Allen Grant

The Evolutionist at Large

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Содержание

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Dear Mother, take this English posy, culled.
In alien fields beyond the severing sea:
Take it in memory of the boy you lulled
One chill Canadian winter on your knee.

Its flowers are but chance friends of after years,
Whose very names my childhood hardly knew;
And even today far sweeter in my ears
Ring older names unheard long seasons through.

I loved them all – the bloodroot, waxen white,
Canopied mayflower, trilliums red and pale,
Flaunting lobelia, lilies richly dight,
And pipe-plant from the wood behind the Swale.

I knew each dell where yellow violets blow,
Each bud or leaf the changing seasons bring;
I marked each spot where from the melting snow
Peeped forth the first hepatica of spring.

I watched the fireflies on the shingly ridge
Beside the swamp that bounds the Baron's hill;
Or tempted sunfish by the ebbing bridge,
Or hooked a bass by Shirley Going's mill.

These were my budding fancy's mother-tongue:
But daisies, cowslips, dodder, primrose-hips,
All beasts or birds my little book has sung,
Sit like a borrowed speech on stammering lips.

And still I build fond dreams of happier days,
If hard-earned pence may bridge the ocean o'er;
That yet our boy may see my mother's face,
And gather shells beside Ontario's shore:

May yet behold Canadian woodlands dim,
And flowers and birds his father loved to see;
While you and I sit by and smile on him,
As down grey years you sat and smiled on me.

G. A.

PREFACE

These Essays originally appeared in the columns of the 'St. James's Gazette,' and I have to thank the courtesy of the Editor for kind permission to republish them. My object in writing them was to make the general principles and methods of evolutionists a little more familiar to unscientific readers. Biologists usually deal with those underlying points of structure which are most really important, and on which all technical discussion must necessarily be based. But ordinary people care little for such minute anatomical and physiological details. They cannot be expected to interest themselves in the *flexor pollicis longus*, or the *hippocampus major* about whose very existence they are ignorant, and whose names suggest to them nothing but unpleasant ideas. What they want to find out is how the outward and visible forms of plants and animals were produced. They would much rather learn why birds have feathers than why they have a keeled sternum; and they think the origin of bright flowers far more attractive than the origin of monocotyledonous seeds or exogenous stems. It is with these surface questions of obvious outward appearance that I have attempted to deal in this little series. My plan is to take a simple and well-known natural object, and give such an explanation as evolutionary principles afford of its most striking external features. A strawberry, a snail-shell, a tadpole, a bird, a wayside flower – these are the sort of things which I have tried to explain. If I have not gone very deep, I hope at least that I have suggested in simple language the right way to go to work.

I must make an apology for the form in which the essays are cast, so far as regards the apparent egotism of the first person. When they appeared anonymously in the columns of a daily paper, this air of personality was not so obtrusive: now that they reappear under my own name, I fear it may prove somewhat too marked. Nevertheless, to cut out the personal pronoun would be to destroy the whole machinery of the work: so I have reluctantly decided to retain it, only begging the reader to bear in mind that the *I* of the essays is not a real personage, but the singular number of the editorial *we*.

I have made a few alterations and corrections in some of the papers, so as to bring the statements into closer accordance with scientific accuracy. At the same time, I should like to add that I have intentionally simplified the scientific facts as far as possible. Thus, instead of saying that the groundsel is a composite, I have said that it is a daisy by family; and instead of saying that the ascidian larva belongs to the sub-kingdom Chordata, I have said that it is a first cousin of the tadpole. For these simplifications, I hope technical biologists will pardon me. After all, if you wish to be understood, it is best to speak to people in words whose meanings they know. Definite and accurate terminology is necessary to express definite and accurate knowledge; but one may use vague expressions where the definite ones would convey no ideas.

I have to thank the kindness of my friend the Rev. E. Purcell, of Lincoln College, Oxford, for the clever and appropriate design which appears upon the cover.

G. A.

A BALLADE OF EVOLUTION

In the mud of the Cambrian main
Did our earliest ancestor dive:
From a shapeless albuminous grain
We mortals our being derive.
He could split himself up into five,
Or roll himself round like a ball;
For the fittest will always survive,
While the weakliest go to the wall.

As an active ascidian again
Fresh forms he began to contrive,
Till he grew to a fish with a brain,
And brought forth a mammal alive.
With his rivals he next had to strive,
To woo him a mate and a thrall;
So the handsomest managed to wive,
While the ugliest went to the wall.

At length as an ape he was fain
The nuts of the forest to rive;
Till he took to the low-lying plain,
And proceeded his fellow to knive.
Thus did cannibal men first arrive,
One another to swallow and maul;

And the strongest continued to thrive,
While the weakliest went to the wall.

Envoy

Prince, in our civilised hive,
Now money's the measure of all;
And the wealthy in coaches can drive,
While the needier go to the wall.

