

THOUGHTS AND OBSERVATIONS ON NATURAL HISTORY.

By H. B. M. BUCHANAN, B.A.



OME ONE has said—who, I forget—that for every ten men who can think, one man can speak; and that for every ten men who can speak, one man can see." Intelligent observation is the

—violets, celandines, speedwell, ground-ivy, spurge—spread their yellow, blue, and white flowers with a reckless abundance. Week after week passed and no rain came, and yet the green kept its freshness and the wild flower did not fade; for in February a larger quantity of rain fell than usual, filling the rivers and wells and saturating the soil to a great depth, and so the tree's fibrous and spreading root could obtain in liquid form the food from the soil that it required for a long, dry spell.

It was a lovely day this early spring. The sun was warm, the air still and fresh, and the sky an expanse of soft blue. I was walking along one of the beautiful Surrey lanes; the dog-mercury, violet, yellow celandine, and ground-ivy brighten up the foot of the wayside; but as yet the hedges hardly gave a sign of the glorious foliage of a few weeks later, when up got a flock of peewits and a flock of starlings—they are often found together at this time of the year—and in two distinct and compact bodies flew round and round in perfect order, the united swish, swish of the peewits' wings breaking on the still spring air with deep regularity. Away they flew, now turning to the right, now turning to the left, with perfect precision, as if under a word of command; sometimes the starlings in front, sometimes the peewits, flying further and further away, till they disappeared, as two tiny specks, in the distance of the blue heaven. It was a very beautiful flight, and I do not think that I shall ever forget it.

The ways and doings of the starlings I love to watch. One day I went out in my garden with the intention of writing, but my attention was arrested by the quaint movements of two starlings. They had just found a suitable place for their nest under the roof, and they did not seem able to contain themselves for joy at their discovery. One of the birds kept popping into the nest and then on to the roof, flapping his wings, snapping his beak loudly, and imitating in turn a blackbird, tit, and chaffinch, cocking his head first on one side and then on the other, as if quite conscious that he was a very funny bird; then he flew from chimney to chimney in chase of his mate, then popped into the place that he had found for a nest, then on to the roof, and repeated this very funny performance again

and again. Save a dog who has lost his master, and found him again before time has dimmed his devotion, I have never seen a greater exhibition of gladness. The very sight of it made me the happier.

Starlings are very sociable birds; directly they have finished with their young they collect in flocks. In fenny countries, such as Lincolnshire, they collect not in flocks, but in clouds. A single flock will consist of countless thousands, quite darkening the sky; and they seem to move under a guiding spirit, as they now wheel to the right and now wheel to the left, now advancing, now retiring, then by suddenly changing their course and presenting only their wings to the spectator they become almost invisible. The beautiful colour of the bird is not developed till it is three years old.

rarest of gifts. To observe and know something of the ever-changing sky over our heads; the bird that is flying in the blue expanse, with steadfast purpose, faster than any express train; the tree that clothes itself with the pure light-green of spring, to slowly change into the deeper and duller green of summer, and then to change again into all the various and glorious tints of autumn; the flower and weed that are beautiful by the wayside; the animals quietly eating the green grass, or resting lazily in the warm sunshine; the numberless insects that move in the summer air with rhythmical sound; the bit of human nature that stands by our side; to observe and know something of it all is to fill the measure of life with an interest and joy that will not waste. It would be wise, when we go for our walks and incursions into the country, to leave the business behind, the social worries and unkindnesses, the unsolved philosophical problem, and only to observe and talk about the endless things that on all sides are pleading for notice.

Seldom in the history of the English climate has the worker of the soil looked anxiously for a rain-cloud to appear on the horizon, and longed that it might gradually spread and deepen till it fell on the parched earth as rain. But so it has been this wonderful year, and the grumblers against the vileness of the English climate are compelled for once to cease their wailings. The leaf sprang from its winter's imprisonment fresher and more beautifully green than ever; the early spring flowers

Owing to the great destruction of eggs and birds from various causes, it is necessary that birds should live a comparatively long time if the number of the species is to be kept constant. The mortality amongst the young is terrible. Certain eminent German scientists have calculated it like this:—Say, a certain species lives 10 years, and during that time lays 200 eggs—20 eggs a year; if the species is to remain constant in numbers, 198 out of that 200 must perish. Again, a golden eagle lives for 60 years, and lays 2 eggs each year; then in 50 years 100 eggs will be laid, but out of these 100 eggs only 2 will grow to adult birds, or, in other words, a pair of eagles will only bring 2 young eagles to maturity once in 50 years. Small singing-birds live from 8 to 18 years. Nightingales have lived 8 years in captivity, and blackbirds 12 years, but both will live longer in a natural state; canaries in captivity 12 to 15 years, ravens 100 years, magpies 20 years, parrots 100 years, fowls 20 years, golden pheasant 15 years, turkeys 16 years, pigeons 10 years. There is a fairly well-authenticated record of a cuckoo, which was recognised by a peculiarity in its note, that sang in the same place for 32 consecutive years. A golden eagle, which died in Vienna in the year 1719, had been captured 104 years previously. A falcon is said to have attained an age of 162 years. A white-headed vulture, which was taken in 1706, died in the Zoological Gardens at Vienna in 1824, thus living 118 years in captivity. Swans are said to have lived 300 years.

ANSWERS TO CORRESPONDENTS.

MISCELLANEOUS.

ANNIE EILLES, Mühldorf, Bavaria.—We were much interested in your letter, and wish we were able to send you the used stamps of different countries for your brother's collection. We have little space for correcting your English. You transpose words in your sentences sometimes, as, for instance, when you say, "also, would it be a very unnecessary expense," you place the words in the form of a question, not as the statement of the fact. You should have said "it would," not "would it?"

MARY GRAY.—1. Your parents are your nearest of kin, and your brothers and sisters come next to them.—2. Your spelling is very bad. The word "question" should not be spelt "quiston," nor "feel," "fill."

VERY ANXIOUS.—The fact that you desire Christ to be your Saviour and do not wish to deny Him is a proof that the sin you dread cannot be laid to your charge. Read all we have said on the subject to others. If you do not reject Him He certainly will not reject you.

SUSIE.—1. You had better take the advice already given to the owner of a parrot who has the same trick. Cut out a cardboard collar, cut an opening through it at the back, and sew it together round his neck. It must stand out straight, and needs not to be very wide to preclude the possibility of his picking out his feathers.—2. We have little doubt but that you could obtain a tortoise in Covent Garden; or a naturalist would procure one for you. A hedgehog would serve your purpose equally well.

TOMBOY.—In the ancient Greek mythology the God of Love and the little Cupids are represented as shooting the object of their affections with an arrow aimed at the heart. So your lover's sketch of "a heart transfixed by an arrow" signifies that his own has been smitten with your arrow, and your love and attractions have penetrated his heart. Do not imagine the emblem to be equivalent to a "moonlighter's" sketch of a coffin or a skull and crossbones! No harm is meant.

TRIXIE.—Gargle your throat with a mild solution of borax and powdered alum. A chemist would prepare it for you of the right strength.

SUSAN.—If your cousin be still growing there may be a chance of her straightening her round shoulders. She should always wear a face-board stuck into her belt when at her studies and writing to keep her head up and her chin well back; and she should use a backboard at the same time when not requiring to use her hands. We regret that a former letter of yours received no reply, and are gratified by your warmly expressed approval of our paper.

FORGET-ME-NOT.—Try a little milk applied with a sponge. We cannot advertise what is sold in the shops for cleaning patent leather.

DOR.—1. The origin of the common phrase "it suits to a T" is found in the instrument used by mechanics and carpenters, the "T-square" or rule which is employed when great exactitude is required.—2. Every precious and semi-precious stone has ancient superstitions connected with it. The opal was by no means regarded as bringing ill-fortune on its owner, as generally supposed; it was called the "child of love," and said to make its possessor lovable. The turquoise was said to protect the wearer from falls.

fasten or begin again in the middle or any other part.

Coral stitch is seen in *d*. Let your branches always be of the same size, and before passing on to it again make the French knot in the spot.

In *e* you see the satin-stitch, which should always be evenly done and worked across the

way of the cotton spot, and not in the same direction.

Snail-trail is seen in *f*. Instead of, as in chain stitch, you put the needle in the loop, you place it behind the silk. Then draw the loop and go on to the next.

Before ending I must remind my readers that if they wish the work really to simulate

daisies, they should do the flower in white silk tipped with deep red. This can be done by fastening down the loop of the picot stitch with red, or else making a tiny red French knot at the end of a spike. The middle should be worked in yellow stitch, or else a cluster of small French knots made so as entirely to cover the spot.

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II.—THE CUCKOO.



AFTER a long and dreary winter's rest, the cuckoo's first call-note in the month of April—the month of the fresh furrow—stirs again a feeling of hope in our minds as we picture the sun's warmer rays driving away the chill

and dampness of the winter. Day by day we see the green spread, and the flowers show more numerous, till from every corner of the land life most abundant appears, a hymn of praise and joy. When the imagination passes into the beautiful reality, the cuckoo's perpetual call grows wearisome, and the feelings of hope that it aroused in April, in July are turned into despondency. In the middle of July the cuckoo has laid its six to eight eggs of various tints, and taken them up in its beak and placed them in different nests, according to the colour of the eggs of the foster-parent to be, principally hedge-sparrow, meadow pipit, reed warbler, sometimes the wrens and red wagtails, and then, indifferent to their fate, the bird migrates off by Heligoland to Africa, where through the winter its insect food can be obtained.

I have often wondered what were the conditions acting on the bird's ancestors that produced in the cuckoo of to-day these contradictions to the maternal instincts that are so strong in other birds, and can suggest no explanation. The birds are discontented, unamiable, and unsociable even when migrating—most birds are sociable by necessity at this time—they are hungry and greedy, and their habit of feeding on hairy caterpillars, whose indigestible hairs form a network in their gizzard, is thought by some naturalists to set up dyspepsia, which has resulted in their unnatural vices against bird society. The anatomy of the bird shows that they require a great amount of food, and so it may be that they have little time or strength to bestow on the higher development of maternal love or care. The fact of the males being largely in excess of the females may further account for the loss of the maternal instinct. Although the size of four skylarks, its eggs are about the same size as those of the skylark.

THE SILVER WEED.

Along the wayside, in the rain-gutters that in summer run dry, amidst the stones and dust of the hard road, grows a prostrate weed. Its leaves are divided like a feather, and are covered with a white silky down, especially on the surface that lies along the ground, which gives the roadside where it grows the appearance of burnished silver. Here and there, from amidst its silver pinnate leaves, a sulphur-yellow flower grows erect, in all respects like a very small old-fashioned yellow rose. This humble, beautiful silver weed—

unnoticed mostly—is the simplest living type from which has sprung the great rose family of the botany books. From some such humble type of flower as this wayside weed have deviated and developed, under different conditions, the wayside Aveus, cinquefoil, tormentil, strawberry, brambles, agrimony, meadow-sweet, and roses; the trees mountain ash and hawthorn; the fruits cherries, plums, almonds, peaches, nectarines, apricots, apples, pears, quinces, and medlars. This bold botanical generalisation, which is based upon many well-established facts, and reasoned out closely from these facts, is of great interest, but, of course, is too long for me to attempt to even touch upon in these notes. This thought, however, may tempt us not to pass the silver weed unheeded, but with reverence to stop and take notice of it.

THE WISDOM OF KINDNESS TO HORSES.

The other day I was passing a house that was in course of building, and one of the men hailed a good-looking horse standing, some distance off, in a builder's cart, with a heavy load behind him. The intelligent animal at once showed that he understood the signal by walking quickly towards his master, and his anxiety was so great to get to him that for the last few yards he broke into a trot. As is my custom, when I see an act of animal kindness, I stopped, and told the man that he must have treated the beautiful creature well. "Yes," he said shortly; "he would far sooner come to me than go from me." Horses are treated with more sense than formerly, but an improvement is still wanting. We always call a dog to us, whereas a horse, by necessity, we work by always driving from us; but, notwithstanding, a horse, by consistent and firm kindness and early training, can be made every bit as intelligent as a dog. I have often been struck with the high intelligence shown by a horse in finding his way along roads that he has once only previously traversed, and the length of time he will hold the way in his memory. He has often this faculty developed to a higher degree than his master. As with human beings, so with horses; gain their confidence and train their intelligence when young—when quite little foals—the earlier the better; teach them to follow, handle them freely, get them accustomed to the saddle and bridle and harness, and manage them entirely with the human voice. A voice that a horse associates by experience with wisdom and kindness will act in a manner that nothing else will. It will restore confidence, steady the most highly-strung nerves, and make the animal quiet and obedient. Hasty, cruel breaking-in, and rough treatment on the part of the groom or master, has been the cause of nearly all the vicious tempers of the horse.

THE GUMMY GLOSS ON THE LIME-LEAF.

I have noticed, this year especially, that the leaves of the lime have been more thickly coated with honey-dew than usual. This

honey-dew is sweet and sticky, and gives the leaves a glossy, gummy appearance; it is exuded by the green fly aphides. Lady-birds live on the aphides, and so keep them from becoming too numerous, and consequently this year I have noticed lady-birds in unusual numbers. The awful struggle for life goes on everywhere; the lower down the scale the more untiring and merciless is the fight waged—no pause is asked or expected. Day by day, season after season, age after age, is the struggle to live in full activity. "Life living on death" is the Almighty fiat that has gone forth as the internal necessity of all things that live. It demands obedience from the waving tree and green grass no less than from man and the first pulsing of life. It is the undeviating law of earthly life, and can it therefore be other than good and great, although we for the present cannot understand how this can be? Ants capture the aphides and use them as cows.

