated in the woods so that it may set its bright pink February blossoms in ten thousand cottage gardens.

In many a place on the dry hillside stand the big green bushes of the deadly nightshade. Any one knows it at sight for a potato, though it belongs in blossom to a different tribe of the Solanaceæ. The blossom of the deadly nightshade is a bell (of a deadly, liverish purple), whereas the potato, tomato, woody nightshade, white nightshade, Duke of Argyll's tea tree, and many new ornamental creepers in our gardens have the star-like blossom with the yellow stamens pressed into a cone. The leaves of the deadly nightshade (*Atropa belladonna*) are potato-like, but rather shinier than most varieties, and their pattern as light-catchers is one of the most beautiful that we can find, every space being filled with lobes of diminishing size till very little light passes through the bush to the ground.

It is in the fruiting stage that the belladonna shows its potatoship best, the likeness to the potato ball being, except in colour, exact. The

fruit is the deadly part of this plant. Now that it is ripe its colour is the deep black that can only be attained over purple, and the juice is in fact like purple ink. One of the best names for it is Naughty Man's Cherry, the Naughty Man being, of course, the Prince of the Underworld. Dwale is another name.

This is most probably the fruit, if fruit it was, that according to Plutarch brought madness and death to many Roman soldiers when retreating from the Parthians. Says the historian :—

‘He that had eaten of it immediately lost all memory and knowledge ; but at the same time would busy himself in turning and moving every stone he met with, as if he was upon some very important pursuit. The camp was full of unhappy men bending to the ground, and thus digging up and removing stones, till at last they were carried off by a bilious vomiting, when wine, the only remedy, was not to be had.’

It was with dwale, too, that the Scots poisoned Sweno's Danes, mixing the deadly juice in the bread which they treacherously gave the invaders during a truce.

After the deadly one, the other nightshades are comparatively innocuous. At any rate, they have not poisoned so many people or so badly. The more dangerous of our two species is the black one, which some people call white. Its blossoms are white, and its berries black. It persists in coming up in the rich soil of an estab-

lished garden, and though the plant is but an annual, our utmost vigilance fails to exterminate it. Somewhere an overlooked plant will escape and swiftly set and sow its fruit before we can, in gardening parlance, 'turn round.' The berry is more enticing to children than the oblong red tomatoes of the woody nightshade or bitter sweet, probably because none of our edible berries have the latter shape.

Another annual that has a mysterious hold on the garden is the prickly pear or thorn-apple, whose generic name, *Datura*, will be found in the dictionary side by side with daturine, a very active poison extracted from its seeds. There is usually one in some corner of the garden, opening its convolvulus-like flower and setting its fruit like a prickly horse chestnut, from which it throws when ripe plenty of little black seeds. Sometimes a year goes by without its thorn-apple, but the next year it appears again. The seed, no doubt, can on occasion remain dormant over one season into the next.

I think the thorn-apple must have survived in the garden from the time when some eighteenth-century worthy cultivated it for its (rather complex) virtue as a 'simple.' Its reputation as a curer of asthma rests on a much firmer foundation than that of even such a well-lauded simple as betony, and daturine is to-day one of our best-used herbal remedies.

I do not find the thorn-apple wild anywhere

near the one or two far-scattered gardens where it comes up in spite of persecution. The henbane, on the other hand, soon gives up its hold on the old herbal garden, and flourishes in the wild state. It looks as poisonous as it is. The long bending sprays with many pairs of opposite leaves has a general resemblance to Solomon's seal, but the leaves have an angry appearance that reminds you of the nettle, bristling in all directions like the fingers of a hand that is clutching the air with fury. The blossoms, roughly like the deadly nightshade in shape, are not so purple, the lurid veins not discharging into the paler flesh of the petals, but keeping their colour like scribblings of a pen dipped in dirty blood.

It is a happy thing for us that the plant looks a villain all over. The fruit is not in the least attractive, resembling that of the thorn-apple in the fact that the seeds are quite dry. Instead of splitting, the capsule deftly scalps itself like a very neatly opened egg, showing within the perfectly packed seeds. A caterpillar of its own, coloured with the same olive-green as the ripe leaves, pushes its head into the open box and devours all the seeds it can get. It is wonderful that the scientists have not prepared an antitoxin from that caterpillar to fortify us from the very rare chance of hyoscine poisoning.

That ends the deadly nightshade—thorn-apple—henbane family, a very close association of plants all poisonous, except perhaps the tomato. The

potato is hardly an exception. We do not eat its fruit, and even the root that we do eat is not good till it is cooked. The root of the cuckoo-pint, raging with oxalic acid, is perhaps as good as the potato when it is cooked, which may even be true of the very deadly hemlock, wolf-bane, water drop-wort and others. Our subject, however, is fruits only, and it is nearly finished. The cuckoo-pint should not be dangerous, its berries being exhibited in so abnormal a grouping. On their stiff stalk coming from nowhere, for the leaves have disappeared, they remind us of something fungoid rather than vegetable. Children have, however, fallen victims to their bright colouring. It is a fiery poison, but probably its scorching of the mouth comes too late. A berry has been swallowed, and then the case is a bad one. Happier the child that tastes gingerly before eating, for he would assuredly be warned and get off with nothing worse than a swollen tongue.

We would fain finish with something more pleasant than these poisonous fruits. The whortleberries are as wholesome a family as the nightshades are dangerous. They are moorland people, the whortleberry itself being the only one that sometimes descends to lower levels and even into such suburban places as Hindhead and the almost sea-level woods round Farnham and Woking. The whortleberry, bilberry, or whinberry, seems to be in fruit in June, for its somewhat

fleshy pink blossom is of the same bottle shape, and gives a generous taste of nectar when it is held to the tongue. But in August when the 'hurts' themselves come it is good to be up on Dunkerry Beacon, Anstey Down, or anywhere in Exmoor; to put our hand under the box-like sprays and tickle the fruit off till we have twenty or a hundred of the cleanest, solidest, sweetest fruit that grows, a mouthful to swallow and good provender for the system withal. By the lanesides of moorland Somerset and Devon it grows extra large, and the traveller who has a bit of bread and butter to go with it for civilization's sake has no need of the tavern board. And the gourmet whose happy stomach is sound has never tasted anything so wealthy as farm-house bread spread with whortleberry jam and crowned with Devonshire cream.

The cranberry, red whortleberry, or cowberry is not so well known, growing in comparatively few chosen bogs. Nor is it a raw berry, but cultivate, dear reader, the love of cranberry jam. There are few better tonics, and the cranberry must have been a veritable life-saver in the days before man domesticated other fruits and vegetables, as a wholesome change from meat and corn. The fruit of the bearberry is usually left for the grouse which, in demolishing its crowded red clusters, rob the moor of its greatest September beauty. I do not leave them all the cloudberry when I come across them gleaming like red blackberries

(to whose genus they belong) in their narrow bogs on Kinder Scout or Pen-y-ghent. In Scotland they call it Avrons, and for some reason it tastes sweeter under that name.

A wild fruit of the heather tribe that science has labelled for the eye only is the arbutus, *Arbutus unedo*. Who can think of it without thinking of Killarney, where the twisted red trunks with umbrellas of foliage each of a different olive or golden-green capture the eye and the heart far more than the mere configuration of Irish lakeland?

A whiff from the drawer reminds me of one other member of the *Ericaceæ*, the dainty little winter-green. It grows only in certain beech-woods of sufficient antiquity to be worthy of so fastidious a flower. There it comes up abundantly. From a rosette of leaves, just like those of the pear, whence the plant gets its botanic name of *Pyrola*, it sends up a spike of blossom very like the lily of the valley, so that the children commonly call it summer lily of the valley. It is a tiny phial of oil of winter-green that gives me the whiff from the drawer. No cork will suppress it. When I go to handle the bees I rub a spot into the back of each hand, and no bee offers to sting. No bee of mine, not one bee in ten thousand million has seen the winter-green in blossom. What is the message of the essence of winter-green to the bee that turns its murderous hum into amiability?

OCTOBER

II

THE BROWNING OF THE LEAVES

THE yellow of autumn is running down the elms, turning them into astonishing pillars of pale fire. The big leaves of the lime take the colour of straw, and drop off almost within the course of twenty-four hours. The flame-shaped fingers of the Ampelopsis on the house wall become coloured images of the devouring element; the long fingers of the sumac are bloodily crimson; the beech has luminous leaves in every shade from yellow to scarlet; the oak is going out in a sort of sturdy scorched biscuit-colour. The trees, in short, about to shed their leaves brighten the world with a display of reds even more remarkable and varied than the greens with which they came in.

The phenomenon of the leaf-fall is not, as we instinctively imagine, easy to explain on the mere score of change of temperature. As it happens, this autumn is warmer than the summer has been, and yet the yellowing of the leaf began as early as

in other years, and is taking precisely the same course. Some say that the cooling of the soil is the determining factor, but artificial experiments in that direction have resulted not in the unpinning and the casting away of the leaves, but in their shrivelling on the plant. The cutting off of the sap through the decreased activities of the roots is an alternative or a supplementary explanation. But the branches of the sycamore we cut down last week, thus effectively cutting off the sap, will have withered leaves on them till the middle of the winter.

The shedding of its leaves by a deciduous tree is not a mere negative, but a complex and masterly process. The health of the tree is shown as much by the way in which it gets rid of its leaves before the winter as by the way it puts them on in spring. A diseased tree often shows its disease by its incapacity to get rid of its leaves in the proper way.