I.
MICROSCOPIC BRAINS

Sitting on this little rounded boss of gneiss beside the path which cuts obliquely through the meadow, I am engaged in watching a brigade of ants out on foraging duty, and intent on securing for the nest three whole segments of a deceased earthworm. They look for all the world like those busy companies one sees in the Egyptian wall-paintings, dragging home a huge granite colossus by sheer force of bone and sinew. Every muscle in their tiny bodies is strained to the utmost as they prise themselves laboriously against the great boulders which strew the path, and which are known to our Brobdingnagian intelligence as grains of sand. Besides the workers themselves, a whole battalion of stragglers runs to and fro upon the broad line which leads to the head-quarters of the community. The province of these stragglers, who seem so busy doing nothing, probably consists in keeping communications open, and encouraging the sturdy pullers by occasional relays of fresh workmen. I often wish that I could for a while get inside those tiny brains, and see, or rather smell, the world as ants do. For there can be little doubt that to these brave little carnivores here the universe is chiefly known as a collective bundle of odours, simultaneous or consecutive. As our world is mainly a world of visible objects, theirs, I believe, is mainly a world of olfactible things.

In the head of every one of these little creatures is something that we may fairly call a brain. Of course most insects have no real brains; the nerve-substance in their heads is a mere collection of ill-arranged ganglia, directly connected with their organs of sense. Whatever man may be, an earwig at least is a conscious, or rather a semi-conscious, automaton. He has just a few knots of nerve-cells in his little pate, each of which leads straight from his dim eye or his vague ear or his indefinite organs of taste; and his muscles obey the promptings of external sensations without possibility of hesitation or consideration, as mechanically as the valve of a steam-engine obeys the governor-balls. You may say of him truly, 'Nihil est in intellectu quod non fuerit in sensu;' and you need not even add the Leibnitzian saving clause, 'nisi ipse intellectus;' for the poor soul's intellect is wholly deficient, and the senses alone make up all that there is of him, subjectively considered. But it is not so with the highest insects. They have something which truly answers to the real brain of men, apes, and dogs, to the cerebral hemispheres and the cerebellum which are superadded in us mammals upon the simple sense-centres of lower creatures. Besides the eye, with its optic nerve and optic perceptive organs – besides the ear, with its similar mechanism – we mammalian lords of creation have a higher and more genuine brain, which collects and compares the information given to the senses, and sends down the appropriate messages to the muscles accordingly. Now, bees and flies and ants have got much the same sort of arrangement, on a smaller scale, within their tiny heads. On top of the little knots which do duty as nerve-centres for their eyes and mouths, stand two stalked bits of nervous matter, whose duty is analogous to that of our own brains. And that is why these three sorts of insects think and reason so much more intellectually than beetles or butterflies, and why the larger part of them have organised their domestic arrangements on such an excellent co-operative plan.

We know well enough what forms the main material of thought with bees and flies, and that is visible objects. For you must think about *something* if you think at all; and you can hardly imagine a contemplative blow-fly setting itself down to reflect, like a Hindu devotee, on the syllable Om, or on the oneness of existence. Abstract ideas are not likely to play a large part in apian consciousness. A bee has a very perfect eye, and with this eye it can see not only form, but also colour, as Sir John Lubbock's experiments have shown us. The information which it gets through its eye, coupled with other ideas derived from touch, smell, and taste, no doubt makes up the main thinkable and knowable universe as it reveals itself to the apian intelligence. To ourselves and to bees alike the world is, on the whole, a coloured picture, with the notions of distance and solidity thrown in by touch and muscular effort; but sight undoubtedly plays the first part in forming our total conception of things generally.

What, however, forms the thinkable universe of these little ants running to and fro so eagerly at my feet? That is a question which used long to puzzle me in my afternoon walks. The ant has a brain and an intelligence, but that brain and that intelligence must have been developed out of *something*. *Ex nihilo nihil fit.* You cannot think and know if you have nothing to think about. The intelligence of the bee and the fly was evolved in the course of their flying about and looking at things: the more they flew, and the more they saw, the more they knew; and the more brain they got to think with. But the ant does not generally fly, and, as with most comparatively unlocomotive animals, its sight is bad. True, the winged males and females have retained in part the usual sharp eyes of their class – for they are first cousins to the bees – and they also possess three little eyelets or *ocelli*, which are wanting to the wingless neuters. Without these they would never have found one another in their courtship, and they would have run their heads against the nearest tree, or rushed down the gaping throat of the first expectant swallow, and so effectually extinguished their race. Flying animals cannot do without eyes, and they always possess the most highly developed vision of any living creatures. But the wingless neuters are almost blind – in some species quite so; and Sir John Lubbock has shown that their appreciation of colour is mostly confined to an aversion to red light, and a comparative endurance of blue. Moreover, they are apparently deaf, and most of their other senses seem little developed. What can be the raw material on which that pin's head of a brain sets itself working? For, small as it is, it is a wonderful organ of intellect; and though Sir John Lubbock has shown us all too decisively that the originality and inventive genius of ants have been sadly overrated by Solomon and others, yet Darwin is probably right none the less in saying that no more marvellous atom of matter exists in the universe than this same wee lump of microscopic nerve substance.