THE ANTS TEACH A USEFUL LESSON.

We are in possession of enough facts to justify us in stating with certainty that if an organ be disused it will get weak, and in time become useless. The want of regular muscular exercise, the want of a healthy use of water, air, and wholesome food, will cause in due course a broken down and diseased body. By devoting the mind to its material surroundings, the ideal will lie grovelling at the feet of the sensual. The overstraining of the intellectual will deaden the full pulsing of the human heart towards the human beings that are around us. Too often, and it may be too late, do the high philosophical thinker, the scientific demonstrator of exact fact, the worldly sensualist, in their rare flashes of true insight, discern how one-sided their existence has been, how wanting in fullness of living. This law of atrophy, or loss through disuse, is clearly shown by the reddish ants found in the meadows of Switzerland and Alsace. These ants go forth to attack the nests of blacker and inferior ants, and bring back to their nests the pupæ of the ants on which they have raided. The red ants take every care of the captured pupæ, and when they are hatched hold them in slavery. These slave-ants do everything for their red masters; they feed the larvæ, build galleries and chambers, bring in food supplies, and feed their utterly lazy masters, and as a result the red ants lose the power of feeding themselves. If shut up and supplied with honey, which is their favourite food, they will not feed but rather die of starvation till they are supplied by one of their dusky slaves. Directly this is done the slave eats a quantity of honey, and then proceeds to feed its masters, who are quite satisfied to be saved from starvation in this manner. So these ants illustrate the dire results that inevitably follow from the disuse of any serviceable organ, and the degradation that accompanies a system of slavery.

Serpent's lasting for many hours longer, even though the anticipated storm should not burst upon her.

In answer to our broken words and halting remonstrances, father showed us the jolly-boat, which the ship's carpenter was putting under repair, and assured us solemnly that while he considered it his part to stand by his ship to the last, when the last did come he would certainly do what he could to save his life by following our example. He would be wanted to stand a court-martial, if he

could do no more for the service, father observed with lurking dry humour, in order to keep up our courage, and we should want him, though Perry and Tom would do their best for us, so, please God, we should meet again.

He roused himself from the reverie on which Jane had broken in, to take each of us to the side of the ship, and to give each a hasty embrace, and a "God bless you, my dear." He held Jane for a moment longer in his arms, before he helped to put her into the boat.

As it rowed away we strained our eyes through a mist of unshed tears, to see the one figure, first bending over the bulwark, and then standing like a statue, watching us. We forgot that we were bidding farewell to our home, which we should never see again, we thought only of our father, and of what he had been to us. Not one of us but would have found it more easy to return and keep watch with him till the last befel, than to leave him there without us.

(To be continued.)

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III. REFLEX ACTION—INSTINCT—INTELLIGENCE—INDIFFERENCE.

FROM time to time in these notes I shall relate instances of animal intelligence as I notice them, or as they are brought under my notice by well-trained observers. Therefore it will not be out of place if, according to the present state of our knowledge, I relate as simply as I am able what scientific men say is the difference between reflex action, instinct, and mind or intelligence. It is apparent to anyone who has observed and thought that these three headings glide so imperceptibly into one another, that it is almost impossible to define where one ends and the other begins. But broadly speaking, reflex action is illustrated by a machine, that when in order is always set in motion when the proper stimuli are applied to it, without consciousness or choice.

Another illustration from the human body: A man breaks his back so as to sever the nervous connection between his legs and his brain. His feet on being tickled will be drawn away from the irritation; but he will not be conscious of any feeling, as the cord is damaged by which the sensation of tickling is conveyed to the brain, where alone it is translated into the feeling of tickling.

Instinct is reflex action become conscious, but a consciousness that has no necessary knowledge of the relation between means and ends—a consciousness that under frequently recurring circumstances always acts in the same way.

Reason or intelligence is a consciousness that has a knowledge of the relation between means and ends, a consciousness that will not always act under the same circumstances precisely in the same way. In other words, a consciousness that will learn from experience. A dog is hungry, his nose supplies the stimulus that urges him to eat the meat put before him—this is instinct; but if his master has taught the dog not to eat the meat till he gives a certain signal, then the dog has learnt from experience, and shows the beginning of intelligence or mind. So we can say that wherever any animal, bird, or reptile learns from its own individual experience, we must infer the beginning of intelligence. We argue in this manner in dealing with the world of men, and justice and logic compels us to argue in the same manner when reasoning about the creation inferior to men.

THE SQUIRREL.

I was sitting reading and thinking in the pine woods of the beautiful Frensham district one very hot day this exceptional summer. The air was very still, the birds were silent, the pine trees stood grimly upright without movement, and the only sound was the hum of innumerable flies and insects, when through the stillness I was startled by a noise resembling

the deep cluck of a hen. After a little time I discovered that it came from a squirrel who had seen me, and appeared in a great rage that I should be there. He jumped on to the tree under which I was seated, swaying his tail and body violently about from the effort of the noise he was making. The bold little red thing then, much to my surprise, descended the tree, and I verily believe would have jumped on to me had I not knocked the trunk of the tree several times with my stick, which drove him reluctantly up again, still making his angry noise. Then, catching sight of another squirrel, away he went in chase, and a right glorious chase it was, a perfect miracle of swiftness and agility, from tree to tree, from branch to branch, from twig to twig, long jumps, short jumps, never missing, never making a mistake. The exciting chase being amongst pine trees I could watch it for some few moments till the squirrels both disappeared. I have noticed the squirrel on pine trees more often than any other tree, and the wary little things when watched will keep the trunk or branch between you and them in the most aggravating manner. When sitting in these pine woods, with no sound of a bird about me, I was suddenly surrounded by numbers of tits, who with cheery chirp and body downwards, searched branch and twig of each tree for food, and then passed on as rapidly as they had come, leaving me alone with the silence again.

Defence against Enemies.—It is interesting to notice the various weapons of attack and defence that the world of living things have developed through time. The elephant and deer, its tusks and horns; the lion, tiger, and dog their teeth; the horse its speed of foot; the bird its wings; the snake its death-dealing venom; the butterfly its nasty taste; the caterpillar its hairy indigestible skin; the tree its poison; the bramble its thorn; in others the power of imitating the colour of the ground or surrounding vegetation, and by this imitation escaping the watchful eye of the pouncing bird of prey or the cruel teeth and claws of the beast who lives on the life of others. I have noticed specially how partridges, rabbits, hares, seem to know instinctively the patch of ground that is like their own living bodies, and by crouching down in it make themselves so like their surroundings that they often escape detection. I remember once seeing a brood of quite little partridges running along the side of a bank. I walked after them, and directly I came up to them, they flattened their little brown bodies against the brown bank, and appeared as one with the bank, so that I certainly should have passed them over had I not been following them.

A pheasant is an imported bird from countries where the hot sun brings out the richest tints of vegetation colour, and amidst these

bright surroundings the beautiful bird has developed its striking plumage.

One day I was gazing in dumb admiration at a copse; the trees had been cut down, the undergrowth was not thick, and the whole ground was a mass of wild flowers of every variety of species; no painter's pen or poet's lines could exaggerate this mass of varied harmonious colour. And amidst it all there stalked a majestic cock pheasant; as he stepped along with his slow proud step, he seemed to be conscious that his plumage and these wild flowers were a goodly match. Seeing me watching, he remained still and crouched; and then I could barely distinguish which were flowers and which was pheasant—so alike was the bird's plumage to the blaze of colour that surrounded him.

Perhaps one of the most interesting examples of how insects can imitate and so preserve themselves is shown by a certain insect that lays its eggs end-on to each other in single column, so that they resemble the flower of the ordinary stinging-nettle; when the eggs are hatched out the little insects show their gratitude for this protection by feeding on the nettle.

A few Facts about Birds.—I noticed one day a parent sparrow teaching two little sparrows to fly. First the mother flew from the ground on to the palings, where she would wait till the little ones flew to her side, then to a higher paling, then to the water-spout, then on to the roof, then across the roof, the mother always waiting till the little ones reached her side. The impulse that evidently made the young sparrows follow their mother was that of hunger, as they alighted by her with their wings flapping with expectancy, as is the custom with young birds when hoping to be fed. It reminded me of a child learning to walk who is not quite sure of foot, and only wanting a mother's anxious hand now and then to prevent a fall.

For a marvel of grace, swiftness, and precision, nothing that I have seen can beat a swallow feeding her little ones that have fled from their nest, and are perched in the open. I watched them one day in a hayfield three in line on a paling. The parent-birds, with their wonderful swift and happy flight, went in merry chase after the flies. Now with wings steadied dropping to the earth, now with a few flaps ascending into the blue sky, now with many rapid flaps making headway against an adverse wind, now with outstretched wings gliding with great speed before a favourable current of wind, turning to the right, turning to the left, with no pause or sign of weariness. The little ones always knew of the nearing approach of their food, and with flapping wings and quick chirps received into their open expectant mouths the insect that the old swallows placed there with unerring precision and with hardly a pause in their rapid flight.

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PART IV.



THE oak is the most favoured tree for the attack of the little gall fly. About fifty different species of this fly attack the two kinds of oak, which are found wild in this country, and the puncture of these fifty different species

of insects cause the formation of fifty galls differing in shape, size, colour and other characteristics. So here is this wonderful fact that the puncture of each species of fly produces a different habitation for its young, for the gall, as I shall now show, is a house for its young. The insects pierce the young leaves or buds, and lay their eggs in the wound they have inflicted; the irritation thus set up causes the sap food to flow with greater speed than usual towards the punctured part, and this sap over-feeds the cells of the injured part, which in consequence swell and divide with abnormal rapidity, and thus is caused the unnatural growth of a gall. In like manner an oak-apple is formed by the puncture of a number of gall flies. These flies lay their eggs in the places punctured, a growth is then formed in the manner I have described, round each of the eggs, and these growths collectively form the apple. The egg, thus well protected in the gall, in due time turns into a grub (larva), which pierces its way out as a fly at the end of May or beginning of June. The galls are fully formed by the end of May, and having a certain beauty of their own, were formerly used as button-holes on the 29th of May—Restoration Day—whence their popular name of "King Charles's Apple." As the oak-apple gets older, it loses its juiciness, and becomes brown, dry, spongy, and very light, whereas an oak-apple is formed by an unnatural growth around the punctures of many insects.

The *artichoke gall* is formed by a most beautiful growth round the puncture of one insect. This gall is of a pale yellowish green colour, very like an artichoke flower in miniature, and is so symmetrical and regular, that until it is opened and the little grub seen inside, it is very difficult to believe that it is not a beautiful vegetable growth. Galls, of course, can only be regarded as vegetable disorders,

tumours arising from overfed and deranged cells, yet in her derangements Nature cannot help being orderly, for the artichoke gall is a modified bud, but modified without distortion, the leafy scales of which overlap one another with perfect regularity, making a rather stumpy conical body, like the head of a thistle. On turning back these leaves, an oval object is seen standing erect, which is hollow, and is the home of the grub of the gall fly. About the end of August this hollow chamber falls to the ground, and remains there throughout the winter, the insect issuing from the gall during the next spring.

SPECULATIONS OF AN UNSCIENTIFIC AGE.

The speculations of our forefathers as to the cause of the formation of the gall is so amusing, that I am tempted to tell of a few of them. How an insect got inside a gall, without any apparent entrance, was naturally a matter of the deepest wonderment. Some said the eggs were taken from the ground, and carried by the sap to the gall, that was already prepared and waiting for it; others that the germs floating in the air got fixed to certain parts of the tree, and then the growth of the tree, growing around them naturally, enclosed them; others, that although the insect belonged to the animal kingdom, it was the result of vegetable growth, just as leaves, flowers, and fruit are. And then of course came in the explanation of spontaneous generation, an explanation that was always put forward when every other failed. It was all very mysterious, and so the little insect was made to foretell coming events. The unpierced gall was believed to contain a fly, a spider, a worm. If a fly was found—the fly of course was the fully matured insect and the worm its lava—it prophesied war, if a worm, the price of commodities might be expected to rise, and if the insect turned out to be a spider, then might be expected a terrible time of pestilence and death. It is not so easy to see what was meant by the spider, unless galls containing mites or beetles were referred to.

BIRDS DO MORE GOOD THAN HARM.