Let us ask what are the penalties for retaining the broad leaves of the deciduous trees. The first is the waste of vital force by evaporation in excess of suction, when the colder weather comes. Yes, or hot weather either, for we must not forget that in tropical and sub-tropical countries the approach of the dry season is preceded by a fall of the leaf, just like that which precedes the winter in our clime. A second penalty in our climate is the overweighting and breaking of the branches by the extra tons of snow that each tree would

carry if it retained its leaves. Beyond those two we need not go.

The stripping of the trees is an anticipation of the cold weather that brings those drawbacks. The tree that waits till it is cold, as here and there an oak does, will not be able to lose its leaves, but must wear them in shrivelled state till the spring. Of two trees, the one that happens to have shed its leaves when the cold comes will be the better off, and so it has come about that nearly all the broad-leaved trees have developed the habit of unrobing slowly during the fine days of autumn.

If it were merely a matter of throwing the leaves off, what an immense amount of capital the trees would lose, and how much richer would the leaf-mould be. Nature is not so spendthrift as all that. Just as the tadpole, instead of shedding its tail as some suppose, slowly absorbs it into its body for the nutriment of other parts, so the trees suck their leaves dry of the starches and sugars before throwing away the empty skeletons.

There is an interesting summer experiment to show the chemical action of the leaf-juices. Blot out the light from a portion of the leaf by pinning a disk of champagne cork to it. Leave it in the open air for a few days (the leaf being still on its plant and growing as before). Now bleach the leaf by first dipping it in boiling water and then soaking for a day or two in methylated spirits. All but the starch will have gone out, and you can tell where the starch is by dipping it in iodine

solution. Lo, the circle that has been covered with the cork remains white, and only the rest goes black. The circle finding itself in the dark ceased to secrete starch, and sent in what it had already made to the midrib, and thence to the main plant for its common needs.

So in the autumn, and let who will put it down to mere reflex action in response to failing light. The days are as long, the sun as near, the air and soil as warm as in April, when every leaf was hard at work making green. But something makes the trees carry out a policy, the utility of which will be manifest some weeks hence. Every possible grain of starch is converted by the vegetable saliva into sugar and carried back into the twigs, the trunk, or even the roots. When the last available grain has gone in, a barricade is set up between twig and leaf, a division neatly sealed with cork made between them, and the next breeze casts the empty leaf down. In the case of compound leaves, like those of the chestnut and the Virginia creeper, each leaflet is thus cut off, and a little later, the convoy having passed the leaf-stalk, that, too, is cut off and thrown away.

But why, when the leaves are empty, are they not white as in the case of our summer experiment? We bleached that summer leaf by taking away its chlorophyl or green starch-collecting matter. In the autumn leaf, the dregs of the chlorophyl remain as detached units cut off from the retreat hanging along the veins and the sides of the cells

that have been mainly drained. However, take what you will from green, either green or yellow or blue remains. You can scarcely make it red, such as the flaming crimson of the sumac or the violet glow of the dogwood.

Ruskin, speaking to the students of Tunbridge Wells of the red colour in nature, said :—

‘Iron stains the great earth wheresoever you can see it, far and wide—it is the colouring substance appointed to colour the globe for the sight, as well as to subdue it to the service of man. You have just seen your hills covered with snow, have enjoyed, at first, the contrast of their fair white with the dark blocks of pine woods; but have you ever considered how you would like them always white—not pure white, but dirty white—the white of thaw with all the chill of snow in it, but none of its brightness? That is what the colour of the earth would be without its iron; that would be its colour, nor here or there only, but in all places, and at all times.

Ruskin then proceeded to tell his hearers of some of the ways in which the earth was coloured by iron—the gravel walks, the warm colour of the common, the earth of the ploughed field, the golden colour of the seashore.

Is it not possible that he might have added the glory of the autumn beech to the credit of the ubiquitous rusty iron? We only know that it has been shown that chlorophyl, the green light-splitting, carbon-elaborating substance of the leaf,

cannot exist without iron. May it not be then that the blaze of autumn is caused by the rusting of millions and millions of fairy girders and stays in the scaffolding of the leaves from which all the vital green and their products have been withdrawn before the trees finally cast them away ?

See how the autumn tries to woo the trees into imprudent green with bursts of sunshine brighter and more balmy than many of the months of summer, but without breaking through the useful habit that a winter now and then proves to be for the best. Every one has noticed how, after September and October have marked the running down of the year, a second summer intervenes before the portals of winter are reached. It has been variously called St. Martin's Summer, St. Martin's Day being the 11th of November ; All Saints' Summer, for the 1st of November ; or St. Luke's Little Summer, which brings it back to the 18th of October.

The ordinary man does not trouble himself to find a reason for this quickening of summer after autumn has set in. It would be interesting to try him and see if he could, by guessing, hit upon the leading paradox of our solar system. Every one knows that Great Britain turns away from the sun at midsummer, that by Christmas it has reached the limit of its rudeness, and begins to turn back towards the full light of next midsummer. Now, from 25th October to Christmas is two months, and from Christmas to 25th February is

also two months. Why is it that October is so much brighter and warmer than February? The answer is easy. Because October has the warm months of August and September behind it, while February follows a hundred and twenty short days and long cold nights. The earth chills slowly and warms up again slowly, so that the coldest days follow midwinter day and the warmest days come after midsummer day.

That is one reason why October is not so much colder than September, nor November so much colder than October as the days are shorter. One explanation of so unpractical a problem is usually held sufficient, and so the practical man never tumbles on the fact that the sun is actually nearer the earth at Christmas than at midsummer. Some of the brilliance of our autumn sun at mid-day is accounted for by the fact that he is a good million miles nearer than he was at midsummer. He will have advanced towards us another million and a half miles by Christmas. It is only as much as though a man sitting at the end of a thirty-foot drawing-room should be asked to come one foot nearer the fire, turning his chair at the same time so that the blaze was rather less direct.

It may seem a small thing, but counts for more in the case of a very fierce fire like the sun than where a mild air-warming coal fire is concerned. Another point in favour of the autumn sun is that we are advancing towards it all the time, and thus intercepting its rays at a greater velocity

than if we were stationary or retreating. The phenomenon is like the sound of a coming train which increases its roar tremendously till it has come abreast, then falls away quite suddenly as the sound becomes a receding one.

The wild things mostly resist the importunities of the autumn sun, though, as our gardens testify, a very little selection is needed to produce crops of flowers in the summer of St. Martin. The wild white bush-rose, *Rosa arvensis*, now and then puts out a blossom in October or November all among its red hips. Such bushes as these are the fore-runners of our cultivated roses that, not content with overshadowing all other flowers in June, give us new blossoms to rival the phlox and the African marigold in their own seasons.

When the cold nights and the rotting rain keep off we can find plenty of October violets and primroses with stray champions, pale pink images of the summer ones, dandelions, buttercups, and others breaking rank or rather breaking bivouac, as individuals will in the best organized of armies. A pear tree occasionally breaks into bloom amid the ripe fruit, and I have seen a horse chestnut come out in November as full of fans and blossom-buds as when they unglue in spring.

These, however, are manifest exceptions. Though it may be true that the growing leaf-bud pushes off the old red leaf, yet when that is accomplished, the pushing movement holds. The autumn sun may run polishing up and down

the bare branches, but the buds hold themselves for the winter that by hereditary experience they know must intervene before the spring message, delivered often in far colder weather, tells them that it is indeed time to open. Even the hazel catkins that are half-sized before the leaves have fallen very rarely open before the turn of the year, immediately after which they can be seen swinging as 'lambs' tails,' though the twigs be rimed with frost.

Her wild children that run about, Nature catches one by one and forces to take the sleep that is good and safe for them. The wasp and the late butterfly remain at the banquet of St. Martin's Summer as long as they can. By day they feast on the ivy blossoms or the more generous artificial nectaries of the garden. Each night they find some cranny to shelter them from the cold, but their sleep is apt to get longer and longer, their hour of rising later and later each day, till the long sleep of winter overtakes them. We say lightly of our own dozes of eight hours apiece, that sleep is mimic death. How much more then is death imitated by the sleep of the brimstone butterfly, which keeps it for months so motionless that not even the microscope can detect any outward sign of life, or of the wasp, whose limbs are so brittle that they will break but never bend, till life reinvades them, oils them, and sets them in new motion.

The butterflies that hibernate in our country

are all or nearly all of the *Vanessidæ*, that is peacock, red admiral, painted lady, large and small tortoiseshell, and probably the Camberwell beauty, and outside the *Vanessidæ* the brimstone and the comma. Strange that the sleep habit should belong only to so well defined a group, for the comma and the brimstone are so like the *Vanessidæ* that one or either is usually included by any one bold enough to make an original classification. I cannot help thinking that the fact that they hibernate ought to weigh down the balance in their favour, and secure them admission to the noble class of the purple emperor.