My dog Grip, running about on the path there, with his nose to the ground, and sniffing at every stick and stone he meets on his way, gives us the clue to solve the problem. Grip, as Professor Croom Robertson suggests, seems capable of extracting a separate and distinguishable smell from everything. I have only to shy a stone on the beach among a thousand other stones, and my dog, like a well-bred retriever as he is, selects and brings back to me that individual stone from all the stones around, by exercise of his nose alone. It is plain that Grip's world is not merely a world of sights, but a world of smells as well. He not only smells smells, but he remembers smells, he thinks smells, he even dreams smells, as you may see by his sniffing and growling in his sleep. Now, if I were to cut open Grip's head (which heaven forfend), I should find in it a correspondingly big smell-nerve and smell-centre – an olfactory lobe, as the anatomists say. All the accumulated nasal experiences of his ancestors have made that lobe enormously developed. But in a man's head you would find a very large and fine optic centre, and only a mere shrivelled relic to represent the olfactory lobes. You and I and our ancestors have had but little occasion for sniffing and scenting; our sight and our touch have done duty as chief intelligencers from the outer world; and the nerves of smell, with their connected centres, have withered away to the degenerate condition in which they now are. Consequently, smell plays but a small part in our thought and our memories. The world that we know is chiefly a world of sights and touches. But in the brain of dog, or deer, or antelope, smell is a prevailing faculty; it colours all their ideas, and it has innumerable nervous connections with every part of their brain. The big olfactory lobes are in direct communication with a thousand other nerves; odours rouse trains of thought or powerful emotions in their minds just as visible objects do in our own.

Now, in the dog or the horse sight and smell are equally developed; so that they probably think of most things about equally in terms of each. In ourselves, sight is highly developed, and smell is a mere relic; so that we think of most things in terms of sight alone, and only rarely, as with a rose or a lily, in terms of both. But in ants, on the contrary, smell is highly developed and sight a mere relic; so that they probably think of most things as smellable only, and very little as visible in form or colour. Dr. Bastian has shown that bees and butterflies are largely guided by scent; and though he is certainly wrong in supposing that sight has little to do with leading them to flowers (for if you cut off the bright-coloured corolla they will never discover the mutilated blossoms, even when they visit others on the same plant), yet the mere fact that so many flowers are scented is by itself enough to show that perfume has a great deal to do with the matter. In wingless ants, while the eyes have undergone degeneration, this high sense of smell has been continued and further developed, till it has become their principal sense-endowment, and the chief raw material of their intelligence. Their active little brains are almost wholly engaged in correlating and co-ordinating smells with actions. Their olfactory nerves give them nearly all the information they can gain about the external world, and their brains take in this information and work out the proper movements which it indicates. By smell they find their way about and carry on the business of their lives. Just as you and I know the road from Regent's Circus to Pall Mall by visible signs of the street-corners and the Duke of York's Column, so these little ants know the way from the nest to the corpse of the dismembered worm by observing and remembering the smells which they met with on their way. See: I obliterate the track for an inch or two with my stick, and the little creatures go beside themselves with astonishment and dismay. They rush about wildly, inquiring of one another with their antennæ whether this is really Doomsday, and whether the whole course of nature has been suddenly revolutionised. Then, after a short consultation, they determine upon action; and every ant starts off in a different direction to hunt the lost track, head to the ground, exactly as a pointer hunts the missing trail of a bird or hare. Each ventures an inch or so off, and then runs back to find the rest, for fear he should get isolated altogether. At last, after many failures, one lucky fellow hits upon the well-remembered train of scents, and rushes back leaving smell-tracks no doubt upon the soil behind him. The message goes quickly round from post to post, each sentry making passes with his antennæ to the next picket, and so sending on the news to the main body in the rear. Within five minutes communications are re-established, and the precious bit of worm-meat continues triumphantly on its way along the recovered path. An ingenious writer would even have us believe that ants possess a scent-language of their own, and emit various odours from their antennæ which the other ants perceive with theirs, and recognise as distinct in meaning. Be this as it may, you cannot doubt, if you watch them long, that scents and scents alone form the chief means by which they recollect and know one another, or the external objects with which they come in contact. The whole universe is clearly to them a complicated picture made up entirely of infinite interfusing smells.