I have long been under the impression that birds, by making away with more destructive insects and seeds of weeds, than they eat fruit or grain, do far more good than they do harm, and this opinion is, I am pleased to see, rapidly gaining ground, amongst all trained observers. I have heard lately of a celebrated fruit-grower who, for a time, killed birds that lived in his orchards, but after careful observation came to the conclusion that birds who were fed on the premises, although destroying a certain

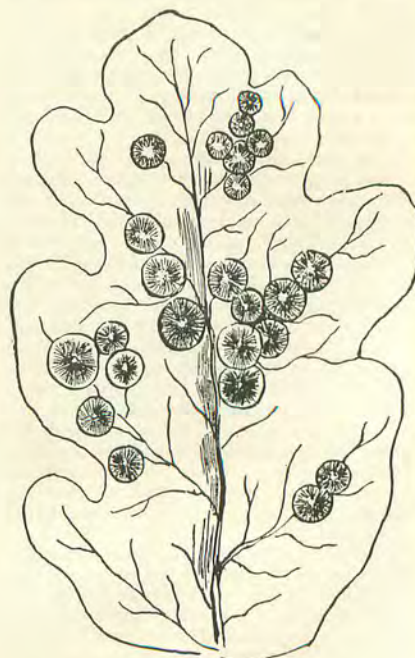
number of buds and eating a certain quantity of fruit, more than compensated for this damage by eating the enemies of the fruit-grower, through all the stages of their existence. At the same time he decided that it was unwise to grow fruit near a wood, as the birds swarm from the wood amongst the trees, when the fruit ripens, and by going back after their feast into the wood again do not destroy a sufficiency of insects as compensation at other times. It has been nearly universally thought that birds of prey do more harm than good, but this popular idea turns out to be false. A body of scientific men in America examined the stomachs of 2212 birds of prey, and it was found that fifty-six per cent. contained mice, twenty-seven per cent. insects, and only three and a half per cent. poultry or game-birds. The great enemy to many of our rapidly disappearing species of birds is the collector. Can any words be too strong to express the vile selfishness of the man who deliberately kills a rare bird whenever he gets a chance. A great living picture, a nobly executed work of art, a soul-elevating piece of music, an energising, deeply-penetrating thought, beautifully expressed in poetry or prose, may be replaced. Yes, and replaced by better, if there be any truth in human progress; but a species of birds, one of God's most perfect handiworks, once destroyed, is gone from the earth for ever; no time can repair the loss, and thousands of weary, city-encompassed human beings have missed the chance of having their dull eyes and pale cheeks brightened up by the sight of the lovely swift moving life. And then when it is in the collection it is no more like the living bird than the poor, still, pale body of the dead is like the moving emotional body of the friend who once walked by our side. Life that gave flush to the skin and colour to the bird, and makes all things beautiful, is gone. Let the birds go free then to enjoy the unhindered life for which they, of all living things, are most fitted. It is



Artichoke Gall of Oak Tree.



Section of Oak apple, showing cells of Gall-flies.



Portion of Oak Leaf with Spangles.

surely more pleasure to watch and observe them flying here and there as they will, than to see them, with dull plumage and unhappy movement, confined within the bars of a cage, or see them stuffed in a collection, a mockery of their real selves.

A DOE AND HER FAWN: A MOTHER'S INTELLIGENCE.

How often do we notice that the parental instinct develops unusual characteristics of bravery, endurance and intelligence. I once owned a little fox-terrier; she was an absolute little coward, and would not face the smallest mouse; but when this nervous,

cowardly little creature had puppies, she became a perfect little fiend; no one could go near her, and she did not seem to fear man or beast; but directly she weaned her puppies, she became as cowardly as before. A partridge by shamming itself wounded, and flying just in front of the dog, will in this manner attract them away from its young. But one of the prettiest acts of great maternal intelligence that has been brought under my notice, is recorded by Mr. Hudson, in his delightful book, *Naturalist in La Plata*.

When hunters and dogs are in pursuit of the common deer and her little one, that are found on the Pampas of South America, the doe will remain quite still, with the fawn

motionless by her side, then at a given signal, the fawn will rush some eight hundred or a thousand yards away, and with its little head stretched close to the earth, will hide itself amidst the long grass or uneven ground. The mother in the meantime stands without the slightest movement till the dogs come near her, and then she will start off, pretending to be lame, and by keeping just in front of the dogs, entice them in the opposite direction to her little one.

I do sincerely trust that this act of great intelligence is in most cases rewarded by doe and fawn escaping from the bloodthirsty hunters and his dogs, and rejoining each other again.

A VANISHED HAND.

By SARAH DOUDNEY, Author of "Michaelmas Daisy," etc.

CHAPTER XVII.

THE PICNIC.

"The chatters chatter, here and there,
They chatter of they know not what."

Owen Meredith.



HE cool, brown holiday-looking thing was donned in obedience to Mrs. Lennard's decree. Mrs. Verdon had written to her milliner to send her down something new for the occasion in the shape of headgear. But Elsie had spent an hour in her room, on the day before the picnic, and had re-trimmed a black chip hat with black lace and soft knots of scarlet ribbon.

"I am not a rich woman," she said to the rector's wife. "And if I were, I should still like to use the gifts that have been given me. I think we should not let any gift get rusty for lack of use."

"You would have made an excellent wife for a poor man, my dear," Mrs. Lennard remarked.

"I shall never be any man's wife," said Elsie. "I mean to devote myself to the poor, and especially devote myself to children. That is my vocation; I see it plainly."

"Indeed"—Mrs. Lennard leaned back in her chair with a satisfied little smile as she surveyed her favourite—"I don't think I would adopt that kind of dress just yet, if I were you. Black lace and a touch of scarlet are very becoming."

The day of the picnic was as balmy and blue as those that had gone before.

The dew was still hanging on the clustered white roses which climbed to her latticed casement when Elsie looked out. The sweet, wet blossoms touched her face as she leaned forward into the pure morning air.

Her window overlooked that side of the garden nearest to the lane. And someone, strolling between the leafy hedges, looked up and saw a vision of a bright, yet delicate face, framed in a quantity of thick, dark, rumpled hair.

He stood still, well hidden by the screen of leaves, and gazed upward in silent delight. The pretty picture only lasted half a minute; she vanished, and he, finding that the casement remained a blank, went back over a gate, and across dew-wet fields, to his solitary breakfast.

The picnic was exactly like other picnics. A space of level turf, under the shade of some fine beeches, had been chosen as the banqueting-place.

It was quite an aristocratic gathering; most of the important people of the county were there. There were white and rose-colour, violet and primrose, showing out amongst other indescribable tints. Frilled parasols were unfurled like great flowers; the place was filled with dainty fabrics, and soft hues, and laughter and ceaseless movement. All this flutter and commotion made Elsie feel intensely quiet. Somehow, although she was by no means unnoticed, she could not enter into the spirit of the hour.

Jamie did not care about the ladies and their pretty dresses; but he appreciated the good things to eat. Mrs. Verdon had said that he was too young to be of the party, but had ended by bringing him. Home was only a little way off, and nurse was among the other servants. Meanwhile the boy had stationed himself by Elsie's side, and she was keeping a careful watch over his plate.

Arnold saw them sitting together on the edge of the crowd, and longed to join them. But the party had assembled in his field, and he had a host's duties to perform. His father's friends came round him, glad to see that he had returned to the Court; elderly men prof-

ferred advice about this matter and that, taking it for granted that he would be a wanderer no more; matrons regarded him with motherly eyes. And Elsie silently thought that he looked like a prince upon his own borders, bidding them all welcome.

Lily Danforth, with two girl friends from the other side of the county, was sitting near her. The men moved about helping everybody, supplying their own needs in a rambling fashion. It was altogether a gay, informal kind of affair.

"I suppose it must be true," one of the girls said. "It was Henry who told us the news. He said that her horses bolted, and Mr. Wayne stopped them, and then it turned out that they had heard of each other for years. Such a story can have but one ending."

"I think the ending is pretty certain," Lily answered, with gay confidence. "In fact he has confessed as much to my father. We are all delighted. She is charming; and we were afraid he would settle down as a confirmed bachelor or not settle at all."

"She is really pretty, and so distinguished-looking," the other girl joined in. "I hope she'll give no end of balls at the Court. Just look at her now!"

Involuntarily following the direction of the speaker's glance, Elsie saw Mrs. Verdon and Arnold. He was putting something into her plate, and she was gazing up at him with eyes that seemed no longer wanting in colour and expression. Whether he returned that gaze or not, Elsie, at the moment, could not tell. But, being a woman in love, she jumped to the conclusion that he did.

Moreover, there were Lily's words to ring in her ears like a chime: "In fact he has confessed as much to my father."

A sudden heart-sinking made her inexpressibly weary of her surroundings, and then she rallied, angry with herself—rallied just in time to see Jamie taking a second plateful of cherry-tart.

"Not a bit more, little man," she said resolutely. "Everybody else has finished. You wouldn't like to sit here and eat all alone. I think we had better

Joe Gunter, and it was entirely on her account that he made several successive journeys to London.

There were persons at Swanbaston who said it was fine goings on to be running off to London every now and then, neglecting the farm and his old father, and they would not have thought that Joe could have been capable of such conduct. But others were more lenient, and viewed the proceedings with indulgent eyes. Among the latter were old Isaac and good Mrs. Larder, who instead of making ill-natured remarks, did their best to further the young countryman's desires.

In this there was some little difficulty, for it

was some time before Katie could be made to believe that Joe Gunter's visits to London, and more especially to Park Lane, were in any way connected with herself. It was not till she had received unmistakable proofs of his devotion that she began to think differently.

Then one day she hastily sought Mrs. Larder, and with smiles and blushes asked what she thought of Joe Gunter wishing to make her his wife?

And Mrs. Larder answered,

"What do I think of it, my dear? Why, very nice indeed; and I've known you long enough to feel sure that you will be a kind

and thoughtful mistress at Briar-wood Farm, and that you will do your best to make all happy."

And Katie does do her best, and she does make all happy; and friends who were foremost in thinking it so very ungenteel for her to go to service, have long altered their opinion. And in all Swanbaston there is no better manager nor happier matron than young Mrs. Gunter; and if there are any who doubt this assertion they had better ask Joe's father what he thinks. Certain it is that neither he nor Joe has ever regretted the latter's choice of a wife.

S. L. HANDS.

THOUGHTS AND OBSERVATIONS ON NATURAL HISTORY.

By H. B. M. BUCHANAN, B.A.

PART V.

FOR ages past man has fondly dreamt the dream that all things—trees, flowers, fruit, and the great kingdom of animal life—were principally fashioned for his special benefit and happiness. The exact research, the patient gathering together of facts, the closely-reasoned deductions from these accumulating facts that are specially marking these modern days, is dissipating the dream, and showing in its stead a picture more worthy of this great and mysterious Universe. It is being realised more and more that the bird's colour and swiftness of wing, that the tree's green leaf and ripened fruit, that the wayside flower's colour and smell, that the snake's hiss and poison, that the lion's flesh-tearing fang and sharpened claw, that the deer's quick danger-sense and fleetness of foot, that these and all the innumerable forms, ways, and doings of Nature, have arisen to preserve more effectually the life once granted to their ancestors in the far-off past, and to develop through time the most suitable, and therefore the most perfect, forms of life.

It is being realised more and more that every form and process, that every colour, scent, and taste exists primarily to conserve the life of the race; and that while each individual of its race obeys the great law to live as best it may, cannot live to itself alone, but must, consciously or unconsciously, administer to the needs and well-being of others, and that in this magnificent scheme man takes his higher and more conscious part.

When this revealing insight dawns upon the vision of man, then will a deeper reverence for all things permeate his being; then he will inflict no unnecessary pang of suffering upon the lowliest worm that crawls, but, instead, the Universe will be to him full of sacredness, full of meaning, full of hope. Then will a primrose be to him more than a primrose.

PUMA THE FRIEND OF MAN.

The lesser lion of the New World, as the puma is called, is a carnivorous animal, fawn-

coloured, without a mane, and much smaller than the lion. It is very courageous, active, and skilful, and attacks its enemy the jaguar—an animal much larger than itself—by jumping on to its back and inflicting terrible wounds with its teeth and claws. The puma of South America has an uncontrollable desire for horseflesh, and kills all its victims instantaneously, which it does by jumping on to their backs, and with one claw on the chest and the other on the head gives a violent and sudden wrench that breaks the neck. The natives can always recognise the work of the puma by these broken necks. The ass, when attacked by the puma, does not lose its presence of mind, but puts its head well down between its forelegs, and by kicking violently drives the animal off. Although the puma is so skilful and courageous in attacking animals both smaller and larger than itself, it, curiously, will not only not attack but not even defend itself against man. A man or child can sleep on the open pampa of South America without fear from the puma. When the natives throw



SAVED BY A PUMA.

their lasso around its neck and approach it for the purpose of killing it, the poor beast will lose its fierce bearing, moan and cry piteously, and great tears will pour out of its eyes. Mr. Hudson, in his *Naturalist of La Plata*, gives some interesting stories of this disinclination on the part of the puma to harm men. A gauchos of South America had fallen asleep in the open, and on waking during the night saw two full-grown pumas with their little ones close to him. This sight did not in the least alarm him, and he watched them playing about him, jumping over him, till he fell asleep again, and when he awoke in the morning they were gone. Another story of Mr. Hudson's. A man fell off his horse and broke his leg, and, while lying on the ground helpless, to his horror he saw a jaguar approaching him, and realised in a few awful moments the beast's great fangs and cruel claws slowly pulling him to bits, when to his agonised heart came the blessed relief of a puma growl. His deliverer at once engaged the jaguar in deadly combat and eventually drove it off.

A very pretty tradition was current amongst the early settlers of Buenos Ayres. A young girl had committed an act of treachery against the white people, and was condemned to be tied to a tree for two nights and a day as a punishment. At the end of the time some soldiers went, expecting to see her bones picked, but, to their surprise, they found her unharmed. A puma had defended her, she said, against all comers. The girl was at once released and pardoned, as her life being spared was looked upon as a direct interposition of Providence. So convinced are the gauchos that the puma will do them no harm, that, although they will kill them in defence of their horses and sheep—they will not touch cattle—they consider it a crime to kill them in the open, very justly looking upon them as the friend of man. Mr. Hudson speculates as to the reason for this unusual characteristic, and says that colour, scent, noises, affect different animals in strange ways, and suggests that there may be something in man of this nature that safeguards him against the puma; but he ends his speculations by quoting the wise words of Humboldt, "There is something mysterious in the hatreds and affections of animals."

