The Intelligence of the Flowers by Maurice Maeterlinck

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Alfred Hattes

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BY

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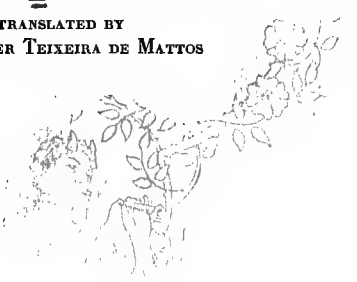

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I

I WISH merely to recall here a few facts known to every botanist. I have made not a single discovery and my modest contribution is confined to a few elementary observations. I need hardly say that I have no intention of reviewing all the proofs of intelligence which the plants give us. These proofs are innumerable and continual, especially among the flowers, in which the effort of vegetable life towards light and understanding is concentrated.

Though there be plants and flowers that are awkward or unlucky, there is none that is wholly devoid of wisdom and ingenuity. All exert themselves to accomplish their work, all have the magnificent ambition to overrun and conquer the surface of the globe by endlessly multiplying that form of existence which they represent. To attain this object, they have, because of the law that chains them to the soil, to overcome difficulties much greater than those opposed to the increase of the animals. And therefore the majority of them have recourse to combinations, to

a machinery, to traps which, in regard to such matters as mechanism, ballistics, aerial navigation and the observation of insects, have often anticipated the inventions and acquirements of man.

II

It would be superfluous once more to trace the picture of the great systems of floral fertilization: the play of stamens and pistil, the seduction of perfumes, the appeal of harmonious and dazzling colours, the concoction of nectar, which is absolutely useless to the flower and is manufactured only to attract and retain

the liberator from without, the messenger of love — bee, humble-bee, fly, butterfly or moth — that is to bring to the flower the kiss of the distant, invisible, motionless lover. . . .

This vegetable world, which to us appears so placid, so resigned, in which all seems acquiescence, silence, obedience, meditation, is, on the contrary, that in which the revolt against destiny is the most vehement and the most stubborn. The essential organ, the nutrient organ of the plant, its root, attaches it indissolubly to the soil. If it be difficult to discover among the great

laws that oppress us that which weighs heaviest upon our shoulders, in the case of the plant there is no doubt: it is the law that condemns it to immobility from its birth to its death. Therefore it knows better than we, who disseminate our efforts, against what first to rise in rebellion. And the energy of its fixed idea, mounting from the darkness of the roots to become organized and full-blown in the light of the flower, is an incomparable spectacle. It exerts itself wholly with one object: to escape above from the fatality below, to evade, to transgress the heavy and sombre

law, to set itself free, to shatter the narrow sphere, to invent or invoke wings, to escape as far as it can, to conquer the space in which destiny encloses it, to approach another kingdom, to penetrate into a moving and active world. . . . Is the fact that it attains its object not as surprising as though we were to succeed in living outside the time which a different destiny assigns to us or in making our way into a universe freed from the weightiest laws of matter? We shall see that the flower sets man a prodigious example of insubmission, courage, perseverance and ingenuity. If we had

applied to the removal of various necessities that crush us, such as pain, old age and death, one half of the energy displayed by any little flower in our gardens, we may well believe that our lot would be very different from what it is.

III

This need of movement, this craving for space, among the greater number of plants, is manifested in both the flower and the fruit. It is easily explained in the fruit, or, in any case, discloses only a less complex experience and foresight. Contrary to that which takes place in the animal

kingdom and because of the terrible law of absolute immobility, the chief and worst enemy of the seed is the paternal stock. We are in a strange world, where the parents, unable to move from place to place, know that they are condemned to starve or stifle their offspring. Every seed that falls at the foot of the tree or plant is either lost or doomed to sprout in wretchedness. Hence the immense effort to throw off the yoke and conquer space. Hence the marvellous systems of dissemination, of propulsion, of navigation of the air which we find on every side in the forest and the

plain: among others, to mention, in passing, but a few of the most curious, the aerial screw or samara of the Maple; the bract of the Lime-tree; the flying-machine of the Thistle, the Dandelion and the Salsafy; the detonating springs of the Spurge; the extraordinary squirt of the Momordica; the hooks of the eriophilous plants; and a thousand other unexpected and astounding pieces of mechanism; for there is not, so to speak, a single seed but has invented for its sole use a complete method of escaping from the maternal shade.

It would, in fact, be

impossible, if one had not practised a little botany, to believe the expenditure of imagination and genius in all the verdure that gladdens our eyes. Consider, for instance, the charming seedpots of the Scarlet Pimpernel, the five valves of the Balsam, the five bursting capsules of the Geranium. Do not forget, upon occasion, to examine the common Poppy-head, which we find at any herbalist's. This good, big head shelters a prudence and a foresight that deserve the highest praise. We know that it holds thousands of the tiniest black seeds. Its object is to scatter

this seed as dexterously and to as great a distance as possible. If the capsule containing it were to split, to fall or to open underneath, the precious black dust would form but a useless heap at the foot of the stalk. But its only outlet is through apertures contrived right at the top of the capsule, which, when ripe, bends over on its peduncle, sways like a censer at the least breath of wind and literally sows the seeds in space, with the very action employed by the sower.

Shall I speak of the seeds which provide for their

dissemination by birds and which, to entice them, as in the case of the Mistletoe, the Juniper, the Mountain-ash, lurk inside a sweet husk? We see here displayed such a powerful reasoning faculty, such a remarkable understanding of final causes that we hardly dare dwell upon the subject, for fear of repeating the ingenuous mistakes of Bernardin de Saint-Pierre. And yet the facts can be no otherwise explained. The sweet husk is of no more use to the seed than the nectar, which attracts the bees, is to the flower. The bird eats the fruit because it is sweet

and, at the same time, swallows the seed, which is indigestible. He flies away and, soon after, ejects the seed in the same condition in which he has received it, but stripped of its case and ready to sprout far from the attendant dangers of its birthplace.

IV

But let us return to simpler contrivances. Pick a blade of grass by the roadside, from the first tuft that offers, and you will perceive an independent, indefatigable, unexpected little intelligence at work. Here, for instance, are two poor

creeping plants which you have met a thousand times on your walks, for we find them in every spot, down to the most ungrateful corners to which a pinch of soil has strayed. They are two varieties of wild Lucern or Medick (*Medicago*), two "ill weeds" in the humblest sense of the word. One bears a reddish flower, the other a little yellow ball of the size of a pea. To see them crawling and hiding among the proud grasses, one would never suspect that, long before the illustrious geometrician and physician of Syracuse, they had discovered the Archimedean

screw and endeavoured to apply it not to the raising of liquids, but to the art of flying. They lodge their seeds in light spirals with three or four convolutions, admirably constructed to delay their fall and, consequently, with the help of the wind, to prolong their journey through the air. One of them, the yellow, has even improved upon the apparatus of the red by furnishing the edges of the spiral with a double row of spikes, with the evident intention of hooking it, on its passage, to either the clothes of the pedestrians or the fleece of the animals. It clearly hopes to add the

advantages of eriophily—that is to say the dissemination of seed by sheep, goats, rabbits and so on—to those of anemophily, or dissemination by the wind.

The most touching side of this great effort is its futility. The poor red and yellow Lucerns have blundered. Their remarkable screws are of no use to them: they could act only if they fell from a certain height, from the top of some lofty tree or tall *Graminea;* but, constructed as they are on the level of the grass, they have hardly taken a quarter of a turn before already they

touch the ground. We have here a curious instance of the mistakes, the gropings, the experiments and the frequent little miscalculations of nature; for only those who have studied nature but very little will maintain that she never errs.

Let us observe, in passing, that other varieties of the Lucern (not to speak of the Clover, another papilionaceous *Leguminosa,* almost identical with that of which we are now speaking) have not adopted this flying apparatus, but keep to the primitive methods of the pod. In one of them, the *Medicago*

aurantiaca, we very clearly perceive the transition from the twisted pod to the screw or spiral. Another variety, the *Medicago scuttellata,* or Snail-medick, rounds its screw in the form of a ball. It would seem, therefore, that we are assisting at the stimulating spectacle of a sort of work of invention, at the attempts of a family that has not yet settled its destiny and is seeking for the best way of ensuring its future. Was it not perhaps, in the course of this search that, having been deceived in the spiral, the yellow Lucern added spikes or hooks to it, saying to itself, not

unreasonably, that, since its leaves attract the sheep, it is inevitable and right that the sheep should assume the care of its progeny? And, lastly, is it not thanks to this new effort and to this happy thought that the Lucern with the yellow flowers is infinitely more widely distributed than its sturdier cousin whose flowers are red?

V

It is not only in the seed or the flower, but in the whole plant, leaves, stalks and roots, that we discover, if we stoop for a moment over their humble

work, many traces of a prudent and quick intelligence. Think of the magnificent struggle towards the light of the thwarted branches, or the ingenious and courageous strife of trees in danger. As for myself, I shall never forget the admirable example of heroism given me the other day in Provence, in the wild and delightful gorges of the Loup, all fragrant with violets, by a huge centenarian Laurel-tree. It was easy to read on its twisted and, so to speak, writhing trunk the whole drama of its hard and tenacious life. A bird or the wind, masters of

destiny both, had carried the seed to the flank of the rock, which was as perpendicular as an iron curtain; and the tree was born there, two hundred yards above the torrent, inaccessible and solitary, among the burning and barren stones. From the first hour, it had sent its blind roots on a long and painful search for precarious water and soil. But this was only the hereditary care of a species that knows the aridity of the South. The young stem had to solve a much graver and more unexpected problem: it started from a vertical plane, so that its top, instead of rising towards

the sky, bent down over the gulf. It was obliged, therefore, notwithstanding the increasing weight of its branches, to correct the first flight, stubbornly to bend its disconcerted trunk in the form of an elbow close to the rock and thus, like a swimmer who throws back his head, by means of an incessant will, tension and contraction to hold its heavy crown of leaves straight up into the sky.