II.
A WAYSIDE BERRY

Half-hidden in the luxuriant growth of leaves and flowers that drape the deep side of this green lane, I have just espied a little picture in miniature, a tall wild strawberry-stalk with three full red berries standing out on its graceful branchlets. There are glossy hart's-tongues on the matted bank, and yellow hawkweeds, and bright bunches of red campion; but somehow, amid all that wealth of shape and colour, my eye falls and rests instinctively upon the three little ruddy berries, and upon nothing else. I pick the single stalk from the bank and hold it here in my hands. The origin and development of these pretty bits of red pulp is one of the many curious questions upon which modern theories of life have cast such a sudden and unexpected flood of light. What makes the strawberry stalk grow out into this odd and brightly coloured lump, bearing its small fruits embedded on its swollen surface? Clearly the agency of those same small birds who have been mainly instrumental in dressing the haw in its scarlet coat, and clothing the spindle-berries with their two-fold covering of crimson doublet and orange cloak.

In common language we speak of each single strawberry as a fruit. But it is in reality a collection of separate fruits, the tiny yellow-brown grains which stud its sides being each of them an individual little nut; while the sweet pulp is, in fact, no part of the true fruit at all, but merely a swollen stalk. There is a white potentilla so like a strawberry blossom that even a botanist must look closely at the plant before he can be sure of its identity. While they are in flower the two heads remain almost indistinguishable; but when the seed begins to set the potentilla develops only a collection of dry fruitlets, seated upon a green receptacle, the bed or soft expansion which hangs on to the 'hull' or calyx. Each fruitlet consists of a thin covering, enclosing a solitary seed. You may compare one of them separately to a plum, with its single kernel, only that in the plum the covering is thick and juicy, while in the potentilla and the fruitlets of the strawberry it is thin and dry. An almond comes still nearer to the mark. Now the potentilla shows us, as it were, the primitive form of the strawberry. But in the developed ripe strawberry as we now find it the fruitlets are not crowded upon a green receptacle. After flowering, the strawberry receptacle lengthens and broadens, so as to form a roundish mass of succulent pulp; and as the fruitlets approach maturity this sour green pulp becomes soft, sweet, and red. The little seed-like fruits, which are the important organs, stand out upon its surface like mere specks; while the comparatively unimportant receptacle is all that we usually think of when we talk about strawberries. After our usual Protagorean fashion we regard man as the measure of all things, and pay little heed to any part of the compound fruit-cluster save that which ministers directly to our own tastes.

But why does the strawberry develop this large mass of apparently useless matter? Simply in order the better to ensure the dispersion of its small brown fruitlets. Birds are always hunting for seeds and insects along the hedge-rows, and devouring such among them as contain any available foodstuff. In most cases they crush the seeds to pieces with their gizzards, and digest and assimilate their contents. Seeds of this class are generally enclosed in green or brown capsules, which often escape the notice of the birds, and so succeed in perpetuating their species. But there is another class of plants whose members possess hard and indigestible seeds, and so turn the greedy birds from dangerous enemies into useful allies. Supposing there was by chance, ages ago, one of these primitive ancestral strawberries, whose receptacle was a little more pulpy than usual, and contained a small quantity of sugary matter, such as is often found in various parts of plants; then it might happen to attract the attention of some hungry bird, which, by eating the soft pulp, would help in dispersing the indigestible fruitlets. As these fruitlets sprang up into healthy young plants, they would tend to reproduce the peculiarity in the structure of the receptacle which marked the parent stock, and some of them would probably display it in a more marked degree. These would be sure to get eaten in their turn, and so to become the originators of a still more pronounced strawberry type. As time went on, the largest and sweetest berries would constantly be chosen by the birds, till the whole species began to assume its existing character.

The receptacle would become softer and sweeter, and the fruits themselves harder and more indigestible: because, on the one hand, all sour or hard berries would stand a poorer chance of getting dispersed in good situations for their growth, while, on the other hand, all soft-shelled fruitlets would be ground up and digested by the bird, and thus effectually prevented from ever growing into future plants. Just in like manner, many tropical nuts have extravagantly hard shells, as only those survive which can successfully defy the teeth and hands of the clever and persistent monkey.

This accounts for the strawberry being sweet and pulpy, but not for its being red. Here, however, a similar reason comes into play. All ripening fruits and opening flowers have a natural tendency to grow bright red, or purple, or blue, though in many of them the tendency is repressed by the dangers attending brilliant displays of colour. This natural habit depends upon the oxidation of their tissues, and is exactly analogous to the assumption of autumn tints by leaves. If a plant, or part of a plant, is injured by such a change of colour, through being rendered more conspicuous to its foes, it soon loses the tendency under the influence of natural selection; in other words, those individuals which most display it get killed out, while those which least display it survive and thrive. On the other hand, if conspicuousness is an advantage to the plant, the exact opposite happens, and the tendency becomes developed into a confirmed habit. This is the case with the strawberry, as with many other fruits. The more bright-coloured the berry is, the better its chance of getting its fruitlets dispersed. Birds have quick eyes for colour, especially for red and white; and therefore almost all edible berries have assumed one or other of these two hues. So long as the fruitlets remain unripe, and would therefore be injured by being eaten, the pulp remains sour, green, and hard; but as soon as they have become fit for dispersion it grows soft, fills with sugary juice, and acquires its ruddy outer flesh. Then the birds see and recognise it as edible, and govern themselves accordingly.

