

The Life of the Bee

BY

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The Life of the Bee

I

ON THE THRESHOLD OF THE HIVE

[1]

IT is not my intention to write a treatise on apiculture, or on practical bee-keeping. Excellent works of the kind abound in all civilised countries, and it were useless to attempt another. France has those of Dadant, Georges de Layens and Bonnier, Bertrand, Hamet, Weber, Clement, the Abbé Collin, etc. English-speaking countries have Langstroth, Bevan, Cook, Cheshire, Cowan, Root, etc. Germany has Dzierzon, Van Berlespoch, Pollmann, Vogel, and many others.

Nor is this book to be a scientific monograph on *Apis Mellifica*, *Ligustica*, *Fasciata*, *Dorsata*, etc., or a collection of new observations and studies. I shall say scarcely anything that those will not know who are somewhat familiar with bees. The notes and experiments I have made during my twenty years of beekeeping I shall reserve for a more technical work; for their interest is necessarily of a special and limited nature, and I am anxious not to over-burden this essay. I wish to speak of the bees very simply, as one speaks of a subject one knows and loves to those who know it not. I do not intend to adorn the truth, or merit the just reproach Réaumur addressed to his predecessors in the study of our honey-flies, whom he accused of substituting for the marvellous reality marvels that were imaginary and merely plausible. The fact that the hive contains so much that is wonderful does not warrant our seeking to add to its wonders. Besides, I myself have now for a long time ceased to look for anything more beautiful in this world, or more interesting, than the truth; or at least than the effort one is able to make towards the truth. I shall state nothing, therefore, that I have not verified myself, or that is not so fully accepted in the text-books as to render further verification superfluous. My facts shall be as accurate as though they appeared in a practical manual or scientific monograph, but I shall relate them in a somewhat livelier fashion than such works would allow, shall group them more harmoniously together, and blend them with freer and more mature reflections. The reader of this book will not learn therefrom how to manage a hive; but he will know more or less all that can with any certainty be known of the curious, profound, and intimate side of its inhabitants. Nor will this be at the cost of what still remains to be learned. I shall pass over in silence the hoary traditions that, in the country and many a book, still constitute the legend of the hive. Whenever there be doubt, disagreement, hypothe-

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gil's—

“Man equal to kings, and approaching the gods;”

whereto Lafontaine might have added—

“And, like the gods, content and at rest.”

Here had he built his refuge, being a little weary; not disgusted, for the large aversions are unknown to the sage; but a little weary of interrogating men, whose answers to the only interesting questions one can put concerning nature and her veritable laws are far less simple than those that are given by animals and plants. His happiness, like the Scythian philosopher's, lay all in the beauties of his garden; and best-loved and visited most often, was the apiary, composed of twelve domes of straw, some of which he had painted a bright pink, and some a clear yellow, but most of all a tender blue; having noticed, long before Sir John Lubbock's demonstrations, the bees' fondness for this colour.

These hives stood against the wall of the house, in the angle formed by one of those pleasant and graceful Dutch kitchens whose earthenware dresser, all bright with copper and tin, reflected itself through the open door on to the peaceful canal. And the water, burdened with these familiar images beneath its curtain of poplars, led one's eyes to a calm horizon of mills and of meadows.

Here, as in all places, the hives lent a new meaning to the flowers and the silence, the balm of the air and the rays of the sun. One seemed to have drawn very near to the festival spirit of nature. One was content to rest at this radiant cross-road, where the aerial ways converge and divide that the busy and tuneful bearers of all country perfumes unceasingly travel from dawn unto dusk. One heard the musical voice of the garden, whose loveliest hours revealed their rejoicing soul and sang of their gladness. One came hither, to the school of the bees, to be taught the preoccupations of all-powerful nature, the harmonious concord of the three kingdoms, the indefatigable organisation of life, and the lesson of ardent and disinterested work; and another lesson too, with a moral as good, that the heroic workers taught there, and emphasised, as it were, with the fiery darts of their myriad wings, was to appreciate the somewhat vague savour of leisure, to enjoy the almost unspeakable delights of those immaculate days that revolved on themselves in the fields of space, forming merely a transparent globe, as void of memory as the happiness without alloy.