THE CRY OF THE BIRDS.

When the white flakes cover tree and ground with a thick snow-blanket, and the pools of water are solid with the winter's ice, then do the birds plead with a dumb pathos for the few scraps that are left after we have eaten well, and for a little water fresh each day, and hard is the heart that can resist such an appeal.



It is difficult to understand how so many birds live through a long winter's frost and snow. The few remaining berries of the mountain-ash and hawthorn are gone, insect-life is dead or sleeping in concealment, the ground is too hard for the worms to move where the birds can get at them. A few birds that winter with us migrate to any part of the country where the conditions are more favourable for obtaining their food, but a faithful few will cling to their locality come what may; for these (at the expense of a little thought and trouble) we can do something to lighten the severity of their winter's life. A freshly-picked bone, not too well picked, tied by a string to tree or bush, will help the tits; scraps of meat and bread, collected after each meal, will be a merciful charity to the spar-

rows, robins, starlings, thrushes, blackbirds, and the stray chaffinch. That true observer and beautiful writer on what he noticed, Richard Jefferies, says, that in every garden there should be placed a plank, at a height beyond the clean jump of a cat, supported by two uprights, with the edges of the plank at a sufficient distance from the uprights to prevent the cat from crawling up the uprights on to the plank, and then on the plank place food and water.

All such kindly thoughts for the birds will be rewarded by their nesting next spring in the locality, and making us the happier by singing their beautiful hymn to life.

Last spring, in this Surrey suburban garden, were planted some corn-flowers. About the middle of June they began to seed. One day, to my surprise and delight, two bulfinches, cock and hen—they are very rare in this part of Surrey—perched on the corn-flower stalks and greedily devoured the seeds. They came each day for about a fortnight, and gave me many moments of pure enjoyment in watching their beautiful colouring and quick, happy movements.

SNAKE STONES.

A firm belief prevails in the East that a certain stone applied to the bite of a poisonous snake will prevent any fatal results. This stone is a kind of bezoar, or biliary concretion, found in the stomach of various animals. It is about the size of a bean, an absorbent, and chiefly consists of phosphate of lime. I had many doubts as to whether the stone can really do what it is said to do, but the evidence both of scientific Europeans and trustworthy natives is so strong that I think there can be little room to question it. The blood is first induced to flow towards the punctured parts, to which the stones are applied; they hang on for two or three minutes, imbibing the blood that oozes from the bites into their porous texture, and if they have been applied soon enough the bitten person recovers. In some places the stones, after their application, are thrown into milk, which seems to make them disgorge their poison, as until this is done they are useless for further service. In my next set of observations I shall give a wonderful instance of the intelligence of a cobra.

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QUESTIONS.

41. What was the name of God which was "not known" to Abraham? What do you understand by this statement?

42. Show from Genesis that the Ten Commandments were observed before they were given to Moses on Mount Sinai; and give a text showing that Abraham observed them.

43. Give an account of Miriam, and of her supposed husband; show the resemblance between Miriam, whose history is recorded in the Old Testament, and Anna, of whom we read in the New Testament. Give an account of the first battle fought by the Israelites in which Hur is mentioned.

44. What did the Song of Moses embody? Give the reference to it in the New Testament; and how was it sung?

45. Give a reference in the New Testament to the baptism of the Israelites "in the cloud and in the sea." How many of the multitude who crossed the Red Sea crossed the Jordan at the end of the Wanderings? and give a reference.

46. Name some of the benefits derived by the Israelites from their protracted wanderings in the desert.

47. On what recorded occasions did the Israelites murmur in the Wilderness? Show how they broke the first and second Commandments.

hemi-crania when the pain comes on periodically and spreads just over half the face and half the scalp. I do not know a more painful complaint in this world except sciatica, and I speak feelingly, for I have had sad experience of both.

The symptoms of either complaint are far too well known to need definition.

As to the *treatment*, of course this will differ in some cases, therefore I say that it is always best to consult one's own medical man at the beginning of the mischief. But as I know the "G. O. P." finds its way far away into rural districts and into outlying British islands, where doctors are seldom seen, I believe I do well to say a word or two about the treatment of neuralgia in this paper. Well, it is right you should know that anything that tends to lower the system mentally or bodily, or that weakens or sours the blood, is apt to induce an attack of neuralgia, particularly in the cold inclement months of spring.

If it isn't an Irish bull then I should say you must begin to cure your complaint by preventing its coming on at all. The diet must be good and nutritious, and remember, digestible. A fair amount of *meat* should be eaten, but it must be hung until tender. Good bread a day or two old, with fresh sweet butter, eggs in abundance, any amount of milk. Buttermilk or whey as a drink, and cod liver oil thrice a day after meals, beginning with a dessertspoonful and going gradually on to a tablespoonful. Exercise must be regular and pleasant, never fatiguing, and followed by rest. All the fresh air it is possible to get, and good sleep at night in a scientifically ventilated room. If you sleep in a close and stuffy room you undo all the good your exercise in the fresh air by day has done you. Sea-bathing is an excellent ward-off. Or you may have a sea-bath in your own room. Cold, mind you, and taken immediately after getting out of bed in the morning.

Study must be regulated and reading too. Good, honest, exhilarating study does good. But reading all kinds of stories, and the more

trashy of the magazines, gives the mind a list to leeward, if I may be permitted to speak like a sailor, and by-and-by the girl is on her beam ends with neuralgia or worse.

Those inclined to neuralgia must try to get a six weeks' holiday in summer, and spend it in a rational way by the seaside.

Of course I need hardly add that all exposure to damp and cold are exciting causes of neuralgia. A bad tooth may also bring on an attack in a girl disposed to this frightful complaint. People in this country are not half particular with their teeth. They ought to be seen to at once when one begins to go, else the caries will spread. But I am certain that girls could preserve their teeth sound to an almost indefinite time if they would take my advice as to cleaning them. It is here in a nutshell. Let the tooth-brush be a medium hard one. The toothpowder a disinfectant one such as sanitas, or one from some good firm, but not a quack advertised one, if you want to retain the enamel. For if the enamel is scoured off decay at once sets in. Brush the teeth inside and out and up and down as well as across or horizontally. Brush during toilet in the morning and—mark this pray—get into a habit of *brushing the teeth after every meal*. So shall your teeth be like alabaster, and your breath like new-mown hay or honeysuckle.

In the self-treatment of neuralgia the girl sufferer would do well to bear in mind two things, namely, the periodical nature of the attack, and the fact that it attacks the pale and anæmic in preference to the rosy and robust.

If the patient is residing in a district that is in the slightest degree malarious, such as the lands at the foot of the Thames or the fen districts, she will find it advantageous to take quinine. You cannot do better than ask for doses of quinine done up in the palatinoid form. It isn't a pill but a disc of gelatine. The drug is pure, and it slips down the throat so easy.

But iron may be needed. This also may

be taken in the double disc, palatinoid or bi-palatinoid form. The mixture takes place in the stomach, and this form does not produce constipation, which some who suffer from neuralgia find so distressing.

Croton-chloral is recommended by some, but, although it may give relief where there are decayed teeth, still it is not a safe medicine to use, and I cannot therefore recommend it.

But the chloride of ammonium is not only safe, but is often marvellous in its effects, especially if the trouble be in the face. It should be prescribed by a doctor, dose according to age. If it fails to cure in that time, it will be useless to continue it; for it is not a specific in every case.

There are other good remedies for neuralgia, but I fear the patient must trust to the family doctor for their administration. These are bromide of potassium, tincture of belladonna, and arsenic. There is also a so-called remedy called tonga, but I have no personal experience of it.

It has become, I think, too much the fashion of late to inject morphia under the skin. No doubt it procures relief for a time, but it induces the morphia habit and morphia mania, than which nothing more terrible can well be conceived.

Warmth in bed, with hot flannels under the face may cure a paroxysm, but a small blister behind the ear may be tried.

A little aconite ointment may give relief if rubbed in front of the ear; rubbed slowly in, and rubbed well in. But I must repeat, that if neuralgia is occasioned by a weakened system, you will always be subject to it until your system be stronger.

I had hoped to be able to say a few words about a complaint which is the bane of this dull climate of ours, namely, rheumatism. I am not sorry I have not done so, because the subject is of such vast importance that it deserves a paper to itself. And if possible it shall have it, if not next month in the month that follows.

THOUGHTS AND OBSERVATIONS ON NATURAL HISTORY.

By H. B. M. BUCHANAN, B.A.

PART VI.

THE rays of the sun are beginning to stir up movement everywhere. The birds that migrate from far distant countries disband their flocks, spread over the land, and those that mate afresh choose their partners, build their nests, and sing. The catkin-bearing trees are topped with the yellow male pollen, and the little embryo leaves that formed at the end of last summer are ready to cast off their winter covering and burst forth into the pure fresh green of spring. The squirrels and hibernating animals, that went to sleep for the winter, with a store of fat collected through the summer to feed on during their rest, are waking up lean and gaunt (they will be wise, and at first eat but little). Insects will soon fill the air with their comforting hum, and the swallows, after their 6000 miles migration flight, will chase and capture them in innumerable numbers. The wayside flowers are brightening up the foot of the still dead-looking hedge, and shafts of quivering green appear here and there. There is a feeling of expectancy in the air, a prophecy of never-dying life, of life ever renewed. The beams of the great solar giver of light and heat are warming the surface of the earth, which causes the air to rise, and the cold wind from the

north to rush in to fill the void; bitter blasts they are, from over tracts of country that have lain for months under the stillness of snow and ice. The sun's warmth in a sheltered spot, and the blast of the cold east wind in the open, seems a contradiction, as if life and death were struggling for the mastery. But life, fuller and more abundant, is destined now to be king.

Life, the great and inscrutable mystery. Life, that is made visible in all outward forms, in worm and man, in weed and waving tree; the unnumbered and endless varieties of living things that manifest the life of the great world. The iron is extracted from the iron ore, and the refuse is thrown into huge black banks, and soon life appears there. The big stone is raised from the roadside, and there appears under it creeping lowly forms of life. In all corners, on land and sea and in the air too, is life seeking to burst forth.

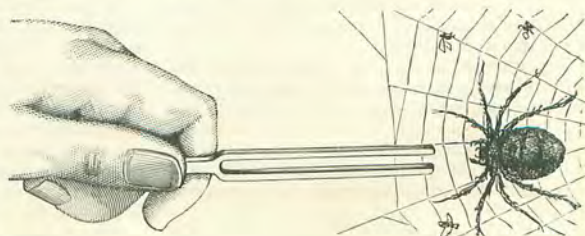
Life, deeper and fuller, is the solemn and awful command of the ages; all things administer to it, and when the contribution of any part to this great law has been

completed, death removes it with unflinching and merciful hand.

THE SPIDER AND THE TUNING-FORK.

A friend of mine one day sounded a tuning-fork within an inch or so of several spiders' webs, and found to his astonishment that in every case the spiders came for the fork in an attitude of attack. I could give him no explanation for this, as it had not come under my observation. Since then, I have learnt from naturalists who have studied spider-life, that a certain species of spider will attack the tuning-fork in the manner my friend described to me.

There are three species of spider common to our hedges and gardens. The one a big



one, which can be seen in the autumn in great numbers, sitting in the middle of its web, and the other two of a smaller and more graceful build; they all three spin webs of different patterns. When the tuning-fork is sounded over the web of the biggest spider, it will at once raise its forelegs to snatch at the instrument; when sounded over the smaller ones, one will drop at once by a single web to the ground, while the other will retreat to the furthest end of its web. Is it the vibratory movement of the tuning-fork that is communicated to the web, and felt by the spider through its legs, or does the spider hear the sound? Opinions are divided, but hardening in the direction of the spider hearing the sound. This is not so interesting, however, as Mr. Boys' explanations as to the reasons why the spiders act in the manner I have stated. Mr. Boys thinks that the sound of the tuning-fork is mistaken by the spider for the buzz of its natural enemy, the wasp. The big spider knows from experience that it can kill or keep off its enemy, and so springs forward to the attack. The smaller ones, on the other hand, know equally well from experience that, unless they can escape, they will be snatched by the wasp from their nest, and so they retreat, the one dropping to the ground, and the other seeking the shelter of the far corner of its web.

A spider looks to me such a calmly cruel and merciless insect; think of the tortures of the fly when it gets entangled amidst those deadly gossamer strings, the more it struggles the more completely does that web of death entwine it. But I am glad to learn from Mr. Pocock, that death to the fly after the spider's bite is very quick. Mr. Pocock made several experiments, by placing bees in different spiders' webs that spin amongst furze-bushes, and found that in every case the spider took good care to keep out of the range of the bee's sting, while encircling the unhappy insect round and round with its endless length of web, till all hope of escape was over. The spider then cautiously approached the bee, gave it one bite in the leg, and retreated to the corner of its web to watch the result. The struggles of the doomed thing got less and less, till within one minute of the bite they ceased altogether. The poison of the spider had done its work very speedily. Dr. Dallinger, who for many years has been making a close study of the ways and doings of spiders,

speaks very highly of their intelligence, and considers it of a more superior order than has usually been imagined. But all observers are now telling the same story of that particular form of life which they have sympathetically studied.

A SKUNK'S WEAPON OF DEFENCE.