Thenceforward, all the preoccupations, all the energy, all the free and conscious genius of the plant had centred around that vital knot. The monstrous, hypertrophied elbow revealed,

one by one, the successive solicitudes of a kind of thought that knew how to profit by the warnings which it received from the rains and the storms. Year by year, the leafy dome grew heavier, with no other care than to spread itself out in the light and heat, while a hidden canker gnawed deep into the tragic arm that supported it in space. Then, obeying I know not what order of the instinct, two stout roots, two fibrous cables, issuing from the trunk at more than two feet above the elbow, had come to moor it to the granite wall. Had they really been evoked by

the tree's distress, or were they perhaps waiting providently, from the first day, for the acute hour of danger, in order to increase the value of their assistance? Was it only a happy accident? What human eye will ever assist at these silent dramas, which are all too long for our short lives?[1]

VI

Among the vegetals that give the most striking proofs

[1] Let us compare with this the act of intelligence of another root, whose exploits are related by Brandis in his *Ueber Leben und Polarität.* In penetrating into the earth, it had come upon an old hoot-sole: in order to cross this obstacle, which, apparently, the root was the first of its kind to find upon its road, it subdivided itself into as many parts as there were holes left in the sole by the stitching-needle; then, when the obstacle was overcome, it came together again and united all its divided radicles in such a way as to form a single homogeneous tap-root.

of initiative, the plants which might be described as "animated" or "sentient" deserve to be studied in detail. I will do no more than recall the delightful nervous terrors of the Sensitive-plant, the shrinking Mimosa which we all know. There are other herbs endowed with spontaneous movements that are not so well known, notably the *Hedysareæ*, among which the *Hedysarum gyrans*, or Moving-plant, acts in a very restless and surprising fashion. This little *Leguminosa*, which is a native of Bengal, but often cultivated in our hothouses, performs a sort of perpetual

and intricate dance in honour of the light. Its leaves are divided into three folioles, one wide and terminal, the two others narrow and planted at the base of the first. Each of these leaflets is animated with a different movement of its own. They live in a state of rhythmical, almost chronometrical and continuous agitation. They are so sensitive to light that their dance flags or quickens according as the clouds veil or uncover that corner of the sky which they contemplate. They are, as we see, real photometers; and this long before Crook's discovery of the natural otheoscopes.

VII

But these plants, to which should be added the Droseras, the Dionæas and many others, are nervous plants that already go a little beyond the mysterious and probably imaginary ridge that separates the vegetable from the animal kingdom. It is not necessary to seek so high; and we find as much intelligence and almost as much visible spontaneity at the other end of the world which we are considering, in the shallows where the plant is hardly to be distinguished from clay or stone: I refer to the fabulous class

of the *Cryptogamia*, which can be studied only under the microscope. For this reason we will pass it by in silence, although the work of the sporules of the Mushroom, the Fern and especially of the Scouring-rush or Horse-tail is incomparable in its delicacy and ingenuity. But, among the aquatic plants, the inhabitants of the original ooze and mud, we can see less secret marvels performed. As the fertilization of their flowers cannot be accomplished under water, each of them has thought out a different system to allow of the dry dissemination of the pollen. Thus, the Zosteras,

that is to say, the common Seawrack with which we stuff our beds, carefully enclose their flower in a regular diving-bell; and the Water-lilies send theirs to blossom on the surface of the pond, supporting and feeding it at the top of an endless stalk, which lengthens as the level of the water rises. The Fringed Villarsia (*Villarsia nymphoides*), having no expanding stalk, simply lets its flowers go: they rise to the surface and burst like bubbles. The *Trapa natans*, or Water-caltrop, supplies them with a sort of inflated tumour: they shoot up and open; then, when the fertilization

is accomplished, the air in the tumour is replaced by a mucilaginous fluid, which is heavier than the water, and the whole apparatus sinks back again to the slime, where the fruits ripen.

The system of the Utricularia is even more complicated. M. Henri Bocquillon describes it in his *Vie des Plantes:*

"These plants, which are common in ponds, ditches, pools and the puddles of peat-bogs, are not visible in winter, when they lie on the mud. Their long, slim, trailing stalk is furnished with leaves reduced to ramified filaments. At the

axilla of the leaves thus transformed, we see a sort of little pyriform pocket with an aperture in its pointed upper end. This aperture has a valve, which can be opened only from the outside inwards; its edges are provided with ramified hairs; the inside of the pocket is covered with other little secretory hairs which give it the appearance of velvet. When the moment of efflorescence comes, the axillary utricles fill with air: the more this air tends to escape, the more tightly it closes the valve. The result is that it imparts a great specific buoyancy to

the plant and carries it to the surface of the water. Not till then do those charming little yellow flowers come into blossom, resembling quaint little mouths with more or less swollen lips and palates streaked with orange or rubiginous lines. During the months of June, July and August, they display their fresh colours gracefully above the muddy water, amid the vegetable decay around them. But fertilization has been effected, the fruit develops, all things play a different part: the ambient water presses upon the valve of the utricles, forces it in, rushes into the cavity,

weighs down the plant and compels it to descend to the mud again."

Is it not interesting to see thus gathered in this immemorial little apparatus some of the most fruitful and recent of human inventions: the play of valves or plugs, the pressure of fluids and air, the Archimedean principle studied and turned to account? As the author whom we have just quoted observes, "The engineer who first attached a rafting apparatus to a sunk ship little thought that a similar process had been in use for thousands of years." In a world which

we believe unconscious and destitute of intelligence, we begin by imagining that the least of our ideas creates new combinations and relations. When we come to look into things more closely, it appears infinitely probable that it is impossible for us to create anything whatsoever. We are the last comers on this earth, we simply find what has always existed and, like astonished children, we travel again the road which life had travelled before us. When all is said, it is very natural and comforting that this should be so. But we will return to this point.

VIII

We cannot take leave of the aquatic plants without briefly mentioning the life of the most romantic of them all: the legendary Vallisneria, an Hydrocharad whose nuptials form the most tragic episode in the love-history of the flowers. The Vallisneria is a rather insignificant herb, possessing none of the strange grace of the Water-lily or of certain submersed comas. But it seems as though nature had delighted in giving it a beautiful idea. The whole existence of the little plant is spent at the bottom of the water, in a

sort of half-slumber, until the moment of the wedding-hour in which it aspires to a new life. Then the female flower slowly uncoils the long spiral of its peduncle, rises, emerges and floats and blossoms on the surface of the pond. From a neighbouring stem, the male flowers, which see it through the sunlit water, soar in their turn, full of hope, towards the one that rocks, that awaits them, that calls them to a magic world. But, when they have come half-way, they feel themselves suddenly held back: their stalk, the very source of their life, is too short; they will never

reach the abode of light, the only spot in which the union of the stamens and the pistil can be achieved! . . .

Is there any more cruel inadvertence or ordeal in nature? Picture the tragedy of that longing, the inaccessible so nearly attained, the transparent fatality, the impossible with not a visible obstacle! . . . It would be insoluble, like our own tragedy upon this earth, were it not that an unexpected element is mingled with it. Did the males foresee the disillusion to which they would be subjected? One thing is certain, that they have locked up in their hearts a bubble of

air, even as we lock up in our souls a thought of desperate deliverance. It is as though they hesitated for a moment; then, with a magnificent effort, the finest, the most supernatural that I know of in the annals of the insects and the flowers, in order to rise to happiness they deliberately break the bond that attaches them to life. They tear themselves from their peduncle and, with an incomparable flight, amid pearly beads of gladness, their petals dart up and break the surface of the water. Wounded to death, but radiant and free, they float for a moment beside their heedless brides

and the union is accomplished, whereupon the victims drift away to perish, while the wife, already a mother, closes her corolla, in which lives their last breath, rolls up her spiral and descends to the depths, there to ripen the fruit of the heroic kiss.

Must we spoil this charming picture, which is strictly accurate, but seen from the side of the light, by looking at it also from that of the shadow? Why not? There are sometimes on the shady side truths quite as interesting as those on the bright. This delightful tragedy is perfect only when we consider the intelligence, the

aspirations of the species. But, if we observe individuals, we shall often see them act awkwardly and in the wrong way in this ideal plan. At one time, the male flowers will ascend to the surface when there are not yet any pistilled flowers near. At another, when the low water would permit them easily to join their companions, they will nevertheless mechanically and to no purpose break their stalks. We here once more establish the fact that all genius lies in the species, in life or nature; and that the individual is nearly always stupid. In man alone does a real emulation exist

between the two intelligences, a more and more precise, more and more active tendency towards a sort of equilibrium which is the great secret of our future.

IX

The parasitic plants also present curious and crafty spectacles, as in the case of the astonishing Cuscuta, commonly called the Dodder. It has no leaves; and no sooner has its stalk attained a few inches in length than it voluntarily abandons its roots to twine about its chosen victim, into which it digs its suckers. Thenceforth, it lives

exclusively upon its prey. Its perspicacity is not to be deceived; it will refuse any support that does not please it and will go some distance, if necessary, in search of the stem of Hemp, Hop, Lucern or Flax that suits its temperament and its taste.

This Cuscuta naturally calls our attention to the Creepers, which have very remarkable habits and which deserve a word to themselves. Those of us who have lived a little in the country have often had occasion to admire the instinct, the sort of power of vision that directs the tendrils of the Virginian

Creeper or the Convolvulus towards the handle of a rake or spade resting against a wall. Move the rake and, the next day, the tendril will have turned completely round and found it again. Schopenhauer, in his treatise *Ueber den Willen in der Natur,* in the chapter devoted to the physiology of plants, recapitulates on this point and on many others a host of observations and experiments which it would take too long to set out here. I therefore refer the reader to this chapter, where he will find numerous sources and references noted down for him. Need I add that, in

the past fifty or sixty years, these sources have been strangely multiplied and that, besides, the subject is almost inexhaustible?