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natural catastrophe whereto they do well to submit

Instead of vainly struggling, therefore, they do what they can to safeguard the future; and, obeying a foresight that for once is in error, they fly to their reserves of honey, into which they eagerly dip in order to possess within themselves the wherewithal to start a new city, immediately and no matter where, should the ancient one be destroyed or they be compelled to forsake it.

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The first impression of the novice before whom an observation-hive¹ is opened will be one of some disappointment. He had been told that this little glass case contained an unparalleled activity, an infinite number of wise laws, and a startling amalgam of mystery, experience, genius, calculation, science, of various industries, of certitude and prescience, of intelligent habits and curious feelings and virtues. All that he sees is a confused mass of little reddish groups, somewhat resembling roasted coffee-berries, or bunches of raisins piled against the glass. They look more dead than alive; their movements are slow, incoherent, and incomprehensible. Can these be the wonderful drops of light he had seen but a moment ago, unceasingly flashing and sparkling, as they darted among the pearls and the gold of a thousand wide-open calyces?

They appear to be shivering in the darkness, to be numbed, suffocated, so closely are they huddled together; one might fancy they were ailing captives, or queens dethroned, who have had their one moment of glory in the midst of their radiant garden, and are now compelled to return to the shameful squalor of their poor overcrowded home.

It is with them as with all that is deeply real; they must be studied, and one must learn how to study them. The inhabitant of another planet who should see men and women coming and going almost imperceptibly through our streets, crowding at certain times around certain buildings, or waiting for one knows not what, without apparent movement, in the depths of their dwellings, might conclude therefrom that they, too, were miserable and inert. It takes time to distinguish the manifold activity contained in this inertia.

And indeed every one of the little almost motionless groups in the hive is incessantly working, each at a different trade. Repose is unknown to any; and such, for instance, as seem the most torpid, as they hang in dead clusters against the glass, are intrusted with the most mysterious and fatiguing task of all: it is they who secrete and form the wax. But the details of this universal activity will be given in their place. For the moment we need only call attention to the essential trait in the nature of the bee which accounts for the extraordinary agglomeration of the various workers. The bee is above all,

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and even to a greater extent than the ant, a creature of the crowd. She can live only in the midst of a multitude. When she leaves the hive, which is so densely packed that she has to force her way with blows of her head through the living walls that enclose her, she departs from her proper element. She will dive for an instant into flower-filled space, as the swimmer will dive into the sea that is filled with pearls, but under pain of death it behoves her at regular intervals to return and breathe the crowd as the swimmer must return and breathe the air. Isolate her, and however abundant the food or favourable the temperature, she will expire in a few days not of hunger or cold, but of loneliness. From the crowd, from the city, she derives an invisible aliment that is as necessary to her as honey. This craving will help to explain the spirit of the laws of the hive. For in them the individual is nothing, her existence conditional only, and herself, for one indifferent moment, a winged organ of the race. Her whole life is an entire sacrifice to the manifold, everlasting being whereof she forms part. It is strange to note that it was not always so. We find even to-day, among the melliferous hymenoptera, all the stages of progressive civilisation of our own domestic bee. At the bottom of the scale we find her working alone, in wretchedness, often not seeing her offspring (the *Prosopis*, the *Colletes*, etc.); sometimes living in the midst of the limited family that she produces annually (as in the case of the humble-bee). Then she forms temporary associations (the *Panurgi*, the *Dasypodoe*, the *Hacliti*, etc.) and at last we arrive, through successive stages, at the almost perfect but pitiless society of our hives, where the individual is entirely merged in the republic, and the republic in its turn invariably sacrificed to the abstract and immortal city of the future.