The quiet man will see just now at any time of the day ghostly shapes at work in the hazel thickets, in the midst of quickset hedges, in the stackyards and in the corn stubbles. Sometimes it is a bushy-tailed dormouse, sometimes a white-vested wood mouse, but much more often a short-tailed vole. They are easily known apart, mainly from the characteristics just named. The dormouse is the only one that has the tail clothed with hair, and the tail of the vole is as though that of a field mouse had been cut down by a good half. Furthermore, the vole has a wide face with the eyes set close together, after the manner of a caricatured Boer farmer, while the mice have large and brilliant eyes set at the outer angle of the face, so that they can look well round at any one who tries to steal up behind. The vole must turn its head before it can anything like look over

its shoulder. That is perhaps a reason why it lives in communities,—or perhaps the result. ‘Father,’ asked the inquiring youngster, ‘why does the sole have its eyes both on one side of its head?’ ‘Because, my son, it lives on the bottom of the sea, and so has no use for eyes on the lower side of its head.’ ‘And, father, why does it live on the bottom of the sea?’ ‘Because both its eyes are on the upper part of its head.’

All these ghostly shapes of the hedgerows are busy gathering their hoards for the winter. Such a provision on the part of the dormouse seems uncalled for and scarcely defensible. If it has the faculty of sleeping through the cold, what need is there to lay up a store? Perhaps this fat gentleman with two strings to his bow is in a state of transition from the storing habit to the hibernating habit. He stores in obedience to an instinct a million years old which the sleeping habit ought to have removed. And because he cannot get rid of the habit of taking a nibble in the middle of the night he cannot become so perfect a sleeper as the bear, who goes to bed fat, and never moves until it is time to get up in spring.

As for the vole and the field mouse, or wood mouse, they are awake all the winter. There can be little real work for old farmer Vole to do in his snug underground retreat with his well-stocked granary beside him. Yet the snow is never down many hours before his footsteps are

plentifully seen in it, and he has driven tunnels under its crust into which we see him hastily withdrawing as we pass by. The amount of wheat, beech nuts, haws, nuts, or other wild or cultured produce that he will store away has to be seen to be realized. Sometimes he annexes the labour of some one else, a whole potato bury in the rickyard, for example, where he makes himself very much at home, retreating further and further among his stores as the human proprietor comes and removes those of the front row.

That little rascal the squirrel is busy among the red leaves, nibbling here, scratching there, and not working so hard as is generally supposed at putting up a winter store. If there are plenty of nuts, however, you may find a heap of them hereafter in some chest of natural wood in the hedge-row. In the hollow stump of an ash we found last spring nearly a peck of nuts, when the squirrel had gone to his hoard and forgotten to shut the door.

We can find now or in winter the shells of nuts from which the wild people have extracted the kernels. The nut with a large and jagged hole in it has been hammered open by the nuthatch. That with a rather smaller and much neater round hole in it has been opened by wood mouse or dormouse. The one that has been split in halves is from the squirrel's board. Put the halves together, and you will find that he first scraped away the angle at the forward end of the nut,

then inserted his tooth in the faint crack that he had uncovered, and jerked the two shells apart. But make certain that it was indeed the squirrel that did this, for because it is the best known way of opening a nut, man has copied it and opens his nuts with a jack knife in the very same way. It is easy to see whether the opening has been effected with the curved instrument of the squirrel or with the straight edge of the jack knife.

NOVEMBER

I

A WALK ROUND THE ZOO

EVERY year the Zoo makes some notable advance in the direction of showing us the animal as he really is. Birds instead of perching for ever in one position in wired boxes are put in mixed companies in large and lofty open-air aviaries where they can fly aloft, build their nests in the various sites suited to the species, and carry on a comparatively free avine life. Sea-lions can stretch their limbs and give us a good exhibition of their marvellous swimming powers in something that really looks like a lake. The polar bears have quite recently moved into quarters that are to the old ones as a field is to a back yard.

Nothing is more typical of the new spirit at the Zoo than the complete enlarging of dozens of American squirrels, as well as some exotic doves. They run about the gardens now with complete confidence, not to say impudence, joining our alfresco lunch parties without invitation, and making us feel that we really are in a garden

of beasts and not an animal prison. But the squirrels swarm still more thickly in the Broad Walk and all over Regent's Park, to the delight of people far more likely to feed them than they are in the gardens where monkeys and many others compete for attention.

The point of approach to the Zoo matters a good deal, and since the squirrels came there we like to get there by the Bakerloo railway, and walk from Regent's Park Station by the Broad Walk. When one has a bag of nuts or a paper bag that looks as though it might contain nuts, the tameness of the squirrels becomes positively startling. They think nothing of running up the leg, on to the forearm, and poking their heads right into the bag to see what it really does hold. They are usually disappointed if they find there apples instead of nuts. They do not quite like to sit there and nibble. They will stay long enough to push the first nut well into the back of the mouth, so that they can then take another and run off with two at once; but unless you provide it in slices they do not attempt to negotiate an apple.

The people who attend the free Zoo in Regent's Park are enormously generous to the squirrels. There are some who bring up daily basketfuls of food. You can hardly ever give the frisky little animals so much that they will cease to take more. They usually take it a little way off, dig a little hole, and hide it.

I do not know one of these squirrels that has anything like a cache into which it puts a quantity of food, though it is likely that the lucky possessors of hollow limbs for nesting in use them as stores in autumn. It seems as though every inch of ground contained its nut. Often a squirrel that you fondly hoped was coming to your bag will dig just where it happens to be, fish up a nut of its own, crack it and eat it. I should think that by and by mice or voles will increase under the trees where the squirrels are, and then we shall need owls to keep them in check. The squirrels already seem about as numerous as they ought to be. I hope some of their numbers will be drafted to our other London parks.

From the vestibule of squirreldom we enter the Zoo itself by the south gate. We probably find if we look for it a tree kangaroo coiled up asleep in the sun on the roof of the ticket-lodge. He, too, comes from the squirrel's yard in the Zoo, daily climbing out and coming just as far as the entrance gate, as if to show that he may come out into the park if he likes. The squirrels were purposely let out, but the woolly tree kangaroo is a truant that has found its way over the supposed unclimbable railings.

Immediately on our left are the cattle sheds. The yards are in front, and a very large percentage of visitors never enter the sheds. Here, however, are to be seen calves of rare species long before they go out into the yards. The British wild

cattle give increase nearly every year, and every calf dropped strengthens the opinion of those who say that it is not a true wild breed, but an artificial one, for whereas the herd-masters of Chillingham and Chartley will have it that the colour of the breed is white, the calves at the Zoo are nearly always black.

Near the hump-backed American bison with blood-shot eyes is another animal with a far more peaceable cast of countenance, but a far more implacable temper. The abiding rage of the African dwarf buffalo is the most terrible thing the Zoo has to show. We can understand the frenzy of a newly caged beast. It is like the rage of a newly caught criminal. Anger, says the poet, is short madness, but what is the anger that lasts unabated for months and years? The dwarf buffalo, more than ten years a prisoner, rages round its pen apparently every minute of every hour of every day. They dare not put it in the yard. Once they tried the experiment, and the first thing it did was to charge furiously at some one it saw through the railings, nearly knocking down even that ponderous structure. The blind, indomitable rage of the species seems to have reacted on the organism by enlarging the base of the horns till they form one solid boss of battering-ram. Sharp horns are not a sign of such inveterate anger. The sharp-horned of our domestic breeds are commonly good natured; if a little fiery when roused, at least soon quiet

again, whereas the hornless breeds often attack one another with their round but knobby foreheads. The hunter of big game in Africa puts this smooth-browed buffalo almost or quite at the top of the list of those most dangerous to encounter.

The snakes and the lions are equidistant from the other end of the cattle sheds. The snake house is almost exciting when there are some rattlesnakes newly arrived. They have not yet learnt the mysteries of glass. If you go at all near them they coil themselves into figures of eight, poise their venomous heads at you, ever bending the catapult more tensely, while behind, the rattle quivers till it becomes invisible by the rapidity of its vibration. You scarcely hear the rattle through the glass, and as you bend forward to do so you seem to fall under the mesmerism of the snake. It is with an effort that you tear yourself away, though you are at the same time in a cold sweat at the horror of its deathly power.

You do not find the Indian cobra giving way to paroxysms like that. The American defends his snakes by saying that they at any rate give honest warning of their belligerency. They are not sneaks like the assassin snakes of India, polished fiends that would as soon kill you as not, whereas the rattlesnake only does so if you persist in disregarding his warning.

But is the rattle of this viper primarily an instrument of warning? My own opinion is that

it is a call designed to imitate the shrilling of a grasshopper. The bird or the mouse that is fated to become the rattlesnake's dinner comes to it because it thinks it hears a grasshopper. The snake sees it coming, and its tail vibrates with eagerness for the strike, just as the cat's tail twitches when she is about to make her spring; but in the case of the snake, the more the tail twitches the nearer the bird comes. Afterwards, the snake sets its rattle going whenever it is about to strike anything, whether to eat or by way of self-defence.

Sometimes there is shown at the Zoo a small snake of the same tribe, but not the same genus as the rattler, which has an equipment of a slightly different kind. As in the rattler, the tail appendage is very different from the next vertebræ. There is a rattle that does not rattle. It is cream or bone-white, and it wriggles just like a white maggot that is for ever crawling out of the grass in which the reptile is coiled, without getting entirely out. It has the flowing movement that we can give to a skipping-rope when one end is free and the other held in the hand. It is in appearance and in motion precisely like a very appetizing grub, whiter than a meal-worm and about as large as a good fat one. If I were a bird, it is perfectly certain that I should want that grub badly, and more than likely that when I went to get it the owner of the tail would get me.