Among so many different inventions, artifices and precautions, let us mention also, for instance, the foresight displayed by the *Hyoseris radiata,* or Starry Swine's-succory, a little yellow-flowered plant, not unlike the Dandelion and often found on the old walls along the Riviera. In order to ensure both the dissemination and the stability of its race, it bears at one and the same time two kinds of seeds: the first are easily detached and are furnished

with wings wherewith to abandon themselves to the wind, while the others have no wings, remain captive in the inflorescence and are set free only when the latter is decomposed.

The case of the *Xanthium spinosum*, or Spiny Xanthium, shows us how well conceived and effective certain systems of dissemination can be. This Xanthium is a hideous weed, bristling with barbaric prickles. Not long ago, it was unknown in Western Europe and no one, naturally, had dreamt of acclimatizing it. It owes its conquests to the hooks which finish off the capsules of its fruits and which cling

to the fleece of the animals. A native of Russia, it came to us in bales of wool imported from the depths of the Muscovite steppes; and one might follow on the map the stages of this great emigrant which has annexed a new world.

The *Silene Italica*, or Italian Catchfly, a simple little white flower, found in abundance under the olive-trees, has set its thought working in another direction. Apparently very timorous, very susceptible, to avoid the visits of importunate and indelicate insects it furnishes its stalks with glandular bristles, whence oozes a viscid fluid in which

the parasites are caught with such success that the peasants of the South use the plant as a fly-catcher in their houses. Certain kinds of Catchflies, moreover, have ingeniously simplified the system. Dreading the ants in particular, they discovered that it was enough, in order to prevent them from passing, to place a wide viscid ring under the node of each stalk. This is exactly what our gardeners do when they draw a circle of tar around the trunk of the apple-trees to stop the ascent of the caterpillars.

This leads to the study of the defensive means employed by the plants.

In an excellent popular work, *Les Plantes originales,* to which I refer the reader who wishes for fuller details, M. Henri Coupin examines some of these quaint and startling weapons. We have first the stimulating question of the thorns, concerning which M. Lothelier, a student at the Sorbonne, has made a number of interesting experiments, resulting in the conclusion that shade and damp tend to suppress the prickly parts of the plants. On the other hand, whenever the place in which it grows is dry and burnt by the sun, the plant bristles and multiplies its spikes, as

though it understood that, as almost the sole survivor among the deserted rocks or in the hot sand, it is called upon to make a mighty effort to redouble its defences against an enemy that no longer has a choice of victims to prey upon. It is a remarkable fact, moreover, that, when cultivated by man, most of the thorny plants gradually lay aside their weapons, leaving the care of their safety to the supernatural protector who has adopted them in his fenced grounds.[1]

[1] Among the plants that have ceased to defend themselves, the most striking case is that of the Lettuce:

"In its wild state," says the author whom I have mentioned above, "if we break a stalk or a leaf, we see a white juice exude from it, the

Certain plants, among others the *Boragineæ*, supply the place of thorns with very hard bristles. Others, such as the Nettle, add poison. Others, the Geranium, the Mint, the Rue, steep themselves in powerful odours to keep off the animals. But the strangest are those which defend themselves

latex, a substance formed of different matters which vigorously defend the plant against the attacks of the slugs. On the other hand, in the cultivated species derived from the former, the *latex* is almost missing, for which reason the plant, to the despair of the gardeners, is no longer able to resist and allows the slugs to eat it."

It is nevertheless right to add that this *latex* is rarely lacking except in the young plants, whereas it becomes quite abundant when the Lettuce begins to "cabbage" and when it runs to seed. Now it is especially at the commencement of its life, at the budding of its first, tender leaves, that the plant is in need of self-defence. One is inclined to think that the cultivated Lettuce loses its head a little, if I may so express myself, and that it no longer knows exactly where it stands.

mechanically. I will mention only the Horsetail, which surrounds itself with a veritable armour of microscopic *silicæ*. Moreover, almost all the *Gramineæ*, in order to discourage the gluttony of the slugs and snails, add lime to their tissues.

X

Before broaching the study of the complicated forms of apparatus rendered necessary by cross-fertilization, among the thousands of nuptial ceremonies that prevail in our gardens, let us mention the ingenious ideas of some very simple flowers, in which

the grooms and brides are born, love and die in the same corolla. The typical system is well enough known: the stamens, or male organs, generally frail and numerous, stand grouped around the robust and patient pistil: *"Mariti et uxores uno eodemque thalamo gaudent,"* says the great Linnæus, delightfully. But the disposition, the form, the habits of these organs vary in every flower, as though nature had a thought that cannot yet become settled, or an imagination that makes it a point of honour never to repeat itself. Often, the pollen, when ripe, falls quite naturally from

the top of the stamens upon the pistil; but, very often, also, pistil and stamens are of the same height, or the latter are too far away, or the pistil is twice as tall as they are. Then come endless efforts to succeed in meeting. Sometimes, as in the Nettle, the stamens, at the bottom of the corolla, stand cowering on their stalk: at the moment of fertilization, the stalk straightens out like a spring and the anther or pollen-mass that tops it shoots a cloud of dust over the stigma. Sometimes, as in the Barberry, whose nuptials can be accomplished only in the bright hours of

a cloudless day, the stamens, far removed from the pistil, are kept against the sides of the flower by the weight of two moist glands: the sun appears and evaporates the fluid and the unballasted stamens are flung upon the stigma. Elsewhere are different things again: thus, in the Primroses, the females are by turns longer and shorter than the males. In the Lily, the Tulip and other flowers, the too lanky bride does what she can to gather and fix the pollen. But the most original and fantastic system is that of the Rue (*Ruta graveolens*), a somewhat evil-smelling medicinal herb of the ill-famed

emmenagogic tribe. The peaceful and docile stamens, drawn up in a circle around the fat, squat pistil, wait expectant in the yellow corolla. At the conjugal hour, obeying the command of the female, which apparently gives a sort of call by name, one of the males approaches and touches the stigma. Then come the third, the fifth, the seventh, the ninth male, until the whole row of odd numbers has rendered service. Next, in the even ranks, comes the turn of the second, the fourth, the sixth and so on. Here is love to order indeed! This flower which knows how to count appeared to

me so extraordinary that I at first refused to believe the botanists; and I was determined to test its sense of numbers more than once before accepting it. I have ascertained that it but seldom makes a mistake.

It is needless to multiply these instances. A stroll in the woods or fields will allow any one to make a thousand observations in this direction, each quite as curious as those related by the botanists. But, before closing this chapter, I would mention one more flower: not that it displays any extraordinary imagination, but because of the

delightful and easily perceptible grace of its movement of love. I allude to the *Nigella Damascena,* or Fennel-flower, whose folk-names are charming: Love-in-a-mist, Devil-in-a-bush, Ragged-lady; so many happy and touching efforts of popular poetry to describe a little flower that pleases it. This plant is found in a wild state in the South, by the roadside and under the olive-trees, and is often cultivated in the North in old-fashioned gardens. Its blossom is pale-blue, simple as a floweret in a primitive painting, and the "Venus' locks" or "ragged locks"

that give the Ragged-lady its popular name in France are the light, tenuous, tangled leaves that surround the corolla with a "bush" of misty verdure. At the source of the flower, the five extremely long pistils stand close-grouped in the centre of the azure crown, like five queens clad in green gowns, haughty and inaccessible. Around them crowd hopelessly the innumerous throng of their lovers, the stamens, which do not come up to their knees. And now, in the heart of this palace of sapphires and turquoises, in the gladness of the summer days, begins the

drama without words or catastrophe which one might expect, the drama of powerless, useless, motionless waiting. But the hours pass that are the flower's years: its brilliancy fades, its petals fall and the pride of the great queens seems at last to bend under the weight of life. At a given moment, as though obeying the secret and irresistible command of love, which deems the proof to have lasted long enough, with a concerted and symmetrical movement, comparable with the harmonious parabolas of a five-fold fountain falling into its basin, they all together bend backwards and

gracefully cull the golden dust of the nuptial kiss on the lips of their humble lovers.

XI

The unexpected abounds here, as we see. A great volume, therefore, might be written on the intelligence of the plants, even as Romanes wrote one on animal intelligence. But this sketch has no pretension to become a manual of that kind; and I wish only to call attention to a few interesting events that happen beside us in this world wherein we think ourselves, a little too vainGloriously, privileged. These events are not selected, but taken, by way

of instances, as the random result of observation and circumstances. I propose, however, in these short notes, to concern myself before all with the flower, for it is in the flower that the greatest marvels shine forth. I set aside, for the moment, the carnivorous flowers, Droseras, Nepenthes, Sarracenias, and the rest, which approach the animal kingdom and would demand a special and expansive study, in order to devote myself to the true flower, the flower proper, which we believe to be insentient and inanimate.

To separate facts from theories, let us speak of

the flower as though all that it has realized had been foreseen and conceived in the manner of men. We shall see later how much we must leave to it, how much take away from it. For the present, let it take the stage alone, like a splendid princess endowed with reason and will. There is no denying that it appears provided with both; and to deprive it of either we must resort to very obscure hypotheses. It is there, then, motionless on its stalk, sheltering in a dazzling tabernacle the reproductive organs of the plant. Seemingly, it has but to allow the mysterious union

of the stamens and pistil to be accomplished in this tabernacle of love. And many flowers do so consent. But to many others there is propounded, big with awful threats, the normally insoluble problem of cross-fertilization. As the result of what numberless and immemorial experiments did they observe that self-fertilization —that is the fertilization of the stigma by the pollen falling from the anthers that surround it in the same corolla—rapidly induces the degeneration of the species? They have observed nothing, we are told, nor profited by any

experience. The force of things quite simply and gradually eliminated the seeds and plants weakened by self-fertilization. Soon, only those survived which, through some anomaly, such as the exaggerated length of the pistil, rendering it inaccessible to the anthers, were prevented from fertilizing themselves. These exceptions alone endured, through a thousand revolutions; heredity finally determined the work of chance; and the normal type disappeared.