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Let us not too hastily deduce from these facts conclusions that apply to man. He possesses the power of withstanding certain of nature's laws; and to know whether such resistance be right or wrong is the gravest and obscurest point in his morality. But it is deeply interesting to discover what the will of nature may be in a different world; and this will is revealed with extraordinary clearness in the evolution of the hymenoptera, which, of all the inhabitants of this globe, possess the highest degree of intellect after that of man. The aim of nature is manifestly the improvement of the race; but no less manifest is her inability, or refusal, to obtain such improvement except at the cost of the liberty, the rights, and the happiness of the individual. In proportion as a society organises itself, and rises in the scale, so does a shrinkage enter the private life of each one of its members. Where there is progress, it is the result only of a more and more complete sacrifice of the individual to the general interest. Each one is com-

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pelled, first of all, to renounce his vices, which are acts of independence. For instance, at the last stage but one of apiarian civilisation, we find the humble-bees, which are like our cannibals. The adult workers are incessantly hovering around the eggs, which they seek to devour, and the mother has to display the utmost stubbornness in their defence. Then having freed himself from his most dangerous vices, each individual has to acquire a certain number of more and more painful virtues. Among the humble-bees, for instance, the workers do not dream of renouncing love, whereas our domestic bee lives in a state of perpetual chastity. And indeed we soon shall show how much more she has to abandon, in exchange for the comfort and security of the hive, for its architectural, economic, and political perfection; and we shall return to the evolution of the hymenoptera in the chapter devoted to the progress of the species.

II

THE SWARM

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WE will now, so as to draw more closely to nature, consider the different episodes of the swarm as they come to pass in an ordinary hive, which is ten or twenty times more populous than an observation one, and leaves the bees entirely free and untrammelled.

Here, then, they have shaken off the torpor of winter. The queen started laying again in the very first days of February, and the workers have flocked to the willows and nut-trees, gorse and violets, anemones and lungworts. Then spring invades the earth, and cellar and stream with honey and pollen, while each day beholds the birth of thousands of bees. The overgrown males now all sally forth from their cells, and disport themselves on the combs; and so crowded does the too prosperous city become that hundreds of belated workers, coming back from the flowers towards evening, will vainly seek shelter within, and will be forced to spend the night on the threshold, where they will be decimated by the cold.

Restlessness seizes the people, and the old queen begins to stir. She feels that a new destiny is being prepared. She has religiously fulfilled her duty as a good creatress; and from this duty done there result only tribulation and sorrow. An invincible power menaces her tranquillity; she will soon be forced to quit this city of hers, where she has reigned. But this city is her work, it is she, herself. She is not its queen in the sense in which men use the word. She issues no orders; she obeys, as meekly as the humblest of her subjects, the masked power, sovereignly wise, that for the present, and till we at-

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tempt to locate it, we will term the “spirit of the hive.” But she is the unique organ of love; she is the mother of the city. She founded it amid uncertainty and poverty. She has peopled it with her own substance; and all who move within its walls—workers, males, larvae, nymphs, and the young princesses whose approaching birth will hasten her own departure, one of them being already designed as her successor by the “spirit of the hive”—all these have issued from her flanks.

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What is this “spirit of the hive”—where does it reside? It is not like the special instinct that teaches the bird to construct its well planned nest, and then seek other skies when the day for migration returns. Nor is it a kind of mechanical habit of the race, or blind craving for life, that will fling the bees upon any wild hazard the moment an unforeseen event shall derange the accustomed order of phenomena. On the contrary, be the event never so masterful, the “spirit of the hive” still will follow it, step by step, like an alert and quick-witted slave, who is able to derive advantage even from his master’s most dangerous orders.