We have stayed with the horrid beasts long

enough. We pass next to the wolves, a neglected section which signifies its indignation at neglect by frequent combined howlings. It requires a little imagination to appreciate the wolves. They look amiable and harmless enough with their doggy faces and gently retroussé noses as they trot rather prettily round their cages. Imagination has been helped somewhat by the christening of the finest pair of timber wolves Lobo and Blanca, after the famous heroes of Mr. Thompson Seton. Somehow it is the rough, long hair of the back near the shoulder that makes me see in the captive wolf all at once a bolt of terror with jaws like a steel trap, as those who have fought wild wolves declare they are. When I look at that roughly parted coarse hair on the shoulder, I can see the muscles play under it as the beast hunches itself in constantly accelerated speed and hurls itself open-jawed on its prey.

In the lion house hard by is a swifter animal than the wolf, the cheetah. It is a perfect caricature of speed—the head no bigger than the neck, the forearm inordinately long and straight, a hump above the clavicle as though when the animal was extended that portion of the leg would telescope out and add further to the length of stride. There is not nearly room for the cheetah to stretch its limbs. It stands and looks out, with its queer baby face marked with big black tear-stains down the side of its nose, waiting for feeding-time. When its joint is pushed through the bars

its long piston-like legs claw at it, like the spokes of a bicycle wheel, so rapidly that you can scarcely see them move, and all in a tremble of balked agility it carries off the food it should have caught at forty miles an hour—only to gnaw it like a cat in the back of its cage.

I like the cheetah, the leopards, the puma, and the tigers better than the king of beasts whose house they share. The young lions point a curious moral, if we can read it. Cubs that are bred in the Zoo are fierce and intractable, while those that are caught young in the forest are far more amiable. It is as though all the bitter years of walking up and down, up and down behind bars to be stared at by cruel and stupid bipeds, had turned sour the milk of leonine kindness, and infected the babes with more than the expressed indignation of the parents. Tom, Dick and Harry, three fine males in the Zoo, are forest-bred lions. It is true that Dick badly mauled a too familiar visitor a few years ago, and that there is some other little matter against Harry, but the keeper declares that the lions were more sinned against than sinning. Dick is now a married man. It is he and his wife that inhabit the first den on the lion side after you pass the keeper's chair.

Behind the keeper's chair a passage runs to the back. Hence comes the meat at feeding-time, and this way will the keeper lead wishful visitors to the regions behind the dens where are sometimes interesting pets. A young lion now nearly

half grown still takes an occasional gambol in the passage or the yard. You can go home and say you have patted him or even been knocked down by him. You can, on the one hand, stroke a puma, and, on the other, look through a little hole at the fiercest beast in the Zoo, a black jaguar that spits at you like all possessed, to show you that nothing shall ever tame it.

Best of all tigers are the pair of Siberians always to be seen, one or both, on the roof of their shed in the yard at the back of the lions. Their hair is rougher and longer than that of the Bengal tiger. The unrecognized reason why the Londoner likes them is that the Chinese have painted their tiger far better than the Indians have painted theirs. When you have seen the Siberian tiger in Chinese water-colour or needlework at the British Museum and also in the flesh at the Zoo, you have a composite idea of prehistoric magnificence and fleshly grace far richer than can be inculcated by the tigers of Indian art and reality. Our own English sabre-toothed tiger must have been about such another in many respects as his Hairiness of Siberia.

The bears fare uncommonly well now, especially those half-grown ones that occupy the yard that once belonged to the polar bears. A few years ago we gave them sugar, only when the keeper was not looking, but now the keepers have become reconciled to this, and every one takes a bag of loaf sugar for the bears. The bear in the pit

will no longer climb his pole for a mere piece of sugar. He sits up or stands up or sprawls with upturned eyes till either you are overcome by his wiles or drop the morsel by accident. Only after he has long gazed at an orange and is convinced that he can get it no other way will he climb. If he catches the orange up there he champs it, and spits out only the pips on regaining terra firma. But if he first takes the orange on the floor it is marvellous to see how neatly he slits the peel with his claws, picks out the pips, and eats only the sweet pulp.

The monkey house is not nearly so terrible a place as it was. The excitement of seeing some one else's bonnet snatched off and made the material of a simian holiday is now denied to us by the strait-laced authorities. The wire-netting is too close to permit a monkey to catch hold of the most careless person's hair. It was in the old days an illuminating lesson in animal intelligence (or the lack of it) to see some valiant young man rescue his adored whose hair had been caught, *by pulling hard at her arm*. Surely she could take that method of extrication herself. Those little monkey hands are not lion's claws, and can be caught and unlocked as easily as baby's fingers. Their owners know it, and rarely suffer you to touch them.

Out in the gardens not many paces away from the monkey house is the only baby simian born in the Zoo. The old Japanese apes and their

offspring live together in the open-air cage where the young one was born about six years ago. They are a highly interesting, if not engaging family. She is susceptible to ridicule as well as secretly jealous of the attention lavished on Young Hopeful, and she will scold and chatter at you like an old Irish washerwoman. Father is getting past work. I believe he never climbs the wire-netting now. He is rheumatically and silent, but if his sometimes thoughtless visitors urge him too much he flies into a rage more terrible than that of his wife, and then Young Hopeful joins in with all sorts of naughty swear words that he really should not have picked up at such a tender age.

Young Hopeful is scarcely nearer to the stature of his parents than a child of five years old of our own species. Like them he has a red face. He is clad in rather hairy khaki, the trousers of which appear decidedly baggy. He is always aloft, where it fatigues his parents to follow, and from his point of vantage he stretches his arms through the wire, almost to the shoulder. You hand to him your closed hand with a bit of apple in the palm. He seizes a finger, draws the hand nearer, then unlocks finger after finger till he can get the food. As he eats it he dances rapidly in a way that plainly signifies, 'Ain't I a clever fellow, and didn't I do that beautifully?'

The inhabitants of the Zoo learn many ways of extracting food from the visitors. Bears find that there is a bar of their cage that jangles, and this

they ring deliberately in order to attract attention. Some of the monkeys in the side cages rattle their bars for the same purpose, and one whines for alms almost with words. You have only to hold up a piece of sugar to one of the elephants and he will gravely pirouette for it. A wave of the arm sends him round the other way, and then he puts out his trunk and claims his wage. Some say that the lower animals have no reason. I can only say that the acts by which we recognize reason in a child are not more striking.

There are many interesting creatures that you do not see though you go round the Zoo many times. The beaver is almost always within his igloo, and that is a great pity, for there is not a more astonishing instance of adaptation that his broad mason's trowel of a tail. There are two badgers from Cumberland of a most unusual colour, the stripes being in sandy yellow and white instead of the usual black. We see neither them nor the normally coloured specimens unless we ask the keeper to turn them out from their beds for a minute. Once a keeper did the same kind turn with a Tasmanian wolf. Out rushed the gaunt creature, snarling and snapping at having to face daylight. We felt as though we were in the presence of the prehistoric life. It is a tiger with wolf's jaws, a creature compounded of the ferocious and the grotesque that might have been invented by some carver of gargoyles instead of created by the same Power that made the squirrel.

I can vouch for the child who said when going home in the train from the Zoo, 'Mother, what a job God must have had to make an elephant.' There is that other story of the child who thought the making of grasshoppers must have been 'niggling work.' What, we wonder, would those two have said if they had seen the Tasmanian wolf?

We will not go home just yet. Some of our beasts are of twilight habit, and the best time to see them is rather late on a winter afternoon. Then will the kinkajou come forth from its possum-like slumber and peer about and even climb about its cage. Then will that even more interesting animal, the aye-aye, timidly show itself, and exhibit the marvellous adaptation of its special finger by extracting its supper from a marrow bone. Marrow is not a bad substitute for the wood-boring insects which it extracts with its astonishingly specialized finger from their auger-holes in the trees of Madagascar. There would be many other interesting things to see at the Zoo if one could stay after the gardens are closed on the departing public. What an experience it would be to spend the night there when lions, wolves, owls, and other fearsome and uncanny night marauders really feel their pristine instincts!

NOVEMBER

II

THE MYSTERIOUS FUNGUS

I N the twilight of the year, when all the flowers have had their day, come the fungi, a sort of elephantine caricature of the flowers, coloured like them in an ascending scale of brilliance, attracting insects and compelling them, as the flowers do, to carry away the instruments of fructification, yet differing from the flowers as the slugs that feed on them differ from the caterpillars.

The sweetness of the white clover attracts the honey-bee, as clean, industrious and cheery as the flower is sweet. The radiance of the golden rod is fitted to the magnificence of the red admiral, which hastens to spread its black-and-scarlet wings on its stippled gold. But the odour of the stinkhorn is that of rotten eggs, and the insects that come to it are the noisome carrion flies. Give it the politer name of 'wood witch,' and when you scent its aroma, grateful even to human nostrils for the associations of former autumns,

trace it through the wood till you find the fungus as the flies find it.

We may have far to go, for the scent of the wood witch carries far through the wood. But we come at length to the place where it stands and shouts its message to the flies. There are the globular 'buttons' of growing stinkhorns, which we like to slice in two for the admiration of the black and white marble of the internal economy, and beside them and far above them stands the stinkhorn of the day, its cap one mass of flies feeding on its stickiness. They rise with a roar and allow us to see how the cap has been pitted with their devourings, adding the appearance of smallpox to the uncleanness of its stench. And the feet of the flies, ubiquitous wanderers and trampers over everything, are clogged with the stinkhorn's gum, and the spores mixed in it for transportation.