"Poor old dog," was my comment, as I read from a letter that a beautiful-looking spaniel, with great, loving, trusting eyes, that I knew in England, had, in the innocence of his heart over in America, gone on the trail of what he thought was probably an English rabbit or hare, and coming up to the animal was seized by the nose, causing the poor old chap to howl with might and main. His master got him free, when the skunk sent over man and dog that awful spray of defence. Mr. Hudson, who has had experience of it in South America, says:—"Crushed garlic is lavender by comparison; it tortures the olfactory nerves, and seems to pervade the whole system like a pestilential ether, nauseating one, until seasickness seems almost a pleasant sensation in comparison."



The skunk of America is about the size of a large cat, and so awful is the effects of its spray, that no living thing—unless by mistake—will attack it, and in consequence it is quite fearless and will hardly get out of the way of man. Mr. Hudson tells of how a foolish eagle vulture, pressed by hunger, tried to seize that menacing tail, but immediately afterwards, began staggering about with dishevelled plumage, tearful eyes and a profusely woe-begone expression on its vulture face. After a dog has once experienced those few dreadful drops of perfume, it will hardly ever be induced to attack the little fiend again. But if after much persuasion and banter, a poor brute, bolder than the average, is urged to the attack, and can seize the skunk by the back, then the victory may lie with the dog; but if the spray reaches the dog before it can do this, it will

fall down as if shot, and not recover for days. A drop on a man's coat will render it quite useless for further wear. For the preservation of life, man has his developed brain, the elephant its tusks, the tiger its claws and teeth, the deer its fleetness of foot, the snake its poison, the stinging nettle its sting, the bush its thorn, and the skunk its drops of deadly perfume.

A COBRA'S INTELLIGENCE.

It is a belief in Ceylon and India that certain of the cobra carry about in their mouths a small shining stone, which they place in the grass after dark, keeping careful guard over it by a quick swaying to and fro of their dangerous heads. For a long time this was thought by Europeans to be a foolish delusion (I fear many scientific men are too apt to consider many things foolishness of which they have had no experience, and which does not come within the restricted laws known to them), until Professor H. Hensoldt was shown by a native the stone shining from the midst of the grass, and the cobra keeping guard over it, by a quick swaying to and fro of its spiteful-looking head. The stone was secured by a clever device on the part of the native and given to the professor, who examined it, and found it to be a semi-transparent water-worn pebble of yellowish colour about the size of a large pea, which in the dark, when previously warmed, emitted a greenish phosphorescent light—a rare variety of fluor spar. Professor Hensoldt gives the following explanation of this curious behaviour on the part of the cobra. The female fire-fly sits on the grass and emits an intermittent glowing light, as an attraction to the male fire-flies, that in consequence fly about her. The cobra is particularly fond of fire-flies, and uses the fluor spar stone as a decoy for the males, and as the males fly round the stone, which they mistake for the female, the cobra, by the rapid darting to and fro of his neck, catches them and makes a good dinner on them. Professor Hensoldt also suggests that the cobras made the discovery by accident, as they noticed how night after night the fire-flies gathered about the shining pebble. Several snakes would then gather, and it would require no great reasoning powers for the cobra to learn that the nearer it got to the stone the better chance would there be of its catching fire-flies, and so the law of competition would lead to the snake's seizing and carrying off the stone, and the habit thus slowly learnt from experience has become hereditary.

VARIETIES.

HE WAS NOT MUSICAL.

Mr. Noear: "What's this, another solo?"

Miss Playfair: "Yes; do you prefer the choruses?"

Mr. Noear: "Well, I don't see the use of dribbling the music out to us in solos, and duets, and trios, and quartettes, when they might just as well let them sing all together, and get through with it."

DOLLS IN JAPAN.—Girls in Japan are as much devoted to their dolls as their little sisters of other races. The third day of the third month is the doll festival, when every little girl receives presents of dolls from all her friends, and has a doll show in her house. There are also beautiful exhibitions of dressed dolls in certain streets in all the towns and cities, and the whole population turns out to celebrate the day and entertain the little folk.

HAVING EYES, THEY SEE NOT.

An idle poet here and there

Looks round him; but for all the rest

The world, unfathomably fair,

Is duller than a witling's jest.

Love wakes men, once a lifetime each;

They lift their heavy eyes, and look,

And lo! what one sweet page can teach

They read with joy, then shut the book.

And some give thanks, and some blaspheme,

And most forget; but, either way,

That and the child's unheeded dream

Is all the light of all their day.

Coventry Patmore.

IN DANGER.—In proportion as a girl suffers the smooth course of her thoughts to depend on anything external, whether on the greenness of the fields, or the gaiety of the streets, or the constancy of friends, so comes she nearer to the chance of shipwreck.

HELP FROM ON HIGH.

A missionary in Alaska saw a Bible tied at the top of a stick three feet long, and placed near the sick-bed of an old man. When asked the reason for this arrangement, the man said—

"I cannot read, but I know that the word of my Lord is there, and I look to heaven, and say, 'Father this is your book: there is nobody to teach me to read. Very good: you help me.' Then my heart grows stronger, and the bad goes away."

FREEDOM IN FRIENDSHIP.—There can be no friendship where there is no freedom. Friendship enjoys a free air, and will not be penned up in straight narrow enclosures. It will speak freely and act so, too, and take nothing ill where no ill is meant; nay, where it is, it will easily forgive and forget too, upon small acknowledgments.

Miss Vaughan, but my temper was up. And no wonder, I am sure you will say. Miss Herbert left the children at the door, who made a nice hash of the story. My mind went to two inquests and the dead-house at once. Then George and Emily had to be changed—in came a dozen tramps with orders for a night's lodging—off went Mrs. R. in hysterics—up came all Arymor to hear the news—and nobody to help but Delia."

Mara made no comment on this, so the irritable little man was huffed.

"I gave Gipsy George a good flogging," he said snappishly.

"You did? what for?" cried Mara, angrily.

"For neglecting the little ones. A sort of vicarious flogging, Miss Vaughan. I hope you'll remember in future that eight o'clock's the hour for closing the house. We're hard upon midnight now."

When they reached the workhouse several people were still about waiting

for the news; amongst them Betty True Blue.

"Where's the foundling, sir? Is Mr. Glyn safe?" echoed on all sides.

"Both safe," said the master.

"More's the pity for Mynydd," said one. "If the sea had taken him, all his troubles 'ould be over."

"The sea's better than the union," said Betty True Blue. "It do swallow you up, sure, and there's an end of you; but the union do sell you up, and swallow you up, and cast you up again, and pitch you about, till you might be one of them balls the jugglers is playing with."

"I wonder you come into it so often," said the master.

"I come for change of air, sir. All great ladies is going from the country to the salt water and back again for their health."

"I wish you would all go home!" said Roderick, going into the house.

Betty detained Mara to say—

"If you do be wanting help give me a wink, and I'll have the rheumatics 'rectly, and be here as fast as they'll let me. You know, miss *fach*, I am willing to do anything for you, for your own sake and Master Gerwyn's. I am not forgetting how he was standing at the top of my pig-stye with my little pig in his arms, when the sea broke into the house. 'Hurrah!' he was crying, 'Betty True Blue, here's your squeaker roaring like a radical,' and he did give him to me safe enough, before he did think of himself."

"Good-bye, Betty," said Mara, squeezing the good woman's hand.

"Good-night, miss," said several voices. "God bless you for caring for poor orphans."

Mara heard the blessing, and felt humble and sad.

(To be continued.)

THOUGHTS AND OBSERVATIONS ON NATURAL HISTORY.

By H. B. M. RUCHANAN, B.A.

PART VII.

AN IMPORTANT EXPERIMENT.



LITTLE over one hundred years ago, Dr. Priestley placed two mice under a glass shade, and found that as they exhausted the air within it they gradually died. Dr. Priestley then be- thought of placing under the shade a

plant, and found to his surprise that it lived. In due time he put other mice under the shade, and found that they lived. Now Dr. Priestley was not satisfied with simply recording these interesting facts, but surmised that these facts suggested some great principle of mutual help worked by mouse and plant, namely, that the plants purified the inside of the glass for the mice, and that the mice in their turn made the atmosphere suitable for the life of the plant. And he generalised further, that, in a universe wisely governed by orderly law, what is true of the mice and plants must be likewise true of all vegetable and animal life. During the last one hundred years of wonderful research, the microscope, chemical analysis, and allied sciences have proved the truth of the great principle that the plants and mice suggested to the mind of Priestley. How true it is that the ordinary everyday occurrences, unheeded mostly by the vast blind multitude, are, in the hands of those who can see, keys to unlock the secrets of Nature!

A true scientific mind is the mind that can select and gather together a few important facts, and from these facts rear a principle which in its turn will explain the facts; and if there is no body of undoubted facts which the principle cannot explain, then the inquirer has a complete chain of scientific demonstration. The facts suggest the principle, and the principle explains the facts, and the more completely this can be done, the more surely does the principle become a scientific certainty.

In the experience of our everyday life, mind,

consciously or unconsciously, precedes matter, and is, I believe, the source from whence matter comes. I could bring forward some very strong arguments to prove this, but must not in these notes enter into the metaphysics of this engrossing problem.

THE USE OF A LEAF.

The countless numbers of green leaves that clothe a tree in summer, and move with gentle rhythmical sound at the bidding of the winds, and glisten so brightly in the vibrating beams of the sun, are very beautiful to look upon. But they are more than this; they are the means a tree puts forth to secure its food; they clear the atmosphere of unwholesome gases, they regulate the rainfall of a district; equalise its temperature, and give shade, shelter, and rest to much flying, walking, and creeping life.

A tree sends down its tap-roots into the ground as its main support, and from it grow, in endless ramification, the underground branches, the root-hairs of which, with almost nervous intelligence, search for the moisture that carries in solution the salts of the earth, sulphates, nitrates, phosphates of lime, magnesia, and potash. The moisture thus collected flows to the main root, ascends the wood of the tree, then flows along its branches, twigs, and over its leaves, by that marvellous network of tissue, watering the growing cells along its course, and a great part escapes into the air by means of the little stomata. These little openings (stomata) are situated mostly in the underneath part of the leaf, and are like small mouths with curved lips, which have the power of closing to prevent the escape of moisture when very dry weather makes this necessary for the well-being of the tree. Several hundred thousand of them are said to exist in a single oak-leaf, 300 to 350 scattered over each square millimetre of leaf.

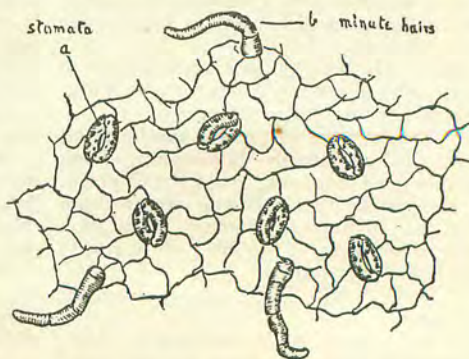
It is calculated that an oak-tree may have 700,000 leaves, and by means of these openings in its leaves throw off 226 times its own weight of water during the year, or 111,125 kilogrammes of water pass from its surface from June to October.

Foul air—carbon dioxide—arising from drainage, decaying vegetable and animal substances, which is so harmful to man, is taken up by the tree through these little openings, and by a marvellous piece of mechanism in the green of the leaf this poisonous carbonic dioxide is split up into two parts, carbon and oxygen; the carbon then recombines with the water and salts brought up from the root and is converted into starch, the food of the tree, while the surplus oxygen that the tree does not require is sent back into the air.

THE USE OF THE GREEN OF THE LEAF.

If a leaf is examined under the microscope, it will be seen to be composed of a network of fibres, amongst which lie the soft parts. The soft parts are the living vegetable cells, and the fibres are the conduit pipes which carry the food that these cells require if they are to live and thrive.

A vegetable cell is composed principally of a thin cell-wall, enclosing its simple protoplasmic life, which in its turn encloses the cell-sap. Embedded in the protoplasm are a great number of green chlorophyll corpuscles; so numerous and close together are they that they give the green appearance to the leaf. These green corpuscles require support for their life, and so carbon dioxide, oxygen, and other materials in the cell-sap, reach them as



LOWER EPIDERMIS OF LEAF SHOWING STOMATA.

food. Here now follows the most marvellous transformations which are going on in every one of the million green corpuscles that exist in every leaf. The green corpuscles act as traps, and into this trap is collected the foods I have mentioned above; the sunlight—or in other words the sun's rapid vibrations—then penetrate into the meshes of the chlorophyll, and tear asunder the carbon dioxide and water into their elements, carbon, hydrogen, and oxygen; and then these three elements, mixing again, in different proportions, with a little nitrogen, phosphorus, and sulphur, obtained from the earth's salts, form little granules of starch, the perfected food that is essential for all the living cells in every part of the tree.

So indeed it may be truly said that each granule of starch is a packet of stored energy captured from the external universe. Try to think of this marvel. All those numberless green leaves waving in the summer air are hard at work, storing food and life for the benefit of the great world of living things. I think it stands to reason that as green is the background of Nature, the human eye has got attuned to it, and therefore it is the best colour to shade our lights and candles with; certainly, bright colours, such as red, are most harmful. In these days of short sight and spectacles, this is important to note and act upon.

HOW THE MOTH ESCAPES FROM THE COCOON.