XII

We shall see presently what light these explanations

throw. For the moment, let us go once more into the garden or the field, to study more closely two or three curious inventions of the genius of the flower. And, already, without going far from the house, we have here, frequented by the bees, a sweet-scented cluster inhabited by a most skilled mechanic. There is no one, even among the least countrified, but knows the good Sage. It is an unpretending *Labiata* and bears a very modest flower, which opens violently, like a hungry mouth, to snap the rays of the sun in passing. For that matter, it presents a large number

of varieties, not all of which —this is a curious detail— have adopted or carried to the same pitch of perfection the system of fertilization which we are about to examine. But I am concerned here only with the most common Sage, that which, at this moment, as though to celebrate spring's passage, covers with violet draperies all the walls of my terraces of olive-trees. I assure you that the balconies of the great marble palaces that await the kings were never more luxuriously, more happily, more fragrantly adorned. One seems to catch the very perfumes of the light of the sun at

its hottest, when noon-day strikes. . . .

To come to details, the stigma or female organ of the flower is contained in the upper lip, which forms a sort of hood, in which are also the two stamens or male organs. To prevent these from fertilizing the stigma which shares the same nuptial tent, this stigma is twice as long as they, so that they have no hope of reaching it. Moreover, to avoid all accidents, the flower has made itself protenandrous, that is to say, the stamens ripen before the pistil, so that, when the female is fit to conceive, the males have

already disappeared. It is necessary, therefore, that an external force should intervene to accomplish the union by carrying a foreign pollen to the abandoned stigma. A certain number of flowers, the anemophilous flowers, leave this care to the wind. But the Sage—and this is the more general case—is entomophilous, that is to say, it loves insects and relies upon their collaboration alone. Still, it is quite aware, for it knows many things, that it lives in a world where it is best to expect no sympathy, no charitable aid. It does not waste time, therefore, in making useless

appeals to the courtesy of the bee. The bee, like all that struggles against death in this world of ours, exists only for herself and for her kind and is in no way concerned to render a service to the flowers that feed her. How shall she be obliged, in spite of herself, or at least unconsciously, to fulfil her matrimonial office? Observe the wonderful love-trap contrived by the Sage: right at the back of its tent of violet silk, it distils a few drops of nectar; this is the bait. But, barring the access to the sugary fluid, stand two parallel stalks, somewhat similar to the uprights of a Dutch

drawbridge. Right at the top of each stalk is a great sack, the anther, overflowing with pollen; at the bottom, two smaller sacks serve as a counterpoise. When the bee enters the flower, in order to reach the nectar she has to push the small sacks with her head. The two stalks, which turn on an axis, at once topple over and the upper anthers come down and touch the sides of the insect, whom they cover with fertilizing dust. No sooner has the bee departed than the springy pivots fly back and replace the mechanism in its first position; and all is ready

to repeat the work at the next visit.

However, this is only the first half of the play: the sequel is enacted in another scene. In a neighbouring flower, whose stamens have just withered, enters upon the stage the pistil that awaits the pollen. It issues slowly from the hood, lengthens out, stoops, curves down, becomes forked so as, in its turn, to bar the entrance to the tent. On its way to the nectar, the head of the bee passes freely under the hanging fork, which, however, grazes her back and sides exactly at the spots touched by the

stamens. The two-cleft stigma greedily absorbs the silvery dust; and the impregnation is accomplished. It is easy, for that matter, by introducing a straw or the end of a match, to set the apparatus going and to take stock of the striking and marvellous combination and precision of all its movements.

The varieties of the Sage are very many—they number about five hundred—and I will spare you the majority of their scientific names, which are not always pretty: *Salvia pratensis, officinalis* (our Garden Sage), *Horminum, Horminoides, glutinosa, Sclarea, Roemeri, azurea,*

Pitcheri, splendens (the magnificent Sage of our baskets) and so on. There is not, perhaps, one but has modified some detail of the machinery which we have just examined. Some—and this, I think, is a doubtful improvement—have doubled and sometimes trebled the length of the pistil, so that it not only emerges from the hood, but makes a wide plume-like curve in front of the entrance to the flower. They thus avoid the just-possible danger of the fertilization of the stigma by the anthers dwelling in the same hood; but, on the other hand, it may happen, if the

protenandry be not strict, that the insect, on leaving the flower, deposits on the stigma the pollen of the very anthers with which the stigma cohabits. Others, in the movement of the lever, make the anthers diverge farther apart so as to strike the sides of the animal with greater precision. Others, lastly, have not succeeded in arranging and adjusting every part of the mechanism. I find, for instance, not far from my violet Sages, near the well, under a cluster of Oleanders, a family of white flowers tinted with pale lilac. These have no suggestion or trace of a

lever. The stamens and the stigma are heaped up promiscuously in the middle of the corolla. All seems left to chance and disorganized.

I have no doubt that it would be possible, to any one collecting the very numerous varieties of this *Labiata,* to reconstruct the whole history, to follow all the stages of the invention, from the primitive disorder of the white Sage under my eyes to the latest improvements of the *Salvia pratensis*. What conclusion are we to draw? Is the system still in the experimental stage among the aromatic tribe? Has it not yet left the period

of models and "trial trips," as in the case of the Archimedean screw in the Saintfoin family? Has the excellence of the automatic lever not yet been unanimously admitted? Can it be, then, that everything is not unchangeable and pre-established; and are they still discussing and experimenting in this world which we believe to be fatally, organically regular?[1]

XIII

Be this as it may, the flower of most varieties

[1] For some years, I have been engaged upon a series of experiments in the hybridization of Sages, artificially fertilizing (first taking the usual precautions against any interference of wind or insects) a variety of which the floral mechanism has reached a high state of perfection

of the Sage presents an attractive solution of the great problem of cross-fertilization. But, even as, among men, a new invention is at once taken up, simplified, improved by a host of small indefatigable seekers, so, in the world of what we may call mechanical flowers, the

with the pollen of a very backward variety; and *vice versa*. My observations are not yet sufficiently numerous to permit me to give any details here. Nevertheless, it appears that a general law is already being evolved, namely that the backward Sage readily adopts the improvements of the more advanced variety, whereas the latter is not so prone to accept the defects of the first. This would tend to throw an interesting side-light upon the operations, the habits, the preferences, the tastes of nature at her best. But these experiments are necessarily slow and long in the making, because of the time lost in collecting the different varieties, of the numberless proofs and counter-proofs required and so on. It would be premature, therefore, as yet to draw the slightest conclusion from them.

patent of the Sage has been elaborated and in many details strangely perfected. A pretty general *Scrophularinea,* the common Lousewort, or Red-rattle (*Pedicularis sylvatica*) which you must surely have noticed in the shady parts of small woods and heaths, has introduced some extremely ingenious modifications. The shape of the corolla is almost similar to that of the Sage; the stigma and the two anthers are all three contained in the upper hood. Only the little moist tip of the pistil protrudes from the hood, while the anthers remain strictly captive. In this

silky tabernacle, therefore, the organs of the two sexes are very close together and even in immediate contact; nevertheless, thanks to an arrangement quite different from that of the Sage, self-fertilization is made absolutely impossible. The anthers, in fact, form two sacks filled with powder; each of these sacks has only one opening and they are juxtaposed in such a way that these openings coincide and mutually close each other. They are forcibly kept inside the hood, on their curved, springy stalks, by a sort of teeth. The bee or humble-bee that enters the flower

to sip its nectar necessarily pushes these teeth aside; and the sacks are no sooner set free than they fly up, are flung outside and alight upon the back of the insect.

But the genius and foresight of the flower go farther than this. As Hermann Müller, who was the first to make a complete study of the wonderful mechanism of the Lousewort, observes (I am quoting from a summary):

"If the stamens struck the insect while preserving their relative positions, not a grain of pollen would leave them, because their

orifices reciprocally close each other. But a contrivance which is as simple as it is ingenious overcomes the difficulty. The lower lip of the corolla, instead of being symmetrical and horizontal, is irregular and slanting, so that one side of it is higher by a few millimetres than the other. The humble-bee resting upon it must herself necessarily stand in a sloping position. The result is that her head strikes first one and then the other of the projections of the corolla. Therefore the releasing of the stamens also takes place successively; and, when their orifices

are freed, they strike the insect, one after the other, and sprinkle her with the fertilizing dust.

"When the humble-bee next passes to another flower, she inevitably fertilizes it, because—and I have purposely omitted this detail—what she meets first of all, when thrusting her head into the entrance to the corolla, is the stigma, which grazes her just at the spot where she is about, the moment after, to be struck by the stamens, the exact spot where she has already been touched by the stamens of the flower which she has last left."