The wood has far more beautiful fungi than the stinkhorn to show us. Russulas in pink and mauve and purple, verdigris agaric in sulphuric green, honey-yellow *fascicularis*, and slimy black ink mushrooms and many others have pushed their way through the foot-deep carpet of fallen leaves. Always near some birch, the prince of poison toadstools, the fly agaric, lifts its bright tomato-coloured cap to which little scabs of white skin stick to make white dots upon it. Huge funnel-shaped 'cankers' full of white juice, and therefore called *lactarius*, have thrust up

among the bracken. Others of equal size are for a long time undiscovered because of their perfect likeness to the dead leaves of an oozing bank on which they grow. Then we find that every other apparent leaf is a leaf-shaped and leaf-coloured fungus.

Aloft, we have equal luxuriance. A dead beech is white to the topmost twigs with a shiny moist thing in mother-of-pearl that we are informed is edible. High up in an oak there are beef-steak mushrooms, each of them weighing two or three pounds, and, as some think, good as beef-steak itself to eat. A hornbeam has gushed out into forty or fifty big brown things like penny buns, as closely laid one over the other as buns in a dish, and so highly finished according to bun fancy as to be each of them decorated with an excellent imitation of icing. Another tree has fungi of elephant colour—a hue at once beautifully soft, of great richness, and as compelling of attention as even the gaudy fly agaric.

From the grass of the open meadow spring fungi of quite a new shape. They are thick and fleshy twigs with the texture of wax candles, some yellow and some white. Others are branched and compel the name of staghorn, which has universally been applied to them.

In the natural history picture book at home there is a fungus something like these candle fungi growing from the head of a New Zealand caterpillar, and the description beneath gives the impression that to grow into a fungus is about as

natural to that particular kind of caterpillar as for an ordinary 'woolly bear' to grow into a chrysalis. Lately, a friend brought home from New Zealand one of these caterpillars in the flesh, with the fungus growing from its nose. Perhaps we should say 'in the wood' rather than 'in the flesh,' for both caterpillar and fungus have turned to a substance almost as hard as oak.

Most of us imagine that these wonderful things only happen in far off countries, in the tropics or at the antipodes, whither we shall never have the luck to go and see them. But, as a matter of fact, several of our candle fungi have bred in the live bodies of caterpillars, and are now fruiting from the dead chrysalis that, as a caterpillar, buried itself beneath the moss in the fond hope of becoming a moth. And the caterpillars are of the same genus as those New Zealand ones, and the fungi of the same genus as the New Zealand disease.

There is no place that we must neglect to look into in our search for the infinite autumn beauties of the fungi. The hollow branch of a beech tree flashes fire as we pass, and when we look in we see a fairy grotto such as has never been staged outside fairydom itself. The ceiling is beautifully sculptured with the gills of a few large red-brown fungi which have scattered their spores of brightest chloride of gold throughout what must surely be a fairy's drawing-room. First, a spider had spun its web diagonally from floor to ceiling, and this the red gold has frosted into a most wonderful

chiffon. On the floor, a curled beech leaf rests lightly on its keel. We know how brightly the autumn beech leaf shines. It seems to have an inner light of its own, a brilliance to which no other leaf attains. But this leaf in the fairy's grotto shines three times as brilliantly as that, because of the myriad grains of glowing chloride of gold that have been sprinkled upon it.

Even when night comes we may not lose all the beauty of the fungi, but may discover a new beauty even greater than that of day. The luminous agarics belong entirely to other countries, Greece, Brazil, and the lands of the fire-fly. But in our woods a stump of dead tree will sometimes deceive us with a belief that we have found a glow-worm, and sometimes a whole log has been found of such luminosity that it was easy to tell the time by any part of it, the whole log appearing like a pillar of fire.

Nothing astonishes us more or is so typically associated with the fungus as the rapidity with which it grows. The plant that sends up almost in a day a fully organized blossom prepared for the visits of insects and the setting of seed is found on inspection to have first equipped itself with very solid stores to which the flower bears the proper proportion of product to producer. But if we uproot the giant puff-ball that has sprung up in the field in a single night we find nothing of the kind to account for it. The globe of white flesh bigger than a football is gathered to a point

where it rests on the ground, and below that there is nothing to be seen. It is as though the colt's-foot root should, instead of merely sending up a blossom, transform itself into a blossom many times bigger than itself, move from its place under the earth and stand on the roots of the grass.

Patient search through the earth beneath the fungus will reveal a little more of the cause of the effect, but without diminishing our wonder. The floor of the wood, hollow with an accumulation of loose dead leaves, has here and there running in every direction minute white threads not unlike the spinings of a spider. They run through that precarious soil, leaping from leaf to leaf, weaving bridges across chasms, linking up communications as sketchily as pencil marks on a rough-grained paper. At length, the organization of the mycelium, as the white threads are termed, comes to a head at some point the precise situation of which no mycologist could have predicted, and a bulbous growth begins to form there. Along the tiny threads, over the bridges, across the chasms, come the stores of their tiny spinning. The bulb grows apace, pushes the pavement of the wood aside, thrusts out into the day, takes on a vivid colour, opens its umbrella and displays beneath it a most marvellously adapted and specialized apparatus, the familiar 'gills' of the mushroom and other agarics packed with millions of tiny spores each capable of continuing the fungoid race.

Not only do the cells pour the food along, but

they themselves are food. The last train takes up the rails behind it, and they, too, are poured into the bulbous mass at headquarters. Writing of the parasol fungus that commonly decorates our hotbeds, Kerner says that it is elaborated, fructifies, and passes to deliquescence all in the space of twenty-four hours. He adds that the fruit must be many times the weight of the mycelium that produces it. But how many times more elaborate. The perfect bee does not weigh nearly so much as the grub from which it grows, nor that grub so much as the food it lived upon. If the fungus weighs only three times as much as the mycelium, it may be said to represent it in complexity many more times than that.

The mystery of the fungus is exceedingly old. Not so old as the flowers, for all the fungi live on dead organic matter, mostly vegetable. Evidence of their antiquity need not depend on the geological records, although these soft and highly perishable bodies have had their monuments carved in the rocks, and the proverbial fly in amber has been found to be infected with the threads of such a mycelium as destroys them in millions every autumn now. The enormous number of species, genera, tribes, and orders into which the toadstools, moulds, ferments, and others naturally divide themselves are evidence just as unequivocal of the millions of years that they have existed on the planet.

Considering how much the gourmets enjoy an

edible fungus, it is astonishing how rare is the knowledge of the edible from the poisonous kinds. In England, the choice of the cook falls on three species of agaric, all of them with flesh-coloured gills. Gills of any other hue, and especially white, are accounted signs of virulent poison. On the Continent, on the other hand, the white-gilled fungi are esteemed edible, and those with coloured gills regarded with suspicion until they have with difficulty proved their worth.

The Englishman could not make a safer extension in mycophagy than by cooking a good large puff-ball. There are puff-balls now in the Home Close measuring thirty inches in girth, and out-bulking though not out-weighting a good vegetable marrow. The puff-ball is that brownish bladder with a casual rip in it from which, when you press it with the foot, brown smoke issues in an apparently inexhaustible stream, every grain of the smoke being a spore thus set free for colonization wherever it may settle. No one would dream of eating a puff-ball in that stage. It must be taken young, when the whole big globe cut across is composed of white flesh. Removing the outer skin you cut the body into suitably sized pieces, and put them in a covered pie-dish to stew gently in the oven.

There are many other even noisome-looking toadstools, not merely good to eat, but surpassing in delicacy of flavour the much-vaunted mushroom. The fairy-ring champignon has a

name more famous to the cosmopolitan gourmet than that of 'mushroom.' Another favourite that is slowly extending its appeal is the edible chantarelle. There are two chantarelles, *Cantharellus cibarius* and *C. aurantiacus*, of which the former is certainly edible and the latter doubtful. When fully open they are like umbrellas blown inside-out, and the gills, not content with joining the stem inside the crown as in the mushroom, run down the stalk. The colour of the edible species is egg-yellow, that of the other commonly orange. The gills of the right kind are swollen like veins, not so numerous as in *aurantiacus* and meandering. In a few hours after being picked this fungus develops a scent like that of apricots. *Cibarius* grows mostly under beech trees, *aurantiacus* mostly under pine.

Quite a different kind of edible fungus is the beef-steak. It juts from the trunk of an oak, looking something like an ox tongue, with pinkish under-side furnished with pin-holes instead of gills for the carriage of the spores. When broken open it is seen to be full of a red juice like the gravy of raw beef. Another of these polyspore fungi, of which the Italians in London gather vast quantities in Epping Forest, is the edible *boletus*, a fungus with a cap of brown velvet and the under-side yellow like a very porous sponge cake. But besides *B. edulis* there are poisonous species, *piperatus*, *sathanas*, and others. They are mostly known by their swollen stems, their generally

poisonous look, the fact that when bruised they develop a blue stain, and, if we should be so curious as to taste one, by their fiery flavour.

The sampling of fungi is a perilous quest. It seems to be fairly established that even the true 'mushroom' has poisoned people. Probably when the spores are ripe the fungus is more poisonous, and the reproductive principle defies the action of the frying-pan. On the other hand, it is possible and indeed seems probable that even the poisonous species would become harmless when quite properly cooked, just as arrowroot and the wild arum are very well known to do. In Siberia they use the exceedingly poisonous fly agaric as the basis of an alcoholic drink, first drying the fungus, and afterwards steeping it in whortleberry juice.