But if this is the genesis of the strawberry, asks somebody, why have not all the potentillas and the whole strawberry tribe also become berries of the same type? Why are there still potentilla fruit-clusters which consist of groups of dry seed-like nuts? Ay, there's the rub. Science cannot answer as yet. After all, these questions are still in their infancy, and we can scarcely yet do more than discover a single stray interpretation here and there. In the present case a botanist can only suggest either that the potentilla finds its own mode of dispersion equally well adapted to its own peculiar circumstances, or else that the lucky accident, the casual combination of circumstances, which produced the first elongation of the receptacle in the strawberry has never happened to befall its more modest kinsfolk. For on such occasional freaks of nature the whole evolution of new varieties entirely depends. A gardener may raise a thousand seedlings, and only one or none among them may present a single new and important feature. So a species may wait for a thousand years, or for ever, before its circumstances happen to produce the first step towards some desirable improvement. One extra petal may be invaluable to a five-rayed flower as effecting some immense saving of pollen in its fertilisation; and yet the 'sport' which shall give it this sixth ray may never occur, or may be trodden down in the mire and destroyed by a passing cow.

III.
IN SUMMER FIELDS

Grip and I have come out for a morning stroll among the close-cropped pastures beside the beck, in the very centre of our green little dingle. Here I can sit, as is my wont, on a dry knoll, and watch the birds, beasts, insects, and herbs of the field, while Grip scours the place in every direction, intent, no doubt, upon those more practical objects – mostly rats, I fancy – which possess a congenial interest for the canine intelligence. From my coign of vantage on the knoll I can take care that he inflicts no grievous bodily injury upon the sheep, and that he receives none from the quick-tempered cow with the brass-knobbed horns. For a kind of ancestral feud seems to smoulder for ever between Grip and the whole race of kine, breaking out every now and then into open warfare, which calls for my prompt interference, in an attitude of armed but benevolent neutrality, merely for the friendly purpose of keeping the peace.

This ancient feud, I imagine, is really ancestral, and dates many ages further back in time than Grip's individual experiences. Cows hate dogs instinctively, from their earliest calfhood upward. I used to doubt once upon a time whether the hatred was not of artificial origin and wholly induced by the inveterate human habit of egging on every dog to worry every other animal that comes in its way. But I tried a mild experiment one day by putting a half-grown town-bred puppy into a small enclosure with some hitherto unworried calves, and they all turned to make a common headway against the intruder with the same striking unanimity as the most ancient and experienced cows. Hence I am inclined to suspect that the antipathy does actually result from a vaguely inherited instinct derived from the days when the ancestor of our kine was a wild bull, and the ancestor of our dogs a wolf, on the wide forest-clad plains of Central Europe. When a cow puts up its tail at sight of a dog entering its paddock at the present day, it has probably some dim instinctive consciousness that it stands in the presence of a dangerous hereditary foe; and as the wolves could only seize with safety a single isolated wild bull, so the cows now usually make common cause against the intruding dog, turning their heads in one direction with very unwonted unanimity, till his tail finally disappears under the opposite gate. Such inherited antipathies seem common and natural enough. Every species knows and dreads the ordinary enemies of its race. Mice scamper away from the very smell of a cat. Young chickens run to the shelter of their mother's wings when the shadow of a hawk passes over their heads. Mr. Darwin put a small snake into a paper bag, which he gave to the monkeys at the Zoo; and one monkey after another opened the bag, looked in upon the deadly foe of the quadrumanous kind, and promptly dropped the whole package with every gesture of horror and dismay. Even man himself –

though his instincts have all weakened so greatly with the growth of his more plastic intelligence, adapted to a wider and more modifiable set of external circumstances – seems to retain a vague and original terror of the serpentine form.

If we think of parallel cases, it is not curious that animals should thus instinctively recognise their natural enemies. We are not surprised that they recognise their own fellows: and yet they must do so by means of some equally strange automatic and inherited mechanism in their nervous system. One butterfly can tell its mates at once from a thousand other species, though it may differ from some of them only by a single spot or line, which would escape the notice of all but the most attentive observers. Must we not conclude that there are elements in the butterfly's feeble brain exactly answering to the blank picture of its specific type? So, too, must we not suppose that in every race of animals there arises a perceptive structure specially adapted to the recognition of its own kind? Babies notice human faces long before they notice any other living thing. In like manner we know that most creatures can judge instinctively of their proper food. One young bird just fledged naturally pecks at red berries; another exhibits an untaught desire to chase down grasshoppers; a third, which happens to be born an owl, turns at once to the congenial pursuit of small sparrows, mice, and frogs. Each species seems to have certain faculties so arranged that the sight of certain external objects, frequently connected with food in their ancestral experience, immediately arouses in them the appropriate actions for its capture. Mr. Douglas Spalding found that newly-hatched chickens darted rapidly and accurately at flies on the wing. When we recollect that even so late an acquisition as articulate speech in human beings has its special physical seat in the brain, it is not astonishing that complicated mechanisms should have arisen among animals for the due perception of mates, food, and foes respectively. Thus, doubtless, the serpent form has imprinted itself indelibly on the senses of monkeys, and the wolf or dog form on those of cows: so that even with a young ape or calf the sight of these their ancestral enemies at once calls up uneasy or terrified feelings in their half-developed minds. Our own infants in arms have no personal experience of the real meaning to be attached to angry tones, yet they shrink from the sound of a gruff voice even before they have learned to distinguish their nurse's face.