XIV

These instances might be multiplied indefinitely; every flower has its idea, its system, its acquired experience which it turns to advantage. When we examine closely their little inventions, their diverse methods, we are reminded of those captivating exhibitions of machine-tools, of machines for making machinery, in which the mechanical genius of man reveals all its resources. But our mechanical genius dates from yesterday, whereas floral mechanism has been at work for thousands of years. When the

flowers made their appearance upon our earth, there were no models around them which they could imitate; they had to derive everything from within themselves. At the period when we had not gone beyond the club, the bow and the flail; in the comparatively recent days when we conceived the spinning-wheel, the pulley, the tackle, the ram; at the time—it was last year, so to speak—when our master-pieces were the catapult, the clock and the weaving-loom, the Sage had contrived the uprights and counterweights of its lever of precision and the Lousewort its sacks

closed up as though for a scientific experiment, the successive releasing of its springs and the combination of its inclined planes. Who, say a hundred years ago, dreamt of the properties of the screw which the Maple and the Lime-tree have been turning to use since the birth of the trees? When shall we succeed in building a parachute or a flying-machine as rigid, as light, as subtle and as safe as that of the Dandelion? When shall we discover the secret of cutting in so frail a fabric as the silk of the petals a spring as powerful as that which projects into space the golden pollen of

the Spanish Broom? As for the Momordica, or Squirting Cucumber, whose name I mentioned at the beginning of this little study, who shall tell us the mystery of its miraculous strength? Do you know the Momordica? It is a humble *Cucurbitacea,* common enough along the Mediterranean coast. Its prickly fruit, which resembles a small cucumber, is endowed with inexplicable vitality and energy. You have but to touch it, at the moment of its maturity, and it suddenly quits its peduncle by means of a convulsive contraction and shoots through the hole produced by the wrench,

mingled with numerous seeds, a mucilaginous stream of such wonderful intensity that it carries the seed to four or five yards' distance from the natal plant. The action is as extraordinary, in proportion, as though we were to succeed in emptying ourselves with a single spasmodic movement and in precipitating all our organs, our viscera and our blood to a distance of half a mile from our skin and skeleton.

A large number of seeds besides have ballistic methods and employ sources of energy that are more or less unknown to us. Remember, for instance, the

explosions of the Colza and the Heath. But one of the great masters of vegetable artillery is the Spurge. The Spurge is an *Euphorbiacea* of our climes, a tall and fairly ornamental "weed," which often exceeds the height of a man. I have a branch of Spurge on my table at this moment, steeping in a glass of water. It has trifid, greenish berries, which contain the seeds. From time to time, one of these berries bursts with a loud report; and the seeds, gifted with a prodigious initial velocity, strike the furniture and the walls on every side. If one of them were to hit you in the face,

you would think that you had been stung by an insect, so extraordinary is the penetrating force of these tiny seeds, each no larger than a pin's head. Examine the berry, look for the springs that give it life: you shall not find the secret of this force, which is as invisible as that of our nerves.

The Spanish Broom (*Spartium junceum*) has not only pods, but flowers fitted with springs. You may have remarked the admirable plant. It is the proudest representative of this powerful family of the Brooms. Greedy of life, poor, sober, robust, dreading no soil, no ordeal, it forms along the

paths and in the mountains of the South huge, tufted balls, sometimes three yards high, which, between May and June, are covered with a magnificent bloom of pure gold, whose perfumes, mingling with those of its habitual neighbour, the Honeysuckle, spread under the fury of a scorching sun delights that are not to be described save by evoking celestial dews, Elysian springs, cool streams and starry transparencies in the hollow of azure grottoes. . . .

The flower of this Broom, like that of all the papilionaceous *Leguminosæ*, resembles the flowers of the Peas of our gardens; and its lower

petals, welded like the beak of a galley, hermetically contain the stamens and the pistil. So long as it is not ripe, the bee who explores it finds it impenetrable. But, as soon as the moment of puberty arrives for the captive bride and grooms, the beak bends under the weight of the insect that rests upon it; and the golden chamber bursts voluptuously, hurling with violence and afar, over the visitor, over the flowers around, a cloud of luminous dust, which a broad petal, shaped like a penthouse, casts down, with a superadded precaution, upon the stigma to be impregnated.

XV

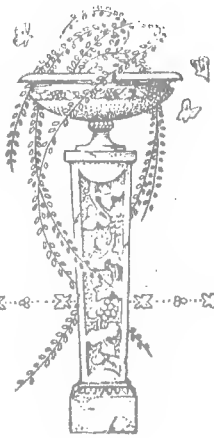
I refer those who would wish to make a thorough study of these problems to the works of Christian Konrad Sprengel, who was the first, in 1793, in his curious volume, *Das entdeckte Geheimniss der Natur im Bau und in der Befruchtung der Blumen,* to analyze the functions of the different organs in the Orchids; next, to the books of Charles Darwin, Dr. Hermann Müller of Lippstadt, Hildebrand, Delpino the Italian, Sir William Hooker, Robert Brown and many others.

We shall find the most perfect and the most harmonious

manifestations of vegetable intelligence among the Orchids. In these writhing and eccentric flowers, the genius of the plant touches its extreme point and with an unusual fire pierces the wall that separates the kingdoms. For that matter, this name of Orchid must not be allowed to mislead us or make us think that we have here to do only with rare and precious flowers, with those hot-house queens which seem to claim the care of the goldsmith rather than the gardener. Our native wild flora, which comprises all our modest "weeds," numbers more than twenty-five species of Orchids,

including just the most ingenious and complicated. It is these which Charles Darwin studied in his book, *On the Various Contrivances by which Orchids are fertilized by Insects*, which is the wonderful history of the most heroic efforts of the soul of the flower. It is out of the question that I should here, in a few lines, summarize that abundant and fairylike biography. Nevertheless, since we are on the subject of the intelligence of flowers, it is necessary that I should give some idea of the methods and the mental habits of that which excels all the others in the art of compelling the bee or the

butterfly to do exactly what it wishes, in the form and time prescribed.



XVI

It is not easy to explain without diagrams the extraordinarily complex mechanism of the Orchid. Nevertheless, I will try to give a sufficient idea of it with the aid of more or less approximate comparisons, while avoiding as far as possible the use of technical terms such as *retinaculum*, *labellum*, *rostellum* and the rest, which evoke no precise image in the minds of persons unfamiliar with botany.

Let us take one of the most widely-distributed Orchids in our regions, the *Orchis maculata*, for instance, or rather, because it is a

little larger and therefore more easily observed, the *Orchis latifolia,* the Marsh Orchid, commonly known as the Meadow-rocket. It is a perennial plant and grows to a height of an inch or more. It is fairly common in the woods and damp meadows and it carries a thyrse of little pink flowers which blossom in May and June. The typical flower of our Orchids represents pretty closely the fantastic and yawning mouth of a Chinese dragon. The lower lip, which is very long and which hangs in the form of a jagged or dentate apron, serves as a landing-place for the insect. The upper

lip rounds into a sort of hood, which shelters the essential organs; while, behind the flower, beside the peduncle, there hangs a kind of spur or long, pointed horn, which contains the nectar. In most flowers, the stigma, or female organ, is a more or less viscid little tuft, which, at the end of a frail stalk, patiently awaits the coming of the pollen. In the Orchid, this traditional installation has become irrecognizable. At the back of the mouth, in the place occupied in the throat by the uvula, are two closely-welded stigmas, above which rises a third stigma modified into an

extraordinary organ. At its top, it carries a sort of little pouch, or, more correctly, a sort of stoup, which is called the *rostellum*. This stoup is full of a viscid fluid in which soak two tiny balls whence issue two short stalks laden at their upper extremity with a packet of grains of pollen carefully tied up.

Let us now see what happens when an insect enters the flower. She lands on the lower lip, outspread to receive her, and, attracted by the scent of the nectar, seeks to reach the horn that contains it, right at the back. But the passage is purposely very narrow; and the insect's

head, as she advances, necessarily strikes the stoup. The latter, sensitive to the least shock, is at once ruptured along a convenient line and lays bare the two little balls steeped in the viscid fluid. These, coming into immediate contact with the visitor's skull, fasten to it and become firmly stuck to it, so that, when the insect leaves the flower, she carries them away and, with them, the two stalks which rise from them, and which end in the packets of tied-up pollen. We therefore have the insect capped with two straight, bottle-shaped horns. The unconscious artisan of a difficult work know

visits a neighbouring flower. If her horns remained stiff, they would simply strike with their pollen-masses the other pollen-masses soaking in the vigilant stoup and no event would spring from the pollen mingling with pollen. But here the genius, the experience and the foresight of the Orchid become apparent. The Orchid has minutely calculated the time needed for the insect to suck the nectar and repair to the next flower; and it has ascertained that this requires, on an average, thirty seconds. We have seen that the packets of pollen are carried on two short stalks inserted into the viscid balls. Now

at the point of insertion there is, under each stalk, a small membranous disc, whose only function is, at the end of thirty seconds, to contract and throw forward the stalks, causing them to curve and describe an arc of ninety degrees. This is the result of a fresh calculation, not of time, on this occasion, but of space. The two horns of pollen that cap the nuptial messenger are now horizontal and point in front of her head, so that, when she enters the next flower, they will just strike the two welded stigmas under the pendent stoup.

This is not all and the genius of the Orchid has not

yet expended all its foresight. The stigma which receives the blow of the pollen-packet is coated with a viscid substance. If this substance were as powerfully adhesive as that contained in the stoup, the pollen-masses, after their stalks were broken, would stick to it and remain fixed to it whole; and their destiny would be ended. This must not be; it is important that the chances of the pollen should not be exhausted in a single venture, but rather that they should be multiplied to the greatest possible extent. The flower that counts the seconds and measures the lines is a

chemist to boot and distils two sorts of gum: one extremely clinging and hardening as soon as it touches the air, to glue the pollen-horns to the insect's head; the other greatly diluted, for the work of the stigma. This latter is just prehensile enough slightly to loosen or disturb the tenuous and elastic threads with which the grains of pollen are tied up. Some of these grains cling to it, but the pollinic mass is not destroyed; and, when the insect visits other flowers, she will continue her fertilizing labours almost indefinitely.

Have I expounded the whole miracle? No; I have

still to call attention to many a neglected detail: among others, to the movement of the little stoup, which, after its membrane has been ruptured to unmask the viscid balls, immediately lifts up its lower rim in order to keep in good condition, in the sticky fluid, the packet of pollen which the insect may not have carried off. We should also note the very curiously-combined divergence of the pollinic stalks on the head of the insect, as well as certain chemical precautions common to all plants; for the experiments made quite recently by M. Gaston Bonnier seem to prove that every

flower, in order to preserve its species intact, secretes poisons that destroy or sterilize any foreign pollen. This is about all that we see; but here, as in all things, the real, the great miracle begins where our power of vision ends.