After all, what do we gain in return for the risk, when we try to add a new fungus to the bill of fare? It does not seem likely that these subterranean growths, owing no allegiance to the sun, possessing no chlorophyl, the essential means of converting sweet fresh air into food, can give us anything really nourishing or wholesome. The decadents of Rome said, 'Keep your corn, O Libya, unyoke your oxen, provided only you send us mushrooms.' Undoubtedly, however, the dead leaves of autumn were better converted into wheat than into the best mushroom that ever grew.

The country people commonly call those fungi

that grow on tree trunks, and end by turning into wood as hard as that of the host, cankers. The likeness of this word to our most dread disease has led even some responsible scientists to suggest that cancer may grow first on decaying trees and then infect the human body. Certainly, fungi (assuming for a moment that cancer is one) are most resourceful colonizers. Many are known to live at will on hosts of totally different kind, such as the wheat smut on the barberry, while waiting for a crop of wheat to devastate. No doubt there are very many others with the same habit not yet discovered. A wounded larch, the only one in the county, is almost certain to attract the *peziza* that is the larch's especial pest. It comes from the air, say the wise men, thinking that because it is unseen it must be a case of spontaneous generation. So they said of plague and smallpox not many years ago, but we know better to-day.

Conceivably, the larch may escape the *peziza*, but never will the apple escape the fungus that turns its juice into cider, or the barley grain its own ferment, or the bit of bread thrown out its semblance of blood, or the plate of jam its crop of white whiskers. The spores must have been waiting somewhere for the opportunity of getting each one its respective food.

A little is known of the life history of some of the worst of the minute fungi. Ergot of rye, that now and then infects whole races of those who

eat that grain with leprosy and madness, has one of the most astonishing. The spores are upon the grain when it is sown. There is no trace of them or of the mycelium in the leaf or the root or the stem during all the months that the plant is growing. You would think that the sap and the other digestive and chemical processes would have converted them again and again into the healthy life of the plant. But when the time of fruiting comes again, there is the ergot fructifying in the ear in long horn-like spikes for all men to see.

Some of the fungi live uncommonly hard. They cannot, like the plants, convert inorganic substances such as carbonic acid gas into food. Chlorophyl alone can do that, and it is apparent that the fungi have not that any more than we ourselves. They have almost as good a claim in this respect to be called animals as plants. There is plenty of organic food for the toadstools in the floor of the wood, in the decaying bulk of the tree, in the richly manured field, in the juices of a doomed caterpillar, in a cider vat, or a piece of stale bread. But there is a fungus that grows in the pipes that convey running mountain water with not a grain of impurity in a hundred gallons. In such an unpromising medium, this particularly thrifty fungus masses up till it flows from the end of the pipe in streamers of red jelly, and, later on, till it chokes the conduit and stops the water from running.

Others of this enterprising class can get a living

on steel, on apparently pure quartz, and in the best sterilized medium that man can prepare. The glass in the Abbey windows that has delighted twenty generations with the beauty of its colours is at last afflicted with 'glass disease.' The colour and the transparency are leaving it, so that in the last stage of the disease it has scarcely any of the properties of glass. Minute holes are drilled through it, and a pressure of the finger produces final dissolution. The patient fungus biding its centuries has overcome even the hard and polished and generally considered impervious glass.

DECEMBER

I

CLEANING-UP TIME

OH the trials of washing-day. Ah, the tribulation of tidying up. The upshot of summer with its merry holiday-making is a great deal of disorderly litter which the pruning-shears and the besom of autumn must remove. The false luxuriance of the annuals gets nipped off. One day the tropeolums are green and rambling, the next they are smitten with a palsy and lie unstarched on the border, the next, they have mysteriously disappeared. There is no more stuff apparently in the nasturtium leaf than there is in a jelly fish, which melts on the sand, and when its water has been given back to the atmosphere, leaves not a wrack behind.

The leaves of our mighty trees are made of sterner stuff than the grass of the field, but they, too, in their thousands of millions are made away with in a silent, inexorable fashion. Getting them off the trees is the least part of autumn's task. It is but the first scurry of the broom,

that makes the children gather into a corner, rather enjoying the fun of washing-day in its first stages. The leaves flew from the trees in a tornado of fun. For a time, they were more in the way than ever, scurrying across the countryside, cluttering the roads and paths, drifting into almost unmanageable heaps. Slowly their buoyancy was tamed with a little water. They lost their crinkle, and clung to the ground instead of bounding over it. Then the worms seized them and drew them one by one into their holes, the stuff in them deliquesced and ran into the ground, the earth claimed them for its own.

The annuals have paid back their brief borrowing in humus for next year's blossoms. The herbaceous parts of the perennials have been hauled down, disintegrated and stowed away. We shall have a sweetly clean slate again for next summer to write her gaieties upon. On those terms, we rejoice at the cleaning-up of autumn. It is a newly revealed delight, uncounted on in summer, to have the trees unsmothered so that we can see the beauties of their inner architecture. The differences of architecture between chestnut and beech, oak and elm can be seen hundreds of yards away more clearly than even when they were covered with leaves. We can see how each branch has fought according to its kind for summer after summer against its fellows, though in a common cause, against the winds and other adversities which were also their inspiration.

We had altogether forgotten that window hole in the beech across the lawn, where a branch after having divided comes together again. The time of no-leaves restores it to us like a long-lost friend. The lime, which was beautiful in its leafage of June and in the golden redolence of midsummer blossom, is also very beautiful in the fairylike arches of its winter structure. From far down the trunk it flings up a shaft which bends more and more away from its original aim, taking the parabola of a rocket. The arch ends high in air, and from the descending part of it a new and an airier arch reascends. That beauty you can see over and over again in the lime, but very rarely in any other tree. Every tree, however, shows its own curve compounded of the two elements of aspiration and the force of gravity. The shoot starts out heavenwards for all the light it can get. Its very success bows it down with leaves or fruit. Now that they are gone you can see the shoots trying to straighten themselves for the heavenward flight again, but none of them can get out all the kinks of prosperity. If we would take the trouble to read such small print, we could read the history of the good and bad summers from the spiral of any stick that was several summers long. We might be able to read in the old trees the history of wonderful summers like 1821 and 1848.

The wind is blowing the last of summer's leaves from the hedge, and many mysteries have come

to light. The black bryony has receded like a tide, leaving high and dry upon the hedge-top a rope of fruit, thick as plaited onions, but more brilliant than cherries. The long white hairs of old-man's-beard, traveller's-joy, or honesty, too, persist in staying after the leaves are gone. But they fail to cover the delicate basket that the whitethroat wove there in the security of thick leaves and in the abundance of all manner of insect life in June. In less than two hundred yards of hedge, looking only from one side, I have counted seven whitethroat's nests, though in summer I do not happen to have looked into one this year.

There is no such picture of the fugitiveness of summer as the whitethroat's nest, nearly as good as when it was woven, but filled with dead leaves now, and its architect five thousand miles away. The thrush's nest is not the same. Often it has haws in it to show that it is still in use by some thrifty mouse—like a Bloomsbury mansion turned into a warehouse. And from the same hedge that holds the mud-lined nest you can start the thrush that made it. He (if he had any notable share in this bit of architecture) is singing now on the ash tree near by whenever the sun gilds it. He and she gobble the red berries from the hedge, where the nightingale, wheatear, butcher-bird, and many others never saw anything but the blossom.

It ought to be the gay butterflies that have

gone, the dull and gloomy souls that are left. It is not so, however. The gayest-plumaged bird that comes for the summer only is the redstart, and he is easily matched in the same tribe by the stonechat, whose black cap, snow-white collar, and magenta breast still decorate the gorse, whose yellow blossoms they outshone in July. Instead of the reddish-brown nightingale, we keep the handsome robin, more in evidence when the world is frozen under snow than when the hedges were smothered with June roses.

The swallows are all gone, down to the dingy sand martin, but the finches present one solid phalanx of winter-abiding birds. There is not a dull feather among them. The larch wood is full of trees of fog, the needles which were the greenest of spring having turned almost to straw-colour. Now the towy bristles are falling, as the chaffinches hop among them, resplendent in slate-purple, rose, and brilliant white shoulder-knots. The rose bushes are being stripped by greenfinches in olive green and black, with flight feathers like solid gold. The thistles are winter provender for red-cheeked goldfinches, more golden of wing than the greenfinches, and with legs as though encased in thigh boots spotlessly pipe-clayed. The privet berries are not so black as the cap of the bullfinch that loves to eat them, and the hips are not rosier than his broad breast, whose feathers curl like little waves over his stiff blue wing.

Leaving some other finches unnamed, who can forget their near ally the bunting, that is to say, the yellow one, our gorgeous yellow-hammer. Two of them sit upon the hedge watching one another so closely that I get within a very few yards before they fly away. Yellower than canaries all down the front from crown to the root of the tail, with back and wings of ruddy brown, and tail that shows wide white feathers when it is spread in flight. Easy to say how yellow, but impossible to give an idea of how lavishly, healthily splendid, this cold December day.

The warblers cannot be gay except in daintiness of shape, but one of them, a good deal more gay than the rest, is the only one that stays the winter—our very well loved hedge-sparrow, which we will not call, as we should, hedge-accentor. Hereabouts they call it blue Isaac, a startling name to the thousands who declare it at sight to be a mere brown bird. But its neck and throat blush and sparkle with a blue iridescence like that which gleams in spring upon ‘the burnished dove.’ Like most other birds, it anticipates spring with much of its finery, and it now pours out from the summit of a blackberry bush a silvery tinnabulation of song that seems to make the sun shine.