When Grip gets among the sheep, their hereditary traits come out in a very different manner. They are by nature and descent timid mountain animals, and they have never been accustomed to face a foe, as cows and buffaloes are wont to do, especially when in a herd together. You cannot see many traces of the original mountain life among sheep, and yet there are still a few remaining to mark their real pedigree. Mr. Herbert Spencer has noticed the fondness of lambs for frisking on a hillock, however small; and when I come to my little knoll here, I generally find it occupied by a couple, who rush away on my approach, but take their stand instead on the merest ant-hill which they can find in the field. I once knew three young goats, kids of a mountain breed, and the only elevated object in the paddock where they were kept was a single old elm stump. For the possession of this stump the goats fought incessantly; and the victor would proudly perch himself on the top, with all four legs inclined inward (for the whole diameter of the tree was but some fifteen inches), maintaining himself in his place with the greatest difficulty, and butting at his two brothers until at last he lost his balance and fell. This one old stump was the sole representative in their limited experience of the rocky pinnacle upon which their forefathers kept watch like sentinels; and their instinctive yearnings prompted them to perch themselves upon the only available memento of their native haunts. Thus, too, but in a dimmer and vaguer way, the sheep, especially during his younger days, loves to revert, so far as his small opportunities permit him, to the unconsciously remembered habits of his race. But in mountain countries, every one must have noticed how the sheep at once becomes a different being. On the Welsh hills he casts away all the dull and heavy serenity of his brethren on the South Downs, and displays once more the freedom, and even the comparative boldness, of a mountain breed. A Merionethshire ewe thinks nothing of running up one side of a low-roofed barn and down the other, or of clearing a stone wall which a Leicestershire farmer would consider extravagantly high.

Another mountain trait in the stereotyped character of sheep is their well-known sequaciousness. When Grip runs after them they all run away together: if one goes through a certain gap in the hedge, every other follows; and if the leader jumps the beck at a certain spot, every lamb in the flock jumps in the self-same place. It is said that if you hold a stick for the first sheep to leap over, and then withdraw it, all the succeeding sheep will leap with mathematical accuracy at the corresponding point; and this habit is usually held up to ridicule as proving the utter stupidity of the whole race. It really proves nothing but the goodness of their ancestral instincts. For mountain animals, accustomed to follow a leader, that leader being the bravest and strongest ram of the flock, must necessarily follow him with the most implicit obedience. He alone can see what obstacles come in the way; and each of the succeeding train must watch and imitate the actions of their predecessors. Otherwise, if the flock happens to come to a chasm, running as they often must with some speed, any individual which stopped to look and decide for itself before leaping would inevitably be pushed over the edge by those behind it, and so would lose all chance of handing down its cautious and sceptical spirit to any possible descendants. On the other hand, those uninquiring and blindly obedient animals which simply did as they saw others do would both survive themselves and become the parents of future and similar generations. Thus there would be handed down from dam to lamb a general tendency to sequaciousness – a follow-my-leader spirit, which was really the best safeguard for the race against the evils of insubordination, still so fatal to Alpine climbers. And now that our sheep have settled down to a tame and monotonous existence on the downs of Sussex or the levels of the Midlands, the old instinct clings to them still, and speaks out plainly for their mountain origin. There are few things in nature more interesting to notice than these constant survivals of instinctive habits in altered circumstances. They are to the mental life what rudimentary organs are to the bodily structure: they remind us of an older order of things, just as the abortive legs of the blind-worm show us that he was once a lizard, and the hidden shell of the slug that he was once a snail.

IV.
A SPRIG OF WATER CROWFOOT

The little streamlet whose tiny ranges and stickles form the middle thread of this green combe in the Dorset downs is just at present richly clad with varied foliage. Tall spikes of the yellow flag rise above the slow-flowing pools, while purple loose-strife overhangs the bank, and bunches of the arrowhead stand high out of their watery home, just unfolding their pretty waxen white flowers to the air. In the rapids, on the other hand, I find the curious water crowfoot, a spray of which I have this moment pulled out of the stream and am now holding in my hand as I sit on the little stone bridge, with my legs dangling over the pool below, known to me as the undoubted residence of a pair of trout. It is a queer plant, this crowfoot, with its two distinct types of leaves, much cleft below and broad above; and I often wonder why so strange a phenomenon has attracted such very scant attention. But then we knew so little of life in any form till the day before yesterday that perhaps it is not surprising we should still have left so many odd problems quite untouched.