XVII

I have just this moment found, in an untilled corner of the olive-yard, a splendid sprig of *Loroglossum hircinum*, a variety which, for I know not what reason (perhaps it is very rare in England), Darwin omitted to study. It is certainly the most remarkable, the most fantastic, the most astounding of all our native Orchids. If it were of the size of the American Orchids, one could declare that there is no more fanciful plant in existence. Imagine a thyrse, like that of the Hyacinth, but a little taller. It is symmetrically adorned with

ill-favoured, three-cornered flowers, of a greenish white stippled with pale violet. The lower petal, embellished at its source with bronzed caruncles, huge mustachios and sinister-looking lilac buboes, stretches out interminably, madly, unreally, in the shape of a corkscrew riband of the colour assumed by a drowned corpse after a month's immersion in the river. From the whole, which conjures up the idea of the most fearsome maladies and seems to blossom in some vague land of sardonic nightmares and witcheries, there issues a potent and abominable stench as of a poisoned goat, which

spreads afar and reveals the presence of the monster. I am pointing to and describing this nauseating Orchid because it is fairly common in France, is easily recognized and adapts itself very well, by reason of its height and the distinctness of its organs, to any experiments that one might wish to make. We have only, in fact, to introduce the tip of a match into the flower and to push it carefully to the bottom of the nectary, in order, with the naked eye, to witness all the successive revolutions of the process of fertilization. Grazed in passing, the pouch or *rostellum* sinks down, exposing the little

viscid disc (the Loroglossum has only one) that supports the two pollen-stalks. As soon as this disc violently grips the end of the wood, the two cells that contain the pollen-balls open longitudinally; and, when the match is withdrawn, its tip is firmly capped with two stiff, diverging horns, each ending in a golden ball. Unfortunately, we do not here, as in the experiment with the *Orchis latifolia*, enjoy the charming spectacle offered by the gradual and precise inclination of the two horns. Why are they not lowered? We have but to introduce the capped match into a neighbouring

nectary to ascertain that this movement would be superfluous, the flower being much larger than that of the *Orchis maculata* or *latifolia* and the nectar-horn arranged in such a way that, when the insect laden with the pollen-masses enters it, they just reach the level of the stigma to be fertilized.

Let us add that it is important to the success of the experiment to select a flower that is quite ripe. We do not know when the flower is ripe; but the insect and the flower know, for the flower does not invite its necessary guests, by offering them a drop of nectar, until the moment

comes when all its apparatus is ready to work.

XVIII

This is the basis of the system of fertilization adopted by the Orchid of our climes. But each species, every family modifies and improves the details in accordance with its particular experience, psychology and convenience. The *Orchis* or *Anacamptis pyramidalis,* for instance, which is one of the most intelligent, has added to its lower lip or *labellum* two little ridges which guide the proboscis of the insect to the nectar and compel her to accom-

plish exactly what is expected of her. Darwin very justly compares this ingenious accessory with the little instrument for guiding a thread into the fine eye of a needle. Here is another interesting improvement: the two little balls that carry the pollen-stalks and soak in the stoup are replaced by a single viscid disc, shaped like a saddle. If, following the road to be taken by the insect's proboscis, we insert the point of a needle or a bristle into the flower, we very plainly perceive the advantages of this simpler and more practical arrangement. As soon as the bristle touches the stoup, the latter

is ruptured in a symmetrical line and uncovers the saddle-formed disc, which at once becomes attached to the bristle. Withdraw the bristle smartly and you will just have time to catch the pretty action of the saddle, which, seated on the bristle or needle, curls its two flaps inwards, so as to embrace closely the object that supports it. The purpose of this movement is to strengthen the adhesive power of the saddle and, above all, to ensure with greater precision than in the *Orchis latifolia* the indispensable divergence of the pollen-stalks. As soon as the saddle has curled round the

bristle and as the pollen-stalks planted in it, drawn apart by its contraction, are forced to diverge, the second movement of the stalks begins and they bend towards the tip of the bristle, in the same manner as in the Orchid which we have already studied. These two combined movements are performed in thirty to thirty-four seconds.

XIX

Is it not exactly in this manner, by means of trifles, of successive overhaulings and retouches, that human inventions proceed? We have all, in the latest of our

mechanical industries, followed the tiny, but constant improvements in the sparking, the carburation, the clutch and the speed-gear. It would really seem as though ideas came to the flowers in the same way as to us. The flowers grope in the same darkness, encounter the same obstacles, the same ill-will, in the same unknown. They have the same laws, the same disillusions, the same slow and difficult triumphs. They would appear to possess our patience, our perseverance, our self-love, the same varied and diversified intelligence, almost the same hopes and the same ideals. They

struggle, like ourselves, against a great indifferent force that ends by assisting them. Their inventive imagination not only follows the same prudent and minute methods, the same tiring, narrow and winding little paths: it also has unexpected leaps and bounds that suddenly fix definitely an uncertain discovery. It is thus that a family of great inventors among the Orchids, a strange and rich American family, that of the *Catasetidæ*, thanks to a bold inspiration, abruptly altered a number of habits that doubtless appeared to it too primitive. First of all, the separation of the sexes is

absolute: each has its particular flower. Next, the *pollinium*, or mass or packet of pollen, no longer dips its stalk in a stoup full of gum, there awaiting, a little inertly and, in any case, without initiative, the lucky accident that is to fix it on the insect's head. It is bent back on a powerful spring, in a sort of cell. Nothing attracts the insect specially in the direction of this cell. Nor have the proud *Catasetidæ* reckoned, like the common Orchids, on this or that movement of the visitor: a guided and precise movement, if you wish, but nevertheless a contingent movement. No, the insect

no longer enters merely a flower endowed with an admirable mechanism: she enters an animated and literally sensitive flower. Hardly has she pitched upon the magnificent outer court of copper-coloured silk before long and nervous feelers, which she cannot avoid touching, carry the alarm all over the edifice. Forthwith, the cell is torn asunder in which the pollen-mass, divided into two packets, is held captive on its bent-back pedicel, which is supported on a big viscid disc. Abruptly released, the pedicel straightens itself like a spring, dragging with it the two packets of pollen and the viscid disc,

which are violently projected outside. In consequence of a curious ballistic calculation, the disc is always flung first and strikes the insect, to whom it adheres. She, stunned by the blow, has but one thought: to leave the aggressive corolla with all speed and take refuge in a neighbouring flower. This is all that the American Orchid wanted.

XX

Shall I describe also the curious and practical simplifications introduced into the general system by another family of exotic Orchids, the *Cypripedeæ?* Let us continue

to bear in mind the circumvolutions of human inventions: we have here an amusing counter-proof. A fitter, in the engine-room, a preparator, a pupil, in the laboratory, says, one day, to his principal:

"Suppose we tried to do just the opposite? Suppose we reversed the movement? Suppose we inverted the mixture of the fluids?"

The experiment is tried; and, suddenly, from the unknown issues the unexpected.

One could easily believe the *Cypripedeæ* to have held similar conversations among themselves. We all know the Cypripedium, or Ladies'-

slipper: with its enormous shoe-shaped chin, its crabbed and venomous air, it is the most characteristic flower of our hothouses, the one that seems to us the typical Orchid, so to speak. The Cypripedium has bravely suppressed all the complicated and delicate apparatus of the springy pollen-masses, the diverging stalks, the viscid discs, the cunning gums and the rest. Its clog-like chin and a barren, shield-shaped anther bar the entrance in such a manner as to compel the insect to pass its proboscis over two little heaps of pollen. But this is not the important point: the wholly unexpected

and abnormal thing is that, contrary to what we have observed in all the other species, it is no longer the stigma, the female organ that is viscid, but the pollen itself, whose grains, instead of being pulverulent, are covered with a coat so glutinous that it can be stretched and drawn into threads. What are the advantages and the drawbacks of this new arrangement? It is to be feared that the pollen carried off by the insect may adhere to any object other than the stigma; on the other hand, the stigma is dispensed from secreting the fluid destined to sterilize every foreign pollen. In any case, this

problem would demand a special study. In the same way, there are patents whose usefulness we do not grasp at once.

XXI

To have done with this strange tribe of the Orchids, it remains for us to say a few words on an auxiliary organ that sets the whole mechanism going: I mean the nectary, which, for that matter, has been the object, on the part of the genius of the species, of enquiries, attempts and experiments as intelligent and as varied as those which are incessantly modifying the economy of the essential organs.

The nectary, as we have seen, is, in principle, a sort of long spur, a long, pointed horn that opens right at the

bottom of the flower, beside the peduncle, and acts more or less as a counterpoise to the corolla. It contains a sugary liquid, the nectar, which serves as food for butterflies, beetles and other insects and which is turned into honey by the bee. Its business, therefore, is to attract the indispensable guests. It is adapted to their size, their habits, their tastes; it is always arranged in such a way that they cannot introduce or withdraw their proboscis without scrupulously and successively performing all the rights prescribed by the organic laws of the flower.

We already know enough

of the fantastic character and imagination of the Orchids to foresee that here, as elsewhere—and even more than elsewhere, for the more supple organ lends itself to this more readily—their inventive, practical, observant and groping spirit has given itself free scope. One of them, for instance, the *Sarcanthus teretifolius*, probably failing in its endeavour to elaborate a viscid fluid that should harden quickly enough to stick the bundle of pollen to the insect's head, has overcome the difficulty by delaying the visitor's proboscis as long as possible in the narrow passages leading to

the nectar. The labyrinth which it has laid out is so complicated that Bauer, Darwin's skilful draughtsman, had to admit himself beaten and gave up the attempt to reproduce it.

There are some which, starting on the excellent principle that every simplification is an improvement, have boldly suppressed the nectar-horn. They have replaced it by certain fleshy, fantastic and evidently succulent excrescences which are nibbled by the insects. Is it necessary to add that these excrescences are always placed in such a manner that the guest who feasts on them must inev-

itably set all the pollen-machinery in movement?