There is a tinkling like little bits of ice jostling in a stream, and from the larch wood to a beech out in the field flies a long-tailed tit. Then another and another, till the air seems full of them, each

like a dragon-fly in shape, but plodding in a straight line instead of taking the strong erratic course of a dragon-fly. Daintiest of all the tits in their rose and black and white, though the great tit and the blue tit, never far to seek, are more brilliant.

Our tiny tits are staunch to a bird when the cuckoo, turtle-dove, landrail and night-jar follow the sun to the south. And smaller even than the tits, smallest and brightest of all the birds, is the golden-crested wren, heedless of every other foe, as of the cold, as he searches with microscopic care a twig scarcely a yard from my face. Well, say that he is not smaller, nor prettier, though more regally coloured than the humble Jenny wren. She, the reputed wife of the robin, flits everywhere, and searches not only bushes but banks and rabbit holes for her tiny food, what time she keeps up her shrill clock-winding, like a little old lady scolding while she makes vain pursuit of lost time.

Cleaners-up all. If all the superfluous grubs, weed seeds, and other eatable nuisances could be collected into one heap, our avine friends would perhaps finish the whole in a week. And when that week was gone there would be nothing to do but quietly to die of starvation. Instead of that they feed the whole winter through at Nature's hopper. Every day they take all that is within sight and reach. Clouds of finches and yellow-hammers are upon the stubble, searching

every inch for seeds of charlock, dock, and other hardy weeds that would soon overrun the world. Every day the tits and others are searching every niche in the smooth, clean limbs of the leafless trees. But to-morrow, by some chance of growth or warmth or frost, something else will be revealed on the station that is clean picked to-day. The next grub on the list of death will choose to turn in its earthen chamber or the movement of a leaf or clod will give up the secret of a seed that had hoped to become a tall mustard tree.

There is no better example of the hopper than the old cones on the alders. Not a day passes but some school of tits or siskins overrun the trees, seeming to inspect every crack between the scales of the cones, yet obviously finding something every day that on another day had been overlooked. An expansion of one two-hundredth part of an inch no doubt will make the difference between inaccessibility and accessibility to some morsel.

On some trees, such as the hawthorn, there are a good many dead leaves still clinging to the branches, some of them lasting till the putting forth of new leaves. Very often the secret of their adherence is the spinning up there of some caterpillar, which remains there in chrysalid shape till the time of moths comes again. One day a lucky tit passing that way may catch a glimpse of something large and round, a feast to stay his appetite for a good ten minutes.

Every morning this week there has been a blue

tit, no doubt the same one, hammering for many minutes at something hard on the top of the May tree. It is probably the very tough case of a saw-fly grub, but we cannot say whether the bird has yet won his way in or whether he will eventually do so. Such perseverance ought to succeed. So firmly does the saw-fly grub encase itself that the grown fly has to have jaws of steel and extraordinarily sharp, for the single purpose of opening the cerement. For the rest of its life the jaws have no use whatever.

A far richer cache for the tits has been awaiting them ever since the caterpillars crawled from the cabbages, and slung their chrysalids under the coping of the garden wall. For weeks and months they hung there undiscovered, but at length a party of great tits discovered them and cleared them off in a single morning. If you think that all the chrysalids are gone, wait till next April and see if there are not just as many white butterflies as ever. We could point out to some soft-billed bird another secret that ought to furnish them with toothsome titbits. Under white silk caps, about as big as a capital O, there are tiny fat grubs that under the microscope turn out to be immature bugs, as those insects that suck plant juices with piercing trunks are technically called. I think they are the mothers of next year's aphides, though they are larger and fatter than their daughters will be. There are twenty of these white bed-chambers on the trunk of the

laburnum alone, and the tits have not yet discovered them.

I have got now on the field of my binocular a dainty little marsh tit in silver and grey with brilliant dark eyes. He is hopping along all the sprays of a wild rose, and every now and then he pushes his embroidery-scissors beak into a leaf-bud that is not quite tightly rolled. The morsel he extracts must be microscopic, yet the quivering of the mandibles and the action of the throat indicate that it is something to keep the engines going.

The birds are here to clean off the superfluous grubs, pupæ and eggs, so that next year's vegetation may have some sort of a chance. It is quite clear that, hungry and numerous as they are at the beginning of autumn, they will never exterminate a single species. Before the last bird discovered the last well-hidden animal morsel he would himself be on his last legs. In fact, it is only a select band that remains to carry out the last search before the long-hidden army of spring life discovers itself by walking abroad. The young birds at the bottom of the class are 'plucked' before October is finished. They fall into the maw of weasel, stoat, or hawk, even if they do not, as later ones do, perish from starvation. There were too many birds. An infinite number of nestlings were of the highest use for the getting under of infinite hoards of present and future locusts, but when they had been so used their surplus, too, must go.

The numbers of our resident chaffinches, greenfinches, and sparrows no more increase than those of the nightingale, whitethroat, cuckoo that must brave two long flights across the sea. Their flocks have now been so cleaned up that every bird of them seems to be a perfect specimen. He is glossy with health, and brightly painted with the totems of his order. There is no laggard when the school moves on to new feeding ground, no novice bird waits on more experienced ones in order to beg a crumb. Every bird knows all the rules of the game, and it is just a matter of chance which of the troupe makes the next discovery of food. Yet even now there are more birds than Nature requires as an annual stock, and these armies of perfect units must be still more perfected by the removal of some more of the least unfit. No human eye could tell which are the doomed ones, but the measuring rod of Natural Selection is one of infinite discrimination.

DECEMBER

II

DEAD LOW

‘**N**OW is the winter of our discontent.’ The meadow wherein we seem to have dreamed that cowslips gemmed it with throbbing green and daintily confectioned blossom, is frozen as hard and as barren as city pavement. The soil that in summer runs through the fingers with a fatness that we know is life, is as dead as marble and far less beautiful. There is not a stroke of new grass, the frozen blades that sparsely decorate the earth having the toughness and tastelessness of worsted. The world rolls dead and scorched with frost under a barren, sunless sky.

True, there is still each day a few hours’ view of the sun. He peeps above the horizon at the east, skims over to the south, and there goes down with an air of not quite knowing whether it is worth while to come again to-morrow for another look at this hopeless end of the globe. He melted a little of the rime from the grass at mid-day, but it has come back again even while he is still to

be seen redly setting. As for softening the ice-gripped mould, that he was unable to do. There is not such a thing as a worm or a grub to be found among the whole army of thrushes native and foreign, and the berries of hedgerow and tree are almost gone. High in air a party of field-fares going off to roost laugh the harsh chuckle of people who find that life's irony has passed bearing point. Redwings are moping about the orchard as thin as bones, and many have yielded up their gentle lives. On the other hand, we can detect no abatement in the cheerfulness of the wren that still tilts her tail at an absurd angle, and goes clicking about her work like a well-wound clock.

It is perfectly natural, of course, that we who know by an experience of thousands of years that the sun will stop going down and come again smothered in flowers should be able to be cheerful at Christmas. It is not wonderful that we who have our larders stuffed with last year's fruits, our cellars (coal cellars I mean) stored with the spoil of a million ages, and whose ships bring us daily the gifts of the sun from other parts of the earth, should feel confident that this age of death will pass. It is an easy thing to go carolling at doors that you know will open upon rosy firesides and tables of plenty, but it is an annual miracle to hear the thrushes singing obviously about February courtship, April eggs, and May grubs when the world is being daily turned away and

away from everything that made summer life worth living.

There must be some thrill of renewing life shooting from the ash branch into the thrush's legs, or the clear-eyed songster can see that the buds of the sycamore have not given up the struggle. I can see as much from my study window, which is on a level with certain tree-tops, and the wild people who live among such things must have countless evidence that summer is not forgotten. At every touch of milder weather the crocuses push out their bundles swollen with blossom-buds. When the frost comes, it cannot drive them back, and their growth remains through the severest weather as an encouragement for the faint-hearted.

As we look round again at our dead world we must take back the epithet. The twigs of every tree have the suppleness of life and a certain purple glow of hope. We catch that best at some distance and at a good mile it is not hidden from us. A dead beech is recognizable in a wood of live beeches, however recently dead it may be. Even though it has all its twigs, there is an absence of circulation, a leprosy of skin that marks it out from the purple health of its fellows. The willows are even going into the red and the orange that presage in the several species their bursting into bud, and the cornel has the October crimson in its twigs that is our sole excuse for admitting it to the garden.

Down among the roots of the big trees the sovereignty of the frost is not acknowledged. The moles are running deep now after the worms. At distances of a yard or six feet they bring up the rich brown earth, soft and even warm to the touch by comparison with the metal of the field. The freshest of the hills are actually moving, if we approach them quietly enough. We can count the jerks of the mole's nose with which he thrusts out the long sausage from the last section of his 'tube' highway. Then is the opportunity of the man who wants to get rid of the 'wunts' from some favourite piece of earth. The catching of moles is not by any means an easy thing to the amateur trapper, but with an ordinary fowling-piece at rather close range we can shoot the little engineer just at the moment when he is ejecting his core through the top of the hillock. It is more to the purpose now to notice how quickly the live earth of the fresh hillock becomes hairy with hoar frost, and then so hard that it rings like iron when we kick it. I think that if I were a thrush, one of the themes of my mid-winter song would be the evidence that these fresh hillocks give that the power of frost is only skin deep.