This problem of the shape of leaves certainly seems to me a most important one; and yet it has hardly been even recognised by our scientific pastors and masters. At best, Mr. Herbert Spencer devotes to it a passing short chapter, or Mr. Darwin a stray sentence. The practice of classifying plants mainly by means of their flowers has given the flower a wholly factitious and overwrought importance. Besides, flowers are so pretty, and we cultivate them so largely, with little regard to the leaves, that they have come to usurp almost the entire interest of botanists and horticulturists alike. Darwinism itself has only heightened this exclusive interest by calling attention to the reciprocal relations which exist between the honey-bearing blossom and the fertilising insect, the bright-coloured petals and the myriad facets of the butterfly's eye. Yet the leaf is after all the real plant, and the flower is but a sort of afterthought, an embryo colony set apart for the propagation of like plants in future. Each leaf is in truth a separate individual organism, united with many others into a compound community, but possessing in full its own mouths and digestive organs, and carrying on its own life to a great extent independently of the rest. It may die without detriment to them; it may be lopped off with a few others as a cutting, and it continues its life-cycle quite unconcerned. An oak tree in full foliage is a magnificent group of such separate individuals – a whole nation in miniature: it may be compared to a branched coral polypedom covered with a thousand little insect workers, while each leaf answers rather to the separate polypes themselves. The leaves are even capable of producing new individuals by what they contribute to the buds on every branch; and the seeds which the tree as a whole produces are to be looked upon rather as the founders of fresh colonies, like the swarms of bees, than as fresh individuals alone. Every plant community, in short, both adds new members to its own commonwealth, and sends off totally distinct germs to form new commonwealths elsewhere. Thus the leaf is, in truth, the central reality of the whole plant, while the flower exists only for the sake of sending out a shipload of young emigrants every now and then to try their fortunes in some unknown soil.

The whole life-business of a leaf is, of course, to eat and grow, just as these same functions form the whole life-business of a caterpillar or a tadpole. But the way a plant eats, we all know, is by taking carbon and hydrogen from air and water under the influence of sunlight, and building them up into appropriate compounds in its own body. Certain little green worms or convoluta have the same habit, and live for the most part cheaply off sunlight, making starch out of carbonic acid and water by means of their enclosed chlorophyll, exactly as if they were leaves. Now, as this is what a leaf has to do, its form will almost entirely depend upon the way it is affected by sunlight and the elements around it – except, indeed, in so far as it may be called upon to perform other functions, such as those of defence or defiance. This crowfoot is a good example of the results produced by such agents. Its lower leaves, which grow under water, are minutely subdivided into little branching lance-like segments; while its upper ones, which raise their heads above the surface, are broad and united, like the common crowfoot type. How am I to account for these peculiarities? I fancy somehow thus: —

Plants which live habitually under water almost always have thin, long, pointed leaves, often thread-like or mere waving filaments. The reason for this is plain enough. Gases are not very abundant in water, as it only holds in solution a limited quantity of oxygen and carbonic acid. Both of these the plant needs, though in varying quantities: the carbon to build up its starch, and the oxygen to use up in its growth. Accordingly, broad and large leaves would starve under water: there is not material enough diffused through it for them to make a living from. But small, long, waving leaves which can move up and down in the stream would manage to catch almost every passing particle of gaseous matter, and to utilise it under the influence of sunlight. Hence all plants which live in fresh water, and especially all plants of higher rank, have necessarily acquired such a type of leaf. It is the only form in which growth can possibly take place under their circumstances. Of course, however, the particular pattern of leaf depends largely upon the ancestral form. Thus this crowfoot, even in its submerged leaves, preserves the general arrangement of ribs and leaflets common to the whole buttercup tribe. For the crowfoot family is a large and eminently adaptable race. Some of them are larkspurs and similar queerly-shaped blossoms; others are columbines which hang their complicated bells on dry and rocky hillsides; but the larger part are buttercups or marsh marigolds which have simple cup-shaped flowers, and mostly frequent low and marshy ground. One of these typical crowfoots under stress of circumstances – inundation, or the like – took once upon a time to living pretty permanently in the water. As its native meadows grew deeper and deeper in flood it managed from year to year to assume a more nautical life. So, while its leaf necessarily remained in general structure a true crowfoot leaf, it was naturally compelled to split itself up into thinner and narrower segments, each of which grew out in the direction where it could find most stray carbon atoms, and most sunlight, without interference from its neighbours. This, I take it, was the origin of the much-divided lower leaves.