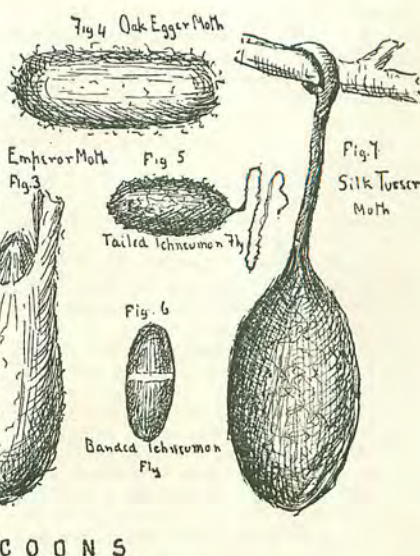
The caterpillar, in order to preserve the life of its race, stores an enormous amount of fat, which it accumulates from the vegetation on which it has lived, and then turns into a chrysalis, as a protection against enemies, and to continue living when winter has destroyed its food supply. In hibernation rest, living at a low vitality, the fat that it has stored is sufficient to keep it from death till the miraculous transformation takes place, and the seemingly lifeless pupa emerges from its imprisonment a full grown and beautiful moth.

The cocoon is built of silk, which in its raw state is a gummy substance, and is coiled in tubes extending from the head towards the tail, and issues in strings from an opening below the mouth. When exposed to the air, this glutinous silk material becomes hard and dry.

Amongst twigs, dead leaves, crevices, corners under ledges, the worker scatters a few threads that serve as a scaffold, in the centre of which the spinner builds mostly an oval-shaped cocoon, of so compact and hard a nature that in many cases it will turn the edge of a knife.

The soft-bodied egger and puss moths escape from their hard and compact shell by pushing off from the end an irregular piece of their cocoon, which looks as if it had been bitten off, although they do not possess any biting jaws. The manner of doing this was for very long a mystery, and many were the amusing speculations suggested as an explanation.

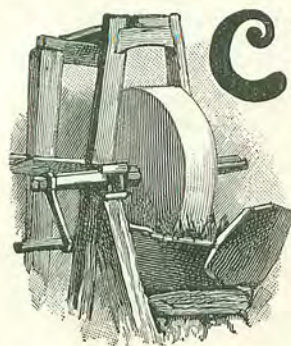
Mr. Oswald Salter conceived the brilliant idea of removing some pupae from their cocoons, and wrapping each in a piece of blotting-paper, so that each pupa had to pierce the blotting-paper instead of its cocoon; and when in due course it did this, Mr. Salter found that the point of escape was wetted;



and by collecting a sufficient quantity he was enabled to analyse the moistened part, and found the moisture to be caustic potash, a substance known to chemists as a powerful solvent. As a confirmation of this Mr. Salter placed a few drops of caustic potash inside several cocoons, and in three minutes they were dissolved into pulp. The head of the emerging moth is covered with a cap, which consists of the front part of the chrysalis shell that serves as a shield, and just behind this covering were discovered a couple of hard sharp points; so that now it is known that the moth first moistens its shell with caustic potash, and then with these sharp points cuts an opening by which it escapes from its imprisonment.

CAN GIRLS INCREASE THEIR STRENGTH?

By "MEDICUS."



CAN girls increase their strength? Undoubtedly they can, and in answering the question let me go even further, and state boldly and without fear of contradiction from anyone, that in the increase

of strength will lie an increase of health, and therefore additional happiness.

Health and happiness! Why, surely these are prizes well worth trying for, giving as they do an extra chance of a long and pleasant life, repose of mind and freedom from care and worry. Health and happiness—well, I will not go so far as to say that these are synonymous terms, but it is a fact nevertheless, that one cannot be long *unhappy* without suffering from derangement of the general health. On the other hand a healthful frame of body generates placidity of temper and evenness of mind. People who possess really good health may

not go about their day's labour in an extra-fussy or bustling way, but what they do, they as a rule do well, so that at night they have nothing to repent of, and can therefore place their heads on easy pillows and be certain of good refreshing sleep.

Moreover, health and strength are the deadly foes to all sorts of peevishness and nervous feelings that tend so much to the reduction of bodily vigour and the induction of early wrinkles, impure or sallow complexions, and eyes that are the reverse of bright.

"Oh!" I think I hear one of my gentle readers exclaim, "I should like to increase my strength, for indeed, Medicus, I am far from being either healthful or strong. Give me something to make me both, please."

Give you something indeed. No, you must not go that way to work. Lost health and strength are not to be won back in one day nor in twenty. And as for medicines for increasing bodily vigour those are mere secondary considerations.

"What then?" you ask, "shall I rush away and join a gymnasium?"

"No," again I answer, "nature will not be rushed."

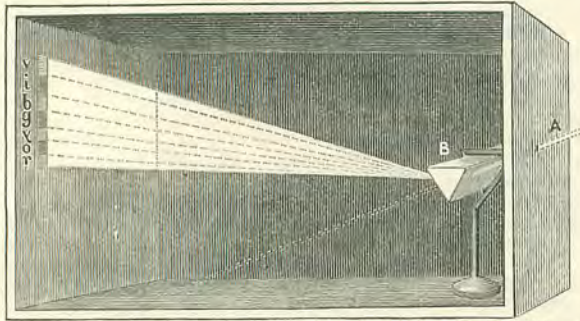
But in trying to rush nature many a girl lays the foundation of a feeble and weakly constitution, and injures herself irreparably. Gymnasiums are all very good in their way,

and the training learnt and gone into at them is often of the greatest advantage, but it must be carried out with some degree of common sense if not science.

Take a hypothetical case. Miss Smith, let us call her, because that is a very uncommon name, and hardly to be found in the London Directory, Miss Smith, I say, is but a wee mite of a thing, hardly indeed is she the height divine, five feet two inches, although she has turned seventeen. Miss Smith's face is somewhat pale, so too are her gums, while the muscles of her arms are as soft and "dweeble" to the feel as a boiled leek, and the arm not much thicker. She does take exercise, however, but it is by fits and starts, for mentally considered she is somewhat purposeless and unsteady, and apt to take up fads and fancies all of a sudden and abandon them in a week or two as tiresome and useless. The fact is that Miss Smith's mind is quite as "dweeble" as her body. I don't say that she is either ill or an invalid, though she has weary spells of it at times, tiredness towards evening, backache perhaps, and now and then a sleepless or dream-perturbed night which interferes materially with her appetite of a morning.

But it is said by her friends that Miss Smith has a deal of nerve or verve and go in her, and that she can walk quite a wondrous long way if she determines to do so. No doubt of it, I

THOUGHTS AND OBSERVATIONS ON NATURAL HISTORY.

PART VIII.
THE MYSTERY OF COLOUR.

Decomposition of a white beam of light (A), by a prism (B) into different bands of colour—(v) violet, (i) indigo, (b) blue, (g) green, (y) yellow, (o) orange, (r) red.

If in a small darkened room, a round hole is made high up in a shutter, and a ray of light allowed to enter through it, and fall upon a piece of glass called a prism, the ray will divide into violet, indigo, blue, green, yellow, orange, and red bands of colour. If these bands of colour are again allowed to fall upon a second prism, placed in a certain position, they will again be united into a white beam of light. This simple experiment proves that the white of a beam of light results from a mingling together of the colours of the spectrum. Red is seen by us to be red, because little vibratory waves, travelling at the rate of 458 million of million times in a second, fall upon the eye, the length of each wave being $\frac{1}{160000}$ of an inch. Violet is seen by us to be violet, because vibratory waves travelling at the rate of 727 million of million times per second fall upon the eye, and have a wave-length of $\frac{1}{250000}$ of an inch, and so on, each several colour having vibratory waves, that recur at different lengths and velocity.

Objects are put together in various ways, or in scientific language, have different molecular constructions, and so each molecular construction reflects back to the eye its own particular vibratory motion or colour. Thus the molecular surface of a white object reflects back to the eye the undivided white light, and takes into its own construction none. A black surface sends back practically none of the white light, but instead absorbs all the rays that fall upon it. A green surface absorbs or quenches all the other bands of colour which make up the white light, except the green, which it sends dancing back to the eye. Therefore a red rose is constructed in such a manner as to absorb or quench the different rates of vibration that make up the different colours, except the red vibration, which instead of absorbing, it sends back to the eye as little vibratory waves pulsing at the rate of 458 million of million times per second. Some flowers are constructed to send back blended colours, and so is obtained all the infinite variation of hues and colours seen in the garden and hedge-row.

THE USE OF COLOUR TO A FLOWER.

Mankind has for long ages, and with a fond conceit, imagined that the sweet smell and beautiful colour of flowers were fashioned with principal regard for his benefit. That they do administer to his purer and higher life cannot be questioned, but this is not the chief reason for their glorious existence.

The smell and colour of a flower are intended firstly as a method of securing the most healthy and perfect growth of the tree on which it appears; and while doing this essential work it unconsciously pours out on all sides a stream of the purest health and delight.

Human society will be verily in a noble state when its members live out earnestly and

easily their higher life, and in doing so administer mostly, fitly, and helpfully to the true happiness of those about them.

Cross fertilisation (by which is meant that the pollen of one tree of the same species is conveyed to another tree of the same species), is the means that vegetation employs to secure a strong and healthy existence.

The wind accomplishes this for the inconspicuous flowers of the pines, oaks, poplar, willow, hazel, nettles, grasses, sedges, etc. The bright petal has developed and unfolds itself as a signal to the butterfly, bee or insect that it contains a store of honey, which as a rule cannot be taken except by the insect

that bears on its body the pollen of another plant of the same species, and so the insect, in abstracting the honey (unconsciously I imagine) leaves behind part of the pollen it has collected, and thus is secured the greatly needed cross fertilisation.

Very showy flowers, especially those with variegated or spotted petals are seldom sweet; whereas white or very pale flowers, such as the jasmine and clematis, and inconspicuous flowers as the mignonette or sweet violet, have developed instead their sweet smell, which attracts certain insect fertilisers. Some flowers smell only at night as an invitation to the night-flying moths; were they to smell by day they would probably be robbed of their nectar by day-flying insects, which could not effect the requisite fertilisation.

A MOTH'S WEAPON OF DEFENCE.

One day I was walking along by some ugly looking suburban wooden palings, and noticed that what appeared a dead leaf (as is so often the case) had got stuck between its planks, and that a boy was looking hard at it. Being in a hurry, and with my thoughts far away, I walked on; but after going a few paces it occurred to me that the boy could not with open mouth be simply looking at a dead leaf, so I retraced my steps, and found that what I thought was a dead leaf was a lappet moth.

I at once secured the insect. Here is a very good illustration of how moths by mimicking their surroundings can deceive their enemies. The imitation was so good that I was deceived, and the boy was too puzzled to do anything except stare in wonder and astonishment.

In the American tropics exceedingly beautiful and bright butterflies (*Heliconidae*) fly about slowly and weakly, and being very conspicuous (as they are in no way like their surroundings) can easily be seen by their enemies, and yet they fly about in great numbers apparently

untouched. The reason being that these beautiful insects possess a strong, pungent, semiaromatic or medicinal odour, which seems to pervade all the juices of their system, and if squeezed between the fingers a yellow juice exudes that stains them, and requires a deal of washing to efface. Birds in consequence, learning from experience, will not touch them. My lappet moth had developed a dull brown colour (like a dead leaf) as a protection, whereas these South American butterflies have developed bright colours as a warning of danger; a protection against enemies being the end desired and effectually attained by both species.



Lappet Moth (*Lasiocampa Quercifolia*)

Now if any other butterflies, not having a nasty taste, can mimic in appearance the nasty flavoured ones, they would stand a good chance of deceiving their enemies, and thus of preserving their lives. This is done by certain of the lepalis, which so exactly resembles the nasty tasting heliconidae, that they not only delude their enemies, but have mystified such eminent naturalists as Bates and Wallace.

THE EFFECT OF MUSIC ON DOGS.

I have wondered, on seeing dogs howling at music, while not attempting to get away from it, what are the sensations that it excites in their brains. Does it with them as with us, only in lesser measure, arouse a sensation of sadness and pleasure subtly mixed, a dreamy feeling that there is a something beyond our experience which cannot be defined, suggestive of hope and harmony, of loftier existence than the present.

Some dogs will howl when the violin is played and not when the piano, and others will do just the reverse of this. Some notes will excite this effect and not others, and so on. I used to watch with amusement a smart-looking fox terrier, sitting, as was his habit, on the ledge of an upstairs window, noticing with the keenest interest the passers below him, and when one of his own race passed his excitement grew intense. One day he was sitting in his accustomed seat, when a street organ, quite unperceived by him (mark that), began to play. At the very first note his attentive keen head and forward ears were sent up into the air in an attitude of supreme despair, and he began to howl as if every nerve of his body was on the rack, just as if an electrical message had been sent from the first note straight to his brain.

On excellent authority I have heard of a dog who would howl directly his master began to extemporise, and if the composition proceeded, would jump on to his master's knees and try to paw away his hands from the piano.

Professor Weissmann, the noted German naturalist and philosopher, tells of a dog so fond of music that directly it began in the house he would come from distant rooms and open with his paw the door of the room where the music was going on. He knew of another dog who would never be kept at home during the fair, which was held twice a year at Frankfurt-on-the-Main. This dog would gratify his love of music by following the street bands that played at that time. His master indulged his musical talent by keeping his supper for him till his return home each evening.

H. B. M. BUCHANAN, B.A.



Lappet Moth on a Fence.

THOUGHTS AND OBSERVATIONS ON NATURAL HISTORY.

By H. B. M. BUCHANAN, B.A.