It disposes pitilessly of the wealth and the happiness, the liberty and life, of all this winged people; and yet with discretion, as though governed itself by some great duty. It regulates day by day the number of births, and contrives that these shall strictly accord with the number of flowers that brighten the country-side. It decrees the queen’s deposition or warns her that she must depart; it compels her to bring her own rivals into the world, and rears them royally, protecting them from their mother’s political hatred. So, too, in accordance with the generosity of the flowers, the age of the spring, and the probable dangers of the nuptial flight, will it permit or forbid the first-born of the virgin princesses to slay in their cradles her younger sisters, who are singing the song of the queens. At other times, when the season wanes, and flowery hours grow shorter, it will command the workers themselves to slaughter the whole imperial brood, that the era of revolutions may close, and work become the sole object of all. The “spirit of the hive” is prudent and thrifty, but by no means parsimonious. And thus, aware, it would seem, that nature’s laws are somewhat wild and extravagant in all that pertains to love, it tolerates, during summer days of abundance, the embarrassing presence in the hive of three or four hundred males, from whose ranks the queen about to be born shall select her lover; three or four hundred foolish, clumsy, useless, noisy creatures, who are pretentious, gluttonous, dirty, coarse, totally and scandalously idle, insatiable, and enormous.

But after the queen’s impregnation, when flowers begin to close

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sooner, and open later, the spirit one morning will coldly decree the simultaneous and general massacre of every male. It regulates the workers' labours, with due regard to their age; it allots their task to the nurses who tend the nymphs and the larvae, the ladies of honour who wait on the queen and never allow her out of their sight; the house-bees who air, refresh, or heat the hive by fanning their wings, and hasten the evaporation of the honey that may be too highly charged with water; the architects, masons, wax-workers, and sculptors who form the chain and construct the combs; the foragers who sally forth to the flowers in search of the nectar that turns into honey, of the pollen that feeds the nymphs and the larvae, the propolis that welds and strengthens the buildings of the city, or the water and salt required by the youth of the nation. Its orders have gone to the chemists who ensure the preservation of the honey by letting a drop of formic acid fall in from the end of their sting; to the capsule-makers who seal down the cells when the treasure is ripe, to the sweepers who maintain public places and streets most irreproachably clean, to the bearers whose duty it is to remove the corpses; and to the amazons of the guard who keep watch on the threshold by night and by day, question comers and goers, recognise the novices who return from their very first flight, scare away vagabonds, marauders and loiterers, expel all intruders, attack redoubtable foes in a body, and, if need be, barricade the entrance.

Finally, it is the spirit of the hive that fixes the hour of the great annual sacrifice to the genius of the race: the hour, that is, of the swarm; when we find a whole people, who have attained the topmost pinnacle of prosperity and power, suddenly abandoning to the generation to come their wealth and their palaces, their homes and the fruits of their labour; themselves content to encounter the hardships and perils of a new and distant country. This act, be it conscious or not, undoubtedly passes the limits of human morality. Its result will sometimes be ruin, but poverty always; and the thrice-happy city is scattered abroad in obedience to a law superior to its own happiness. Where has this law been decreed, which, as we soon shall find, is by no means as blind and inevitable as one might believe? Where, in what assembly, what council, what intellectual and moral sphere, does this spirit reside to whom all must submit, itself being vassal to an heroic duty, to an intelligence whose eyes are persistently fixed on the future?

It comes to pass with the bees as with most of the things in this world; we remark some few of their habits; we say they do this, they work in such and such fashion, their queens are born thus, their workers are virgin, they swarm at a certain time. And then we imagine we know them, and ask nothing more. We watch them hasten from flower to flower, we see the constant agitation within the hive; their life seems very simple to us, and bounded, like every life, by the instinctive cares of reproduction and nourishment. But let the

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eye draw near, and endeavour to see; and at once the least phenomenon of all becomes overpoweringly complex; we are confronted by the enigma of intellect, of destiny, will, aim, means, causes; the incomprehensible organisation of the most insignificant act of life.