But a crowfoot could never live permanently under water. Seaweeds and their like, which propagate by a kind of spores, may remain below the surface for ever; but flowering plants for the most part must come up to the open air to blossom. The sea-weeds are in the same position as fish, originally developed in the water and wholly adapted to it, whereas flowering plants are rather analogous to seals and whales, air-breathing creatures, whose ancestors lived on land, and who can themselves manage an aquatic existence only by frequent visits to the surface. So some flowering water-plants actually detach their male blossoms altogether, and let them float loose on the top of the water; while they send up their female flowers by means of a spiral coil, and draw them down again as soon as the wind or the fertilising insects have carried the pollen to its proper receptacle, so as to ripen their seeds at leisure beneath the pond. Similarly, you may see the arrowhead and the water-lilies sending up their buds to open freely in the air, or loll at ease upon the surface of the stream. Thus the crowfoot, too, cannot blossom to any purpose below the water; and as such among its ancestors as at first tried to do so must of course have failed in producing any seed, they and their kind have died out for ever; while only those lucky individuals whose chance lot it was to grow a little taller and weedier than the rest, and so overtop the stream, have handed down their race to our own time.

But as soon as the crowfoot finds itself above the level of the river, all the causes which made its leaf like those of other aquatic plants have ceased to operate. The new leaves which sprout in the air meet with abundance of carbon and sunlight on every side; and we know that plants grow fast just in proportion to the supply of carbon. They have pushed their way into an unoccupied field, and they may thrive apace without let or hindrance. So, instead of splitting up into little lance-like leaflets, they loll on the surface, and spread out broader and fuller, like the rest of their race. The leaf becomes at once a broad type of crowfoot leaf. Even the ends of the submerged leaves, when any fall of the water in time of drought raises them above the level, have a tendency (as I have often noticed) to grow broader and fatter, with increased facilities for food; but when the whole leaf rises from the first to the top the inherited family instinct finds full play for its genius, and the blades fill out as naturally as well-bred pigs. The two types of leaf remind one much of gills and lungs respectively.

But above water, as below it, the crowfoot remains in principle a crowfoot still. The traditions of its race, acquired in damp marshy meadows, not actually under water, cling to it yet in spite of every change. Born river and pond plants which rise to the surface, like the water-lily or the duck-weed, have broad floating leaves that contrast strongly with the waving filaments of wholly submerged species. They can find plenty of food everywhere, and as the sunlight falls flat upon them, they may as well spread out flat to catch the sunlight. No other elbowing plants overtop them and appropriate the rays, so compelling them to run up a useless waste of stem in order to pocket their fair share of the golden flood. Moreover, they thus save the needless expense of a stout leaf-stalk, as the water supports their lolling leaves and blossoms; while the broad shade which they cast on the bottom below prevents the undue competition of other species. But the crowfoot, being by descent a kind of buttercup, has taken to the water for a few hundred generations only, while the water-lily's ancestors have been to the manner born for millions of years; and therefore it happens that the crowfoot is at heart but a meadow buttercup still. One glance at its simple little flower will show you that in a moment.

V.
SLUGS AND SNAILS

Hoeing among the flower-beds on my lawn this morning – for I am a bit of a gardener in my way – I have had the ill-luck to maim a poor yellow slug, who had hidden himself among the encroaching grass on the edge of my little parterre of sky-blue lobelias. This unavoidable wounding and hacking of worms and insects, despite all one's care, is no small drawback to the pleasures of gardening *in propriâ personâ*. Vivisection for genuine scientific purposes in responsible hands, one can understand and tolerate, even though lacking the heart for it oneself; but the useless and causeless vivisection which cannot be prevented in every ordinary piece of farm-work seems a gratuitous blot upon the face of beneficent nature. My only consolation lies in the half-formed belief that feeling among these lower creatures is indefinite, and that pain appears to affect them far less acutely than it affects warm-blooded animals. Their nerves are so rudely distributed in loose knots all over the body, instead of being closely bound together into a single central system as with ourselves, that they can scarcely possess a consciousness of pain at all analogous to our own. A wasp whose head has been severed from its body and stuck upon a pin, will still greedily suck up honey with its throatless mouth;

while an Italian mantis, similarly treated, will calmly continue to hunt and dart at midges with its decapitated trunk and limbs, quite forgetful of the fact that it has got no mandibles left to eat them with. These peculiarities lead one to hope that insects may feel pain less than we fear. Yet I dare scarcely utter the hope, lest it should lead any thoughtless hearer to act upon the very questionable belief, as they say even the amiable enthusiasts of Port Royal acted upon the doctrine that animals were mere unconscious automata, by pushing their theory to the too practical length of active cruelty. Let us at least give the slugs and beetles the benefit of the doubt. People often say that science makes men unfeeling: for my own part, I fancy it makes them only the more humane, since they are the better able dimly to figure to themselves the pleasures and pains of humbler beings as they really are. The man of science perhaps realises more vividly than all other men the inner life and vague rights even of crawling worms and ugly earwigs.

Конец ознакомительного фрагмента.