XXII

But, without lingering over a thousand very various little artifices, let us end these fairy stories by studying the enticements of the *Coryanthes macrantha*. Truly, we no longer know with exactly what sort of being we have to do. The astounding Orchid has contrived this: its lower lip or *labellum* forms a sort of large bucket, into which drops of almost pure water, secreted by two horns situated overhead, fall continually; when this bucket is half full, the water flows away on one

side by a spout or gutter. Allthishydraulicinstallation is very remarkable in itself; but here is where the alarming, I might almost say the diabolical, side of the combination begins. The liquid which is secreted by the horns and which accumulates in the satin basin is not nectar and is in no way intended to attract the insects: it has a much more delicate function in the really machiavellian plan of this strange flower. The artless insects are invited by the sugary perfumes diffused by the fleshy excrescences of which I spoke above to walk into the trap. These excrescences are above the

bucket, in a sort of chamber to which two lateral openings give access. The big visiting bee — the flower, being enormous, allures hardly any but the heaviest *Hymenopteræ*, as though the others experienced a certain shame at entering such vast and sumptuous halls — the big bee begins to nibble the savoury caruncles. If she were alone, she would go away quietly, after finishing her meal, without even grazing the bucket of water, the stigma and the pollen; and none of that which is required would take place. But the sapient Orchid observes the life that moves around it. It knows that

the bees form an innumerable, greedy and busy people, that they come out by thousands in the sunny hours, that a perfume has but to quiver like a kiss on the threshold of an opening flower for them to hasten in a crowd to the banquet prepared under the nuptial tent. We therefore have two or three looters in the sugary chamber: the space is scanty, the walls slippery, the guests rough. They crowd and hustle one another to such good purpose that one of them always ends by falling into the bucket that awaits her beneath the treacherous repast. She there finds an unexpected

bath, conscientiously wets her bright, diaphanous wings and, despite immense efforts, cannot succeed in resuming her flight. This is where the astute flower lies in wait for her. There is but one opening through which she can leave the magic bucket: the spout that acts as a waste-pipe for the overflow of the reservoir. It is just wide enough to allow of the passage of the insect, whose back touches first the sticky surface of the stigma and then the viscid glands of the pollen-masses that await her along the vault. She thus escapes, laden with the adhesive dust, and enters a neighbouring

flower, where the tragedy of the banquet, the hustling, the fall, the bath and the escape is reenacted and perforce brings the imported pollen into contact with the greedy stigma.

Here, then, we have a flower that knows and plays upon the passions of the insects. Nor can it be pretended that all these are only so many more or less romantic interpretations: no, the facts have been precisely and scientifically observed and it is impossible to explain the use and arrangement of the flower's different organs in any other way. We must accept the evidence. This incredible

and efficacious artifice is the more surprising inasmuch as it does not here tend to satisfy the immediate and urgent need to eat that sharpens the dullest wits; it has only a distant ideal in view: the propagation of the species.

But why, we shall be asked, these fantastic complications which end only by increasing the dangers of chance? Let us not hasten to give judgment and reply. We know nothing of the reasons of the plant. Do we know what obstacles the flower encounters in the direction of logic and simplicity? Do we know thoroughly a single one of

the organic laws of its existence and its growth? One watching us from the height of Mars or Venus, as we exert ourselves to achieve the conquest of the air, might, in his turn, ask:

"Why those shapeless and monstrous machines, those balloons, those airships, those parachutes, when it were so easy to copy the birds and to supply the arms with a pair of all-sufficing wings?"

XXIII

To these proofs of intelligence, man's somewhat puerile vanity opposes the traditional objection: yes,

they create marvels, but those marvels remain eternally the same. Each species, each variety has its system and, from generation to generation, introduces no perceptible improvement. It is quite true that, since we have been observing them — that is to say, during the past fifty years — we have not seen the *Coryanthes macrantha* or the *Catasetidæ* perfect their trap: this is all that we can say; and it is really not enough. Have we as much as attempted the most elementary experiments; and do we know what the successive generations of our astonishing bathing

Orchid might do in a century's time, if placed in different surroundings, among insects to which it was not accustomed? Besides, the names which we give to the orders, species and varieties end by deceiving ourselves; and we thus create imaginary types which we believe to be fixed, whereas they are probably only the representatives of one and the same flower, which continues to modify its organs slowly in accordance with slow circumstances.

The flowers came upon our earth before the insects; they had, therefore, when the latter appeared, to adapt

an entirely new system of machinery to the habits of these unexpected collaborators. This geologically-incontestable fact alone, amid all that which we do not know, is enough to establish evolution; and does not this somewhat vague word mean, after all, adaptation, modification, intelligent progress?

It would be easy, moreover, without appealing to this prehistoric event, to bring together a large number of facts which would show that the faculty of adaptation and intelligent progress is not reserved exclusively for the human race. Without returning

to the detailed chapters which I have devoted to this subject in *The Life of the Bee,* I will simply recall two or three topical details which are there mentioned. The bees, for instance, invented the hive. In the wild and primitive state and in their country of origin, they work in the open air. It was the uncertainty, the inclemency of our northern seasons that gave them the idea of seeking a shelter in hollow trees or a hole in the rocks. This ingenious idea restored to the work of looting and to the care of the eggs the thousands of bees stationed around the combs to maintain the necessary heat. It

is not uncommon, especially in the South, during exceptionally mild summers, to find them reverting to the tropical manners of their ancestors.[1]

Another fact: transport our black bee to Australia or California and her habits will completely alter. Finding that summer is perpetual and flowers forever abundant, she will live, after

[1] I had just written these lines, when M. E. L. Bouvier made a communication in the Academy of Science (*cf.* the report of the 7th of May 1906) on the subject of two nidifications in the open air observed in Paris, one in a *Sophora Japonica*, the other in a Horse Chestnut-tree. The latter, which hung from a small branch furnished with two almost contiguous forks, was the more remarkable of the two, because of its evident and intelligent adaptation to particularly difficult circumstances:

"The bees," says M. de Parville, in his summary in the science-column of the *Journal des Débats* of the 31st of May 1906, "built

one or two years, content from day to day to gather only sufficient honey and pollen for the day's consumption; and, her thoughtful observation of these new features triumphing over hereditary experience, she will cease to make provision for the winter. Büchner mentions an analogous fact, which also proves the bees' adaptation to circumstances, not slow, secular, unconscious and fatal, but im-

consolidating pillars and resorted to really remarkable artifices of protection and ended by transforming the two forks of the chestnut-tree into a solid ceiling. An ingenious human being would certainly not have done so well.

"To protect themselves against the rain, they had installed fences, thickenings and blinds against the sun. One can have no idea of the perfection of the industry of the bees, except by observing the architecture of the two nidifications, now at the Museum."

mediate and intelligent: in the Barbadoes, the bees whose hives are in the midst of the refineries, where they find sugar in plenty during the whole year, will entirely abandon their visits to the flowers.

Let us lastly recall the amusing contradiction which the bees gave to two learned English entomologists, Messrs. Kirby and Spence:

"Show us," they said, "a single case where the pressure of events has inspired them with the idea of substituting clay or mortar for wax or propolis; show us this and we will admit their capacity for reasoning."

Scarce had they formulated this somewhat arbitrary wish, when another naturalist, Andrew Knight, having covered the bark of certain trees with a kind of cement made of wax and turpentine, discovered that his bees were entirely renouncing the collection of propolis and exclusively using this new and unknown matter, which they found in abundant quantities, ready prepared, in the vicinity of their dwelling. Moreover, in the practice of apiculture, when pollen is scarce, the bee-keeper has but to place a few handfuls of flour at their disposal for them at

once to understand that this can serve the same purpose and be turned to the same use as the dust of the anthers, although its taste, smell and colour are absolutely different.

What I have just said, in the matter of the bees, might, I think, *mutatis mutandis*, be confirmed in the kingdom of the flowers. I have referred above to my humble experiments in the wonderful evolutionary efforts of the numerous varieties of the Sage, which are worthy of a more methodical investigation. Meanwhile, among many other indications that could easily be collected, I may mention

an interesting study by Babinet on the cereals, which tells us that certain plants, when transported far from their habitual climate, observe the new circumstances and avail themselves of them, exactly as the bees do. Thus, in the hottest regions of Asia, Africa and America, where the winter does not kill it annually, our Corn becomes again what it must have been at first, a perennial plant, like grass. It remains always green, multiplies by the root and no longer bears ears or grains. When, therefore, from its original and tropical country, it came to be acclimatized in our

icy regions, it must have had to upset its habits and invent a new method of multiplication. As Babinet well says:

"The organism of the plant, thanks to an inconceivable miracle, seemed to foresee the need of passing through the grain state, lest it should perish completely during the severe season."

XXIV

In any case, to destroy the objection of which we spoke above and which has caused us to travel so far from our subject, it would be enough to establish one single act of intelligent progressoutsidemankind. But,

apart from the pleasure which one takes in refuting an over-vain and out-of-date argument, how little importance, when all is said, attaches to this question of the personal intelligence of the flowers, the insects or the birds! Suppose that we say, speaking of the Orchid and the bee alike, that it is nature and not the plant or the fly that calculates, combines, adorns, invents and thinks: what interest can this distinction have for us? A much loftier question and one much worthier of our eager attention towers over these details. What we have to do is to grasp the character,

the quality, the habits and perhaps the object of the general intelligence whence emanate all the intelligent acts performed upon this earth. It is from this point of view that the study of those creatures — the ants and the bees, among others — in which, outside the human form, the processes and the ideal of that genius are most clearly manifested becomes one of the most curious that we can undertake. It appears, after all that we have shown, that those tendencies, those intellectual methods must be at least as complex, as advanced, as startling in the Orchids as in the gregarious

Hymenopteræ. Let us add that a large number of the motives and a portion of the logic of these restless insects, so difficult of observation, still escape us, whereas we can grasp with ease all the silent motives, all the wise and stable arguments of the peaceful flower.