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Our hive, then, is preparing to swarm; making ready for the great immolation to the exacting gods of the race. In obedience to the order of the spirit—an order that to us may well seem incomprehensible, for it is entirely opposed to all our own instincts and feelings—60,000 or 70,000 bees out of the 80,000 or 90,000 that form the whole population, will abandon the maternal city at the prescribed hour. They will not leave at a moment of despair; or desert, with sudden and wild resolve, a home laid waste by famine, disease, or war. No, the exile has long been planned, and the favourable hour patiently awaited. Were the hive poor, had it suffered from pillage or storm, had misfortune befallen the royal family, the bees would not forsake it. They leave it only when it has attained the apogee of its prosperity; at a time when, after the arduous labours of the spring, the immense palace of wax has its 120,000 well-arranged cells overflowing with new honey, and with the many-coloured flour, known as “bees’ bread,” on which nymphs and larvae are fed.

Never is the hive more beautiful than on the eve of its heroic renouncement, in its unrivalled hour of fullest abundance and joy; serene for all its apparent excitement and feverishness.

Let us endeavour to picture it to ourselves, not as it appears to the bees—for we cannot tell in what magical, formidable fashion things may be reflected in the 6,000 or 7,000 facets of their lateral eyes and the triple cyclopean eye on their brow—but as it would seem to us, were we of their stature. From the height of a dome more colossal than that of St. Peter’s at Rome waxen walls descend to the ground, balanced in the void and the darkness; gigantic and manifold, vertical and parallel geometric constructions, to which, for relative precision, audacity, and vastness, no human structure is comparable. Each of these walls, whose substance still is immaculate and fragrant, of virginal, silvery freshness, contains thousands of cells, that are stored with provisions sufficient to feed the whole people for several weeks. Here, lodged in transparent cells, are the pollens, love-ferment of every flower of spring, making brilliant splashes of red and yellow, of black and mauve. Close by, in twenty thousand reservoirs, sealed with a seal that shall only be broken on days of supreme distress, the honey of April is stored, most limpid and perfumed of all, wrapped round with long and magnificent embroidery of gold, whose borders hang stiff and rigid. Still lower the honey of May matures, in great open vats, by whose side watchful

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cohorts maintain an incessant current of air. In the centre, and far from the light whose diamond rays steal in through the only opening, in the warmest part of the hive, there stands the abode of the future; here does it sleep, and wake. For this is the royal domain of the brood-cells, set apart for the queen and her acolytes; about 10,000 cells wherein the eggs repose, 15,000 or 16,000 chambers tenanted by larvae, 40,000 dwellings inhabited by white nymphs to whom thousands of nurses minister.² And finally, in the holy of holies of these parts, are the three, four, six, or twelve sealed palaces, vast in size compared with the others, where the adolescent princesses lie who await their hour, wrapped in a kind of shroud, all of them motionless and pale, and fed in the darkness.

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On the day, then, that the Spirit of the Hive has ordained, a certain part of the population will go forth, selected in accordance with sure and immovable laws, and make way for hopes that as yet are formless. In the sleeping city there remain the males, from whose ranks the royal lover shall come, the very young bees that tend the brood-cells, and some thousands of workers who continue to forage abroad, to guard the accumulated treasure, and preserve the moral traditions of the hive. For each hive has its own code of morals. There are some that are very virtuous and some that are very perverse; and a careless bee-keeper will often corrupt his people, destroy their respect for the property of others, incite them to pillage, and induce in them habits of conquest and idleness which will render them sources of danger to all the little republics around. These things result from the bee's discovery that work among distant flowers, whereof many hundreds must be visited to form one drop of honey, is not the only or promptest method of acquiring wealth, but that it is easier to enter ill-guarded cities by stratagem, or force her way into others too weak for self-defence. Nor is it easy to restore to the paths of duty a hive that has become thus depraved.