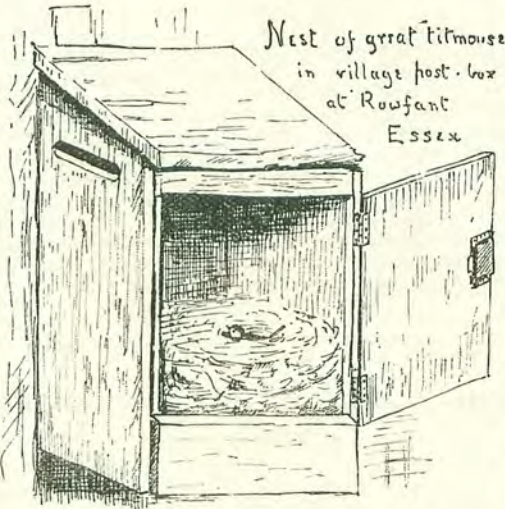
PART IX.

How diversified are the processes and appearances by which the great life principle in the world of matter makes itself apparent to our bodily senses, and how numberless are the methods it employs to hand on its never-dying energy. It is enclosed in the living protoplasm within the hard covering of a seed. In due season, in the ground under the influence of suitable conditions; it bursts forth into the first tender green leaves, and adds cell to cell, tissue to tissue, layer to layer, branch to branch, twig to twig, high up in the air, and wide on all sides; it bursts forth into countless green leaves to gather the aerial food that the parent plant requires. A little later it appears in a profusion of flowers of many shapes, hues of colour, and kinds of smell, to attract the pollen-bearing insect, which effects the needful cross-fertilisation. When this is completed the beautiful petals, their work done, fall to the ground, and it appears in the fruit of many colours, shapes, and tastes, so that the seed should not in the end be lost, but through the agency of birds and wind be conveyed to suitable spots where room can be found for the great mystery to be carried on.

Life on all sides so abundant. Life, nature's supremest and most precious gift, must not cease to be, but must continue, hidden within its clothing of matter through manifold and devious paths to work out its unknown but lofty destiny.

THE USE OF COLOUR AND TASTE IN FRUIT.

In a previous note I stated that the scent and smell of a flower were not primarily intended for man to enjoy, but had been developed to effect the all-essential cross-fertilisation of the vegetable world. After the fertilisation of a blossom is completed, the fruit appears in many colours, shapes, and tastes, for the purpose of securing the distribution of the seed. If the fruit simply fell



to the ground from the tree on which it had ripened, plant after plant would spring up only to kill one another in the fierce fight for room to live. If by chance a sturdy plantlet came off victorious and began to grow, it would shortly have to succumb, because under the shade of its parent tree it would lack many conditions necessary for its life.

It is essential, therefore, that some means of disposal should be employed, and so the seed is protected by a hard or stony covering which in its turn is enclosed by a succulent pericarp mostly of red or black colour. This ripened fruit is swallowed by the bird, but the precious seed, the life within the sweet morsel, being guarded by its hard covering cannot be digested by the bird, and so it is dropped in some spot where one day its hard covering falls away and it springs up to carry on the life of its kind.

The following are some of the British fruits distributed by birds in this manner: strawberry, blackberry, dewberry, cloudberry, barberry, arbutus, privet, spindle-tree, guelder rose, buckthorn, holly, ivy, honeysuckle, bryony, yew, mistletoe, sloe, arum, bird cherry, haw, wild rose, mountain ash, white bean tree, wild service tree, crab tree, juniper, etc.

Cultivated fruit must now be distributed by man, as owing to its size birds cannot effect the distribution. Birds can thrive on many poisonous fruits that would cause the death of mammals, and so some fruits have developed a nasty flavour and poisonous properties as a warning to animals who cannot distribute them to leave them alone.

ABOUT BIRDS' NESTS.

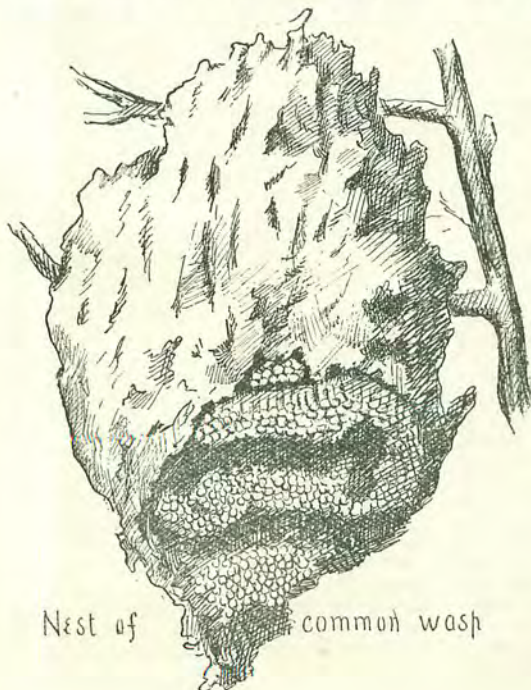
It is interesting to note that when male and female birds are rich in plumage and nearly alike in colour, such as our kingfisher, woodpecker, tits—they build their nests in banks and holes of trees, or in any situation that conceals the bright colours of the sitting bird from its enemies. But when the female is a dull colour and the male bright, the nest is mostly built in open and exposed places, and

nest, eggs, and sitting bird blend in hue with the surroundings so that perchance nest and bird may escape the notice of the destroyer.

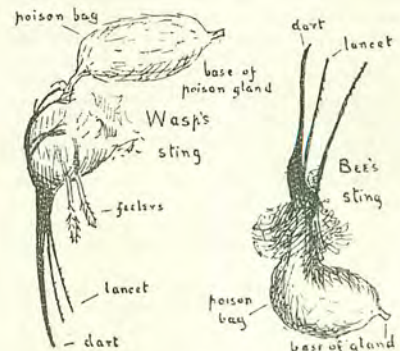
Birds are born with the instinct to build a nest, but seemingly learn the pattern from the nest in which they have been reared. Younger birds are said to mate very considerably with the older and more experienced birds in nest-building. All of this is borne out by these facts, "that the less perfect nests are built by younger birds and the more perfect by the older;" that birds brought up from the eggs in cages do not make the same construction of nest as their species, even though the proper materials are supplied to them, but put together a nest of the rudest structure; that some young chaffinches were taken from England and turned out in New Zealand, and instead of building the beautiful chaffinch nest so well-known to us, they built a nest loosely put together, lined with feathers, with its walls hanging down loosely about eighteen inches below the supporting branch.

Wrens flit about in hedgerows, low thickets, and so build their nests of moss. Rooks dig in pastures and ploughed field for grubs, and in so doing come across roots and fibres with which they line the inside of their nest. Crows feed on carrion, dead rabbits, etc., and frequenting sheep-walks and warrens line its nest with fur and wool. The lark frequents cultivated fields, and so makes its nest on the ground of dry grass stems lined with finer grass and rootlets. The kingfisher makes its nest of the bones of fish which it has eaten. Swallows make a nest of clay and mud taken from the margin of the ponds and rivers where they seek insect food.

In 1888 a pair of great titmice began to build their nest in the post-box which stood in the road, and into which letters were posted and taken out by the door daily. One of the birds was killed by a boy, and the nest was not finished. In 1889 a pair completed the nest, laid seven eggs and began to sit, but one day, when an unusual number of post-cards were dropped into and nearly filled the box, the birds deserted the nest, which was afterwards removed with the eggs. In 1890 a pair built a new nest, laid seven eggs, and reared a brood of five young, although the letters posted were often found lying on the back of the sitting bird, which never left the nest when the door of the box was opened to take out



Nest of common wasp

Stings of Wasp and Bee
(not on same scale)

the letters. The birds went in and out by the slit for the letters.

A WASP PROVIDES FOR ITS YOUNG.

Mr. H. W. Bates, F.R.S., consumed with a burning zeal and unselfish desire to acquire more facts for science, spent some eight years away from his fellow white men, and lived amongst the half-castes and Indians on the Amazon. He is now dead, and science has lost a devoted son not easy to replace. The record of these years of observation, collection of specimens, and privations is most interestingly told by himself in *The Naturalist on the Amazon* (Murray). It is a book worth reading, simple in style and yet vivid with life and earnestness because, it seems to me, the writer was possessed of a wide sympathy, and with truthfulness and knowledge wrote

about the things he loved. In spirit it reminds me of White's *Natural History of Selborn*, and I could give no higher praise than that.

Bates in his book tells us that during one hot summer afternoon he watched a sand wasp about its parental duties. The female worked alone, and with forefeet furnished with a fringe of stiff bristles dug out of the sand a gallery two or three inches in length. Coming out of the hole it closed the entrance, and flying round a few times as if to take note of the locality, flew off. In a short time she returned with a benumbed fly in her grasp which she placed in the hole, and then proceeded to lay an egg in it, so that when her young grub was hatched it would find a plentiful supply of food ready to hand. After this was all finished she emerged from the hole, closing the entrance. Her wisdom in benumbing the fly

is evident, for were she to kill it outright it would shrivel and dry up and be useless as food by the time her young grub required it.

The sting of a wasp or a bee is a sharp dart, grooved on its under surface, along which groove work up and down two long narrow lancets which protrude beyond the dart. The dart and free end of the lancets are notched with teeth that point backwards like the end of the spear of a savage, so that when the insect is alarmed, as it generally is when it stings a human being, in the endeavour to extricate itself quickly it leaves behind the whole sting in the wound.

According to one naturalist, if a bee be allowed to sting a soft piece of leather or indiarubber, it will tear itself away leaving the sting behind beautifully dissected. Another naturalist says a wasp cannot do this, but will remain a prisoner till it is set free.

THE WARDS OF ST. MARGARET'S.

By SISTER JOAN.

CHAPTER XXII.



nearly six months after their arrival they saw no women except natives, and though everyone was very good to them, they both sighed occasionally for a

little female society, though congratulating themselves on their good fortune at having been sent together.

Surely it is true wisdom on the part of authorities to arrange as far as possible that friends should work together. All the trials would indeed have been intensified had Hope and Constance had nothing in common, and been possessed of natures that could not agree.

It is thought by some wonderful and pitiable that two or three educated women living together and working in the hospital do not always get on well amongst themselves. It is always a pity when such is the case, it spoils the work as well as the home-life; but surely it is more wonderful how well so many do agree.

Women brought up in very different atmospheres, with an utterly different training and consequently most varied ideas, are placed together, often in very close quarters. Unlike a doctor, who has his few hours' work in the wards, and can then choose his own company, the sisters must of necessity live their home-life together, and often work side by side in a hospital all day long. Sometimes wearied themselves in body, and often worried by trifling daily annoyances, surely they would be saints indeed if they never disagreed.

Hope and Constance were seated one day enjoying their afternoon tea just before starting their evening work, when two of the doctors, as sometimes was the case, came round and joined them.

"Well!" said the senior of the two, a tall fine-looking man with iron-grey hair, "you have heard, I suppose, that a reduction is to take place very soon. Are you ready for marching orders?"

"We have heard nothing definite," said Constance, "only rumours, which are often circulated, I think, by those who are longing to be off. Is this something fresh?"

"Yes, *bona fide* orders from home," he said; "we shall all soon be off, and a good thing too: people are apt to get into bad habits when there is so little to occupy the mind, as there has been here of late. I do not refer to the hospital," he went on, "I think we can none of us complain of want of work. By-the-bye!" he added, turning to Hope, "you have never seen the invalids embarking, have you? If you care to get up early to-morrow I will call for you, and you can look over the boat and see how comfortable they are during their ten days on the river. Very good," he said smiling as he took his leave, "remember, I shall call for you not later than half-past five."

He was true to his word, but they were ready for him, and the three quite enjoyed their brisk walk along the river side till they reached the place where the steamer lay. Everything looked fairly comfortable, they thought, and was in truth not to be compared to the accommodation on the barges, in which the men were packed like sardines in a tin when a regiment came or went. They quite enjoyed seeing all their sick boys so glad to be off at last, though many of them were looking tired already with the extra exertion and excitement.

"Where is Wilson?" said Constance to one old patient. (He had been ill again, and not able to go home with the last set of invalids as he had hoped to.)

The lad looked uncomfortable, and replied he had been drinking, and was not allowed to come.

Constance felt much grieved. "Out drinking?" she said to Dr. Cairns, as they walked back.

"Yes, he is a thorough scoundrel," he replied; "however, he has gone back to prison now, the best place for him."

He was not an unkind man, but Wilson by absenting himself as he had done, and then being found later on in a state of drunken insensibility, had given a good deal of trouble. Constance heard afterwards that he had been persuaded by some of his old friends to go to the canteen, and once there good resolutions were forgotten or abandoned. Surely his feelings on coming to himself were not to be envied, yet how many, alas! there are like him. The working man as he passes the gin-palaces on his way to work, is often sorely tempted by the persuasion or taunts of his associates to break his pledge and take a glass; but often thoughts of his loved ones at home help to drive back the tempter.

The young soldier in the barrack-room, who has resolved to be an abstainer, is often beset by all his comrades, taunted and jeered at on every possible occasion to such a degree by those who drink and are resolved that he shall do the same, that sometimes for the very sake of peace alone he yields.

A few weeks later Hope and Constance were standing once again in the early morning on board a Nile steamer, this time it was not to see others off. Their own orders had come, and they were bound for Cairo. They could hardly realise it. Though the packing up had been a very real business, it was hard to believe that they had looked their last on this spot in the desert, which, after more than a year's sojourn, had become very home-like.

"Well, our work here is over," Hope said to Constance, as they stood with the other passengers and watched the distance gradually widen between themselves and the shore; "I wonder where we shall be sent to next?"