It is not enough that the survivors of frost and winter rot should be ready to sprout quickly when the sun comes back at Easter. They must begin to grow without waiting for the message. As sharer in a Pan-experience, each plant has a

knowledge of summer after winter as absolute as that which sets our waits playing and everybody feasting not long after the shortest day is passed. But the wild things begin earlier than that. As soon as the autumn check has fallen the early flowers of next spring begin to stir. This scene of death is but a hypocritical surrender to the powers of cold. In all kinds of odd corners we find the audacity of new growth. They have pulled up from the depth of the fish-pond an old water-lily stowl, and it has tiny heart-shaped leaves at the ends of new shoots. The rhubarb has little red leaves almost open beneath the surface of the frozen earth. There is a waiting regiment of colt's-foot in what you might think was only a cemetery of all the years that are gone. Two of the blossoms, as though taking the signs of preparation for the actual order to advance, have sprung out and opened themselves, crumpled and pinched but undoubted gold. It is just like the eagerness of a child who has had a butterfly-net given him at Christmas, and goes out the next day to see if June has not come.

We find more contradictions of the note of death in the wood. This is to be accounted for partly because the wood is more sheltered, partly because the floor of dead leaves is warmer, partly because the wood grows on the limestone, whereas the fields are on the lias. If you kick a hole in the felt of leaves you will find that it is pierced everywhere by the white spikes of wild hyacinth,

which have often a desperately long way to come before they can blossom. Where there is something like a cave under the leaves, I find a leaf or two of that most tender plant the oxalis or wood sorrel, with the clover-like lobes unfolded as though the very time of the cuckoo had come. 'Cuckoo's meat' is here a favourite name of the wood sorrel, which in April gems the banks with a show of bells almost as lavish as the stitchwort.

There is no understanding the mind, the feeling, the instinct, the chemical or physical reaction that makes a flower choose this of all the seasons of the year for opening its blossoms. Yet the winter aconite now breaks the crust not merely by accident, but with the full intention of throwing open its insect-wooing blossoms now, and only now in the whole calendar of the year. The snow-drop is less surprising. We ourselves feel like burning the winter garment of repentance when February has come. It takes the average human being twenty good years to learn that March and even April can be and often are as shrewish as November. Still, if the human race were condemned to sleep for eleven months of the year, I wonder how many would choose any month between September and May for the waking one.

Here is another plant in the wood defying all the rigour of winter, and putting forth inch after inch of the very tenderest green. Setterwort or

stinking hellebore blooms every year before three men in twenty venture into the woods after spring flowers. The summer visitor sees only half its beauty in the maturity of its fingered leaves, and its triad of seed carpels on plates of purple-tipped green. The green of its midwinter burgeoning is the palest in Nature and also the most luminous. The setterwort seems now to be holding fairy lamps above the hard-toothed leaves of last year. The new hands are crumpled most prettily like the hands of babies. Above them come flower buds so globular that they seem to hold a treasure more enormous than any other flower. Even these are green when fully open, and after such luminosity of green it would be idle for the flower to attempt scarlet or brightest blue as an advertisement. But who shall dare to ask where are the insects at this time of year that ought to come to the little forest of golden stamens that the bell-like blossoms guard and exhibit? If a man should open a fancy wool shop under the lee of some iceberg within the inmost polar ring he would apparently have as much chance of doing business as the setterwort has in the month it selects for blossoming.

You might think there were laurels growing here and there in our wood. But if you will examine one of these clumps of shiny evergreen leaves you will find that they are borne aloft on long stems from the ground that resemble in miniature the trunks of palm trees. They belong to spurge

laurel or daphne, first cousin of *daphne mezereon*, the last bush of which seems to have been removed from the wood to serve in a cottage garden the office of proclaiming spring as soon as Christmas has gone. *Daphne laureola* blossoms even earlier than *D. mezereon*, but it does not cover naked branches with a solid crust of purple blossom as the more popular species does. We can find its blossoms now by turning up the crown of leaves, beneath which they hang outwards down the trunk like the blossoms of the crown imperial. They are in delicate honey-green, long in the tube as though designed for bees, and opening only at the extreme end into tiny yellow stars. No bee ever sucks them, and yet the plant sets every year a fair number of oval berries that are purple and poisonous when ripe.

The hellebore, too, is a poisonous plant, though evidently not to a hungry rabbit. In many places where there should be a tower of fresh green above the saw-edged leaves of last year, there is a little heap of chaff where a rabbit has sat and helped himself to the more digestible portions.

Rabbits are not in evidence just now except by their works, but there are other shapes running through the brambles and making a noise among the dead leaves. These are blackbirds, most industrious diggers in anything soft now that the frost has bound the meadows. There is no other bird that thus deliberately turns over the earth

to find worms and grubs. The starlings drill an infinite number of little holes in the turf, and no doubt drag out from them many small grubs, but the blackbird will soon turn over a barrowful of leaves or rotting manure and take the fruit of his digging.

Every other bird in the wood has had the example of the blackbird before it, through its ancestors, for thousands of years, and has profited nothing by it. It is not as though the blackbird had special tools for the work, as the woodpecker has for carpentry, or the woodcock for probing in mud. It is just a winter expedient of a bird with the same equipment and summer habits as the thrush, the redwing, the field-fare, and some others. It is easier to understand how the thrush holds the monopoly of the trade of opening snails, because that is a summer accomplishment, and when snails are plentiful so are worms, but to-day thrushes are starving only because they cannot copy this simple expedient of the blackbird.

There are plenty of other birds on the floor of the wood, searching in a haphazard way for whatever may have been disturbed by a chance movement of the leaves. Many of them are finches, and they, no doubt, are mainly looking for seed of one kind and another. With the chaffinches are bramblings on their winter visit to this country. The moderately careful observer distinguishes them at once from the chaffinches by a mottling of reddish-browns and greys all over

the back and neck, more black and white about the wings, and a great blaze of white on the rump as they fly away.

More industrious than the chaffinches and bramblings are the greenfinches, now of a ripe golden brown. They carry out a faint feathered resemblance to parrots, by their habit of almost walking rather than hopping among the leaves. When the great tits in saffron and blue-black and the amazingly blue-and-yellow blue tits are added to the company of foragers, we have a blaze of colour that is almost tropical. The coal tit makes a rather more sober contribution, but the bold pieing of its neck shows to great advantage as this mouse-like little bird goes hammering about with his active little head.

As noon creeps on into night, a night of fifteen hours, a steel chill strikes through even the cosiest corners. The blackbird leaves his digging and goes off last of all, except the robin, to find the cosiest possible place to keep him alive through the night. His shrill 'chink-chinking,' usually attributed to the fear of cats, is a cry of petulance at the cruelty of the winter and of alarm lest this night should prove worse than the last. Yet how much worse off are certain birds we know.

The blackbird sleeps in the midst of a holly bush into which the snow comes never and the rain very seldom. It is as good as the roof of thatch that the sparrows patronize. Or he sleeps

with chaffinches and others in the thick ivy that surrounds some tree in the hedge. But in London on just as cold a night as this, and even in the drenching rain or cold snow, thousands of birds sleep in the bare branches of the planes. You can see them against the sky, dots upon lines like a very complicated piece of music. One or two larger dots among the lesser ones indicate starlings sleeping among the sparrows, and sometimes, rather nearer the trunk, you can make out a wood-pigeon or two. It speaks very highly for the efficacy of feathers, and for the warmth of bird circulation, that no frozen bodies are found beneath the tree at dawn.

The windfall of that kind that the lean fox picks up nowadays is but slight. We see him prowling about by day, and perhaps his best chance among the birds is to pounce on a redwing from behind an orchard tree, not waiting till the frost and short commons have quite finished their work. Yet there is hunting at night, as the owls testify; the tawny owls of the wood and the white owls of the church tower often being heard at their work, and their pellets revealing the skeletons of mice and voles.

Ugh-r-r-rumph, it makes me shudder to think of anything alive being abroad on these midwinter nights. As soon as the sun has finished his futile journey along the horizon, the mists creep out and add a rasp to the cold that cannot be measured by the thermometer. The wood then seems not

the cosiest place, but the deadliest. The fur of the mouse or rabbit driven out of home at dusk by the intensity of winter persecution by day, catches the hoar frost just like the coldest fern frond. The air seems to tinkle with the tiny atoms of ice that, in fact, have taken the place of its moist vapour.

The truth has to be told that, because it was my annual practice many years ago, I have come out after Christmas dinner to shoot a snipe or woodcock in the marshy hollow below the lake in the wood. He is not there to-day, perhaps because the frost has made a crust upon the black mud, and too hard for his tender beak to pierce. In places where in the driest summer you would sink to your knees, the frost has made a bridge you can walk on. The bog is full of oak branches black almost as mineralized bog oak, those that appear above the water being decorated with bright green moss.

The tiny hairs of the moss have been converted into crystals of hoar frost, by contrast with which the green shines as the very emblem of hope in adversity. And among them, rooted in the same black and chilly swamp, unfolds the winter peziza, the outer curve of its wineglass in fiery plum colour, the inner of the purest scarlet that nature can produce. It would flame among poppies and put them to shame, but there are no poppies in December. It shines in the cold of winter twilight with a brilliance that is startling and mesmeric.

No one can tell why the fungus produces this brilliance in the depth of winter, unless it be to show what nature can do even in the darkest hour. The whole brilliance of summer is foretold in this first step of the New Year.

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