XXV

Now what do we observe, when we perceive nature, the general intelligence or the universal genius (the name matters but little) at work in the Orchid world? Many things; and, to mention it only in passing, for the subject would offer facilities for a long study, we begin by ascertaining that her idea of beauty, of gladness, her methods of attraction, her æsthetic tastes are very near akin to our own. But no doubt it would be more correct to state that ours are congenial with hers. It is, in fact, very uncertain whether we have ever

invented a beauty peculiar to ourselves. All our architectural, all our musical motives, all our harmonies of colour and light are borrowed directly from nature. Without calling upon the sea, the mountains, the skies, the night, the twilight, what might one not say, for instance, of the beauty of the trees? I speak not only of the tree considered in the forest, where it is one of the powers of the earth, perhaps the chief source of our instincts, of our sense of the universe, but of the tree in itself, the solitary tree, whose green old age is laden with a thousand seasons. Among

those impressions which, without our knowing it, form the limpid hollow and perhaps the subsoil of happiness and calm of our whole existence, which of us does not preserve the recollection of a few fine trees? When a man has passed mid-life, when he has come to the end of the wondering period, when he has exhausted nigh all the sights that the art, the genius and the luxury of ages and men can offer, after experiencing and comparing many things he returns to very simple memories. They raise upon the purified horizon two or three innocent, invariable

and refreshing images, which he would wish to carry away with him in his last sleep, if it be true that an image can pass the threshold that separates our two worlds. For myself, I can imagine no paradise nor after-life, however splendid it may be, in which a certain magnificent Beech would be out of place, or a certain Cypress, or a Parasol Pine of Florence or of a charming hermitage near my own house, any one of which affords to the passer-by a model of all the great movements of necessary resistance, of quiet courage, of soaring, of gravity, of silent victory and of perseverance.

XXVI

But I am wandering too far afield: I intended only to remark, with reference to the flower, that nature, when she wishes to be beautiful, to please, to delight and to prove herself happy, does almost what we should do had we her treasures at our disposal. I know that, speaking thus, I am speaking a little like the bishop who was astonished that Providence always made the great streams flow close to the big cities; but it is difficult to look upon these things from any other than the human point of view. Let

us, then, from this point of view, consider that we should know very few signs or expressions of happiness if we did not know the flower. In order well to judge of its power of gladness and beauty, one must live in a part of the country where it reigns undivided, such as the corner of Provence, between the Siagne and the Loup, in which I am writing these lines. Here, truly, the flower is the sole sovereign of the hills and valleys. The peasants have lost the habit of cultivating corn, as though they had now only to provide for the needs of a more subtle race of mankind that

lived on sweet fragrance and ambrosia. The fields form one great nosegay, incessantly renewed, and the perfumes that succeed one another seem to dance their rounds all through the azure year. Anemones, Gilliflowers, Mimosas, Violets, Pinks, Narcissuses, Hyacinths, Jonquils, Mignonette, Jasmine and Tuberoses invade the days, the nights, the winter, summer, spring and autumn months. But the magnificent hour belongs to the Roses of May. Then, as far as the eye can see, from the slope of the hills to the hollow of the plains, between dikes of Vines and Olive-trees, they flow on

every side like a stream of petals whence emerge the houses and the trees, a stream of the colour which we assign to youth, health and joy. The aroma, at once warm and fresh, but above all spacious, that opens up the sky emanates, one would think, directly from the sources of beatitude. The roads, the paths are carved in the pulp of the flower, in the very substance of Eden. For the first time in one's life, one seems to have a satisfying vision of happiness.

XXVII

Still from our human point of view and persevering

in the necessary illusion, let us add to our first remark one a little more extensive, a little less hazardous and perhaps big with consequences, namely, that the genius of the earth, which is probably that of the whole world, acts, in the vital struggle, exactly as a man would act. It employs the same methods, the same logic. It attains its aim by the means which we would use: it gropes, it hesitates, it corrects itself time after time; it adds, it suppresses, it recognizes and repairs its errors, as we should do in its place. It makes great efforts, it invents with difficulty and little by little,

after the manner of the engineers and artisans in our workshops. It fights like ourselves against the heavy, huge and obscure mass of its being. It knows no more than we do whither it is going; it seeks and finds itself gradually. It has an ideal that is often confused, but one in which, nevertheless, we distinguish a host of great lines that rise towards a more ardent, complex, nervous and spiritual form of existence. Materially, it disposes of infinite resources, it knows the secret of prodigious forces of which we know nothing; but, intellectually, it appears strictly to occupy our sphere:

we cannot prove that, hitherto, it has exceeded its limits; and, if it does not endeavour to take anything from beyond that sphere, does this not mean that there is nothing outside it? Does it not mean that the methods of the human mind are the only possible methods, that man has not erred, that he is neither an exception nor a monster, but the being through whom pass, in whom are most intensely manifested the great volitions, the great desires of the universe?

XXVIII

The touchstones of our consciousness emerge

slowly, grudgingly. Perhaps Plato's famous figure is no longer sufficient: I mean the cave with the wall above it whence the shadows of unknown men and objects are thrown into the cave below; but, if we tried to substitute a new and more exact image in its place, this would be hardly more consoling. Suppose Plato's cave enlarged. No ray of brightness ever enters it. With the exception of light and fire, it has been carefully supplied with all that our civilization permits; and men have been imprisoned in it from their birth. They would not regret the light,

having never seen it; they would not be blind, their eyes would not be dead, but, having nothing to look at, would probably become the most sensitive organ of touch.

In order to recognize ourselves in their actions, let us picture these wretches in their darkness, in the midst of the multitude of unknown objects that surround them. What quaint mistakes, what incredible deviations, what astounding misinterpretations must needs occur! But how touching and often how ingenious would seem the use which they would make of things that had not been created

for employment in the dark! How often would they guess aright? And how great would not be their stupefaction if, suddenly, by the light of day, they discovered the real nature and purpose of utensils and furniture which they had accommodated as best they could to the uncertainties of the shade?

And yet their position seems simple and easy compared with our own. The mystery in which they crawl is limited. They are deprived of only one sense, whereas it is impossible to estimate the number of those in which we are lacking. The cause of their mistakes

is one alone, whereas those of ours are countless.

Since we live in a cave of this sort, is it not interesting to prove that the power which has placed us there acts often and on some important points even as we act ourselves? We thus obtain gleams of light in our underground cave to show us that we have not been mistaken as to the use of every object to be found therein; and some of these gleams are brought to us by the insects and the flowers.

XXIX

We have long taken a rather foolish pride in

thinking ourselves miraculous, unparalleled and marvellously incidental beings, probably fallen from another world, devoid of any certain ties with the rest of life and, in any case, endowed with an unusual, incomparable, monstrous faculty. It is greatly preferable to be less prodigious, for we have learnt that prodigies do not take long to disappear in the normal evolution of nature. It is much more consoling to observe that we follow the same road as the soul of this great world, that we have the same ideas, the same hopes, the same trials and—were it not for our specific dream of

justice and pity — the same feelings. It is much more tranquillizing to assure ourselves that, to better our lot, to utilize the forces, the occasions, the laws of matter, we employ methods exactly similar to those which it uses to enlighten and order its unsubjected and unconscious regions, that there are no other methods, that we are in the midst of truth and that we are in our right place and at home in this universe formed of unknown substances, whose thought, however, is not impenetrable and hostile, but analogous or apposite to our own.

If nature knew everything, if she were never

mistaken, if, everywhere, in all her undertakings, she showed herself perfect and infallible at the first onset, if she revealed in all things an intelligence immeasurably superior to our own, then there would be cause to fear and to lose courage. We should feel ourselves the victims and the prey of an extraneous power, which we should have no hope of knowing or measuring. It is much better to be convinced that this power, at least from the intellectual point of view, is closely akin to our own. Our intelligence draws upon the same reserves as does that of nature.

We belong to the same world, we are almost equals. We are associating not with inaccessible gods, but with veiled and fraternal volitions, which it is our business to surprise and to direct.

XXX

It would not, I imagine, be very bold to maintain that there are not any more or less intelligent beings, but a scattered, general intelligence, a sort of universal fluid that penetrates diversely the organisms which it encounters, according as they are good or bad conductors of the understanding. Man would then represent,

until now, upon this earth, the mode of life that offered the least resistance to this fluid, which the religions called divine. Our nerves would be the threads along which this more subtle electricity would spread. The circumvolutions of our brain would, in a manner, form the induction-coil in which the force of the current would be multiplied; but this current would be of no other nature, would proceed from no other source than that which passes through the stone, the star, the flower or the animal.

But these are mysteries which it is somewhat idle to question, seeing that we do

not yet possess the organ that could gather their reply. Let us be satisfied with having observed certain manifestations of this intelligence outside ourselves. All that we observe within ourselves is rightly open to suspicion: we are at once judge and suitor and we have too great an interest in peopling our world with magnificent illusions and hopes. But let the slightest external indication be dear and precious to us. Those which the flowers have just offered us are probably quite infinitesimal compared with what the mountains, the sea and the stars would tell us, could we surprise the secrets

of their life. Nevertheless, they allow us to presume with greater confidence that the spirit which animates all things or emanates from them is of the same essence as that which animates our bodies. If this spirit resembles us, if we thus resemble it, if all that it contains is contained also within ourselves, if it employs our methods, if it has our habits, our preoccupations, our tendencies, our desires for better things, is it illogical for us to hope all that we do hope, instinctively, invincibly, seeing that it is almost certain that it hopes the same? Is it probable, when we find

scattered through life so great a sum total of intelligence, that this life should make no work of intelligence, that is to say, should not pursue an aim of happiness, of perfection, of victory over that which we call evil, death, darkness, annihilation, which is probably only the shadow of its face or its own sleep?

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