"Yes, indeed," replied Constance; "and whether we shall still work together; that would be the dreadful part, but we won't even think of it yet. The orders were for England, so we shall have nearly a month, or possibly more, before we need trouble much about the future."

They gave themselves up in earnest to rest and enjoyment, and a very pleasant time they had; their fellow-passengers were most agreeable, and all the now familiar sights and sounds (the Arab villages with their herd of noisy children, the men working at the shadoofs turned by the oxen) seemed possessed of an added charm as they remembered that soon they would see and hear them no longer.

Twelve hours on the railway completed their journey, and brought them back once more within sight of the pyramids to the capital of the cities of the plain. It was quite dark when the train stopped, but they were soon seated in a roomy carriage driving quickly to the old hospital which they had left, it seemed, almost years ago.

"It is almost like being in England again," said Constance, as she looked around on the lighted streets and the throngs of people in the shops and cafés.

"Yes, it is delicious to be back," replied Hope. "I do not think anyone who has not lived in the desert for some time can realise the intense joy of a return to civilisation. I could not have believed that anything short of home itself could have produced such feelings."

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PART X.

HOW TO STUDY BOTANY.

Do not read text-books, only consult them, this is their real use to you; try to look and think for yourself. Go into the fields, along the lanes, if you cannot do this, into any small back garden, or any waste bit of ground, and examine with a small pocket lens (price 3s. 6d.), if you have one, if not, with finger and naked eye, any insignificant weed or wild flower you see; then ask yourself the question of what use is this or that part, ponder over it, and then go to the text-book and see what that has to say.

This observing and questioning once begun will grow; you will want to know how all manner of things move, why has this leaf and flower its colour, shape and smell. Why is the seed like this. What use is it to the plant itself. And then you will begin to inquire what part in the Grand Scheme does the plant fulfil, its relation and use to insect, bird, animal, and man. More and more you will yearn to know. And the effort to respond to this yearning will bring to you a strength, an interest, a joy which will bubble and flow like a clear stream of pure running mountain water. You will gradually begin to build for yourself a fair and orderly world, in which no harmful thing can have any abiding part. You will begin to understand that there is no dividing-line amidst the different branches of science, but that they are all parts one of another, and that to comprehend any one intelligently it is necessary to know something of them all; physics, chemistry, botany, zoology, man in muscle, and soil growth, all parts of a beautiful whole all dependent one upon another, no useless part, all equally necessary in their time and place. All balanced by the Giver of life, with such exactitude, that to alter one hair in the scales would be to strike the balance to its upsetting and to bring over this fair world chaos and hideous night.

SEEDS DISTRIBUTED BY SHOOTING.

In the hedgerows and ditches, and along the banks of the English lanes, so infinitely varied in their peaceful beauty, what wonderful and diverse operations and designs are taking place to secure the distribution of the ripened seed; winged seeds of suitable shapes for the wind to carry and let drop here and there in cleared space. Fruits of different shapes, colours and tastes, for the birds to swallow, and to let drop undigested through their bodies the hard seeds which were contained within. Seeds that hook themselves to the passer-by, so that perchance they may be conveyed to a bit of ground not overcrowded.

The wild geranium, Herb. Robert (*Geranium Robertianum*), that grows here and there so abundantly, when its pink petals have fallen and the seeds within its seed-case are ripe, by a simple mechanism shoots its seeds with a jerk some little distance. This little plant on Sir John Lubbock's billiard table shot them a distance of twenty feet. The wild vetch and violet also shoot their seeds.

The pods of the common broom, that grows principally on commons, and waste places, at the sight of whose yellow flowers the great Swedish botanist, Linnaeus, fell on his knees, and from an overflowing heart thanked God for having been permitted to see such loveliness, open with a pop, that at times can be distinctly heard, and throw their ripened seeds some distance. The capsule of the common



Seeds of Poppy, shaken out
by the wind.

poppy has little doors in the top, and when it is agitated by the wind, the seeds are ejected one by one through these small apertures; the little doors are protected from rain by an overhanging root, and are said to close themselves in wet weather.

In hot countries the squirting cucumber, when ripe, becomes so gorged with liquid, that at the slightest touch it will burst and send the seeds into one's face.

SEEDS DISTRIBUTED BY CLINGING.

In the autumn, a dry, bristly, roundish thing about the size of a large marble (the bur of the burdock) or the smaller fruit of the cleavers perhaps gets attached to our clothes or entangled in the long hair of our dog, and can only be got rid of with some difficulty.

The burdock, cleavers, agrimony, beer



Seeds distributed by clinging.



Seeds of Goose grass
distributed by clinging.
Cleavers.

parsley, and enchanter's nightshade, so common to our lanes, by means of hooks cling to any passer-by who may chance to knock against them, using this method of distributing their seed.

Seeds by adhering to the wool of sheep have been conveyed in the fleece to other countries, and a new and vigorous growth has resulted therefrom. In all the English plants I have named the hooks are so arranged as to provide for the removal of the seed, and although beautifully formed are small, but in some foreign species they are truly formidable. If the fruits of the *martynia*, found in Louisiana, get hold of an animal they are most difficult to remove. The fruit of the *harpagophytum*, a South American species, rolls about over the dry plains, and has been known, it is said, to attach itself to the skin of a lion, and the poor lordly brute in trying to tear it out of his flesh has got it into his mouth, and so perished miserably.

A kind of grass grows in Australia, in which the mass of inflorescence forms a large round head, and is thus driven for miles over the dry sands till it comes to a damp place, when it expands and soon strikes root. A small annual with rounded pods is met with in the sandy places in Egypt, Syria and Arabia, which when dry curls itself up into a ball or round cushion and is then driven by the wind till it finds a damp place, when it uncurls, the pods open, and the seeds drop out.

Comparatively little is at present known on the subject of seeds, they still hold back many of their secrets. Those only will be able to unravel more of their hidden mysteries who come to the quest with well-stored heads, pure and unprejudiced minds, and a supreme passion for truth.

THE DEATH-TICK—A LOVE SONG.

The sick room is very still in the middle of the night; the frame of the patient, worn with hard battling, just retains its flickering life; the watcher is doing all that knowledge and a great human love can do to assist the heavy struggle. When tick, tick, sounds with startling clearness through the quiet room it is a signal to the superstitious watcher that the struggling and nursing are of little use, and that the precious life so mysteriously wrapped up in the battered body must go forth to other scenes unknown to human experience and knowledge.

So powerful is the exercise of mind over matter, especially when holding together thus delicately, that a fall of hope in watcher or patient may effectually prevent recovery and hasten death.

How appalling to contemplate, the misery that superstition, arising from ignorance of the simplest laws of this world, has caused us poor men and women.

The dreaded death-tick is oftenest heard in old houses, and is made by insects which have their habitation in wood, and cause the noise by striking the wooden walls of their burrows with their hard head or jaws. It is supposed to be a love call, for when one insect has made four or five taps in quick succession it pauses, and is immediately answered by another from a different quarter. Mr. Smith, a naturalist, kept some of these insects in a box, and by knocking a table close to the box with a lead pencil five or six times got them to answer his summons. This they did by raising themselves on their front legs, and bobbing their heads up and down rapidly they tapped with their jaws the bottom of the box. The number of taps on each occasion was either four or five, usually the latter.

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PART XI.

THE INDUSTRIES OF ANIMALS.



ALL well-qualified and true observers, who have made a sympathetic study of the ways and doings of any particular branch of lowly life, are struck with the amount of intelligence displayed by its members, little

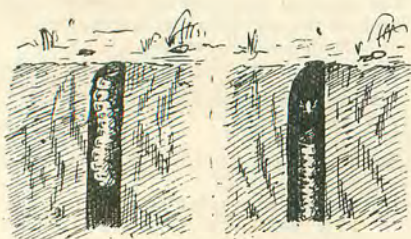
previously anticipated. Dr. Dallinger, an eminent and much respected scientist (whom nobody can accuse of making statements not borne out by facts), after a careful study of the life of spiders, extending over five years, is forced to grant to them a higher degree of intelligence than before such a study he had imagined, and which seems to have overwhelmed him with amazement. The same story reaches me from all sides. The poet and philosopher dreamt that all nature must be bound round by the golden cords of unity, and science, step by step, is proving the truth of their dream.

The manners and customs of the animal kingdom are found to bear a very close parallel to those of primitive man, or those of uncivilised man of the present day. As with primitive man, so with animals, they hunt and fish, store in barns, domesticate certain of their members, harvest, and reap, live in caverns. The fox and rodent dig dwellings in the earth. Certain birds construct their nests by the same method of manufacture as the woollen stuffs of which the wandering tribes make their tents to-day. The ants make vast dwellings of clay. The beavers build huts of wood and mud. As man has done, and still does, animals collect provisions, reduce their fellows to slavery, build admirably arranged houses, know how to make them healthy, and how to defend them against attacks from without, and also they, without doubt, possess the rudiments of ethical laws.

A CATERPILLAR LYING IN AMBUSH.

The most simple method of hunting employed by primitive man, was the ambush, namely, taking advantage of a thicket or some natural hiding-place to bound out on an unsuspecting victim. The Crocodile can make itself like a dead tree floating on the stream, and can disappear without producing the slightest movement of the water, and as noiselessly reappear amongst its intended victims. The Python hangs down like a creeper from a tree, and entwines its horrible body around the unfortunate victim passing below that has not noticed the delusion. A fox constructs a cleverly devised ambush when hunting hares.

The larva of a Tiger Beetle will bore a



Caterpillar lying in ambush

hole in the ground nearly the width of its body, but of an enormous depth for its size—forty centimetres. By arching its supple body against the sides of the hole, it keeps level with the surface of the ground, and thus closes up the hole. A little insect, say, an ant, comes along with no suspicion of the trap, as it is an exact imitation of the soil, but when the caterpillar feels the ant passing over its head it drops down into its long hole, taking with it the little ant, to have the juices of its body sucked out at leisure. The Ant Lion excavates a conical pit-fall, in which it conceals itself, and seizes any unfortunate ants, and other insects that may happen to fall into it.

THE BAITED AMBUSH.

This hunting by chance ambush is carried to a higher degree of perfection by the prepared ambush. So lovely a thing as a fish conceals itself in the mud, and makes a mobile and supple filament, which is attached to its lower jaw, look like a worm, so that the smaller fish prowling in its neighbourhood mistake it for food and disappears down the mouth of the big fish, before discovering their error.

Another fish, by fringed appendages all over its body, looks like a marine plant, and its general colour being exactly like its surroundings, conceals itself amidst the seaweed. From its head arises three movable filaments, formed by three spines detached from the upper fin. The fish, by agitating these three filaments, gives them the appearance of worms, and thus attracts the fish on which it feeds.

A FISH HUNTING WITH PROJECTILES.

Primitive man obtained his prey from a distance by throwing stones, shooting poisoned darts and arrows, and in later times civilised man does this by means of bullets. Certain creatures likewise secure their prey by projectiles from a distance. Certain fish swimming in the rivers of India live on



insects that wander over the leaves of aquatic plants, and to secure them, the *Toxotes* draw in a few drops of water, and contracting its mouth squirts it over the insect with such unerring aim as to bring it down into the water.

Other animals also squirt various liquids, sometimes in attack, but more especially in defence. The Cephalopods emit their ink, which darkens the water, and so allows them to escape. Another fish, the Chelinous of Java, in like manner squirts at a fly, and if it should miss the mark will shoot again till it

has succeeded, thus showing that its movements are not of a machine nature. The Chinese preserve these curious fish in jars, and amuse themselves by making them carry on this little exercise. These facts cannot be doubted, as they have been witnessed and described by many trustworthy observers.

HUNTING IN CO-OPERATION.

I have often watched with much amusement in the country different pairs of dogs having the most rollicking games together; they always put on a most innocent look as much as to say, "See, we are doing no harm, only having a game of fun together," but gradually in their play they would get further and further from their master's call, till away they go on a poaching expedition amongst the rabbits, to return in a few hours thin and hot, bearing a most demoralised and penitent look, fully aware of the flogging that awaited them.

I think this is a lingering instinct in dogs of the habit of hunting in pairs or flocks, which was the rule amongst their remote ancestors. Wolves and wild dogs hunt in bands and in strategy and relays, and by this means capture their prey, which, if hunting alone, they would not have a chance of securing.

Two wolves have been known to approach a flock of sheep; one of them attracts the attention of the guarding dog, who rushes after him with such ardour that he fails to perceive in the meantime the second thief has seized and dragged a sheep into the wood. The sheep-dog finally gives up the pursuit, and returns to his flock. Then the two confederates join each other and share the prey.

Sometimes a male wolf in company with a female, will hunt a deer whose swifter pace would give them no chance unless they adopted a dodge. So they undertake the chase in turns, one rests while the other hunts, and so clever is this arranged, that the hunted deer is always driven close to the concealed and resting wolf. By this system of relays, the strength of the deer is gradually exhausted, and is seized and killed. After which the two knowing rascals share the booty together.

Mr. Tennent tells of a trick which has twice to his knowledge been played on a dog, by two of the small glossy crows of Ceylon. A dog was intent on gnawing a bone; two crows approached, and tried all manner of devices, without success, to draw off the dog. At last one crow approached and dealt the dog a smart tap on the back; this being too much for the dog's control he made after the crow to avenge the insult, and in doing so left the bone unguarded, which the other crow promptly seized in his beak and carried off in triumph. Poor dog, how disgusted and humiliated he must have felt.



Crows hunting in co-operation