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All things go to prove that it is not the queen, but the spirit of the hive, that decides on the swarm. With this queen of ours it happens as with many a chief among men, who though he appear to give orders, is himself obliged to obey commands far more mysterious, far more inexplicable, than those he issues to his subordinates. The hour once fixed, the spirit will probably let it be known at break of dawn, or the previous night, if indeed not two nights before; for scarcely has the sun drunk in the first drops of dew when a most un-

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accustomed stir, whose meaning the bee-keeper rarely will fail to grasp, is to be noticed within and around the buzzing city. At times one would almost appear to detect a sign of dispute, hesitation, recoil. It will happen even that for day after day a strange emotion, apparently without cause, will appear and vanish in this transparent, golden throng. Has a cloud that we cannot see crept across the sky that the bees are watching; or is their intellect battling with a new regret? Does a winged council debate the necessity of the departure? Of this we know nothing; as we know nothing of the manner in which the spirit conveys its resolution to the crowd. Certain as it may seem that the bees communicate with each other, we know not whether this be done in human fashion. It is possible even that their own refrain may be inaudible to them: the murmur that comes to us heavily laden with perfume of honey, the ecstatic whisper of fairest summer days that the bee-keeper loves so well, the festival song of labour that rises and falls around the hive in the crystal of the hour, and might almost be the chant of the eager flowers, hymn of their gladness and echo of their soft fragrance, the voice of the white carnations, the marjoram, and the thyme. They have, however, a whole gamut of sounds that we can distinguish, ranging from profound delight to menace, distress, and anger; they have the ode of the queen, the song of abundance, the psalms of grief, and, lastly, the long and mysterious war-cries the adolescent princesses send forth during the combats and massacres that precede the nuptial flight. May this be a fortuitous music that fails to attain their inward silence? In any event they seem not the least disturbed at the noises we make near the hive; but they regard these perhaps as not of their world, and possessed of no interest for them. It is possible that we on our side hear only a fractional part of the sounds that the bees produce, and that they have many harmonies to which our ears are not attuned. We soon shall see with what startling rapidity they are able to understand each other, and adopt concerted measures, when, for instance, the great honey thief, the huge sphinx atropos, the sinister butterfly that bears a death's head on its back, penetrates into the hive, humming its own strange note, which acts as a kind of irresistible incantation; the news spreads quickly from group to group, and from the guards at the threshold to the workers on the furthest combs, the whole population quivers.

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It was for a long time believed that when these wise bees, generally so prudent, so far-sighted and economical, abandoned the treasures of their kingdom and flung themselves upon the uncertainties of life, they were yielding to a kind of irresistible folly, a mechanical impulse, a law of the species, a decree of nature, or to the force that

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for all creatures lies hidden in the revolution of time. It is our habit, in the case of the bees no less than our own, to regard as fatality all that we do not as yet understand. But now that the hive has surrendered two or three of its material secrets, we have discovered that this exodus is neither instinctive nor inevitable. It is not a blind emigration, but apparently the well-considered sacrifice of the present generation in favour of the generation to come. The bee-keeper has only to destroy in their cells the young queens that still are inert, and, at the same time, if nymphs and larvae abound, to enlarge the store-houses and dormitories of the nation, for this unprofitable tumult instantaneously to subside, for work to be at once resumed, and the flowers revisited; while the old queen, who now is essential again, with no successor to hope for, or perhaps to fear, will renounce for this year her desire for the light of the sun. Reassured as to the future of the activity that will soon spring into life, she will tranquilly resume her maternal labours, which consist in the laying of two or three thousand eggs a day, as she passes, in a methodical spiral, from cell to cell, omitting none, and never pausing to rest.

Where is the fatality here, save in the love of the race of to-day for the race of to-morrow? This fatality exists in the human species also, but its extent and power seem infinitely less. Among men it never gives rise to sacrifices as great, as unanimous, or as complete. What far-seeing fatality, taking the place of this one, do we ourselves obey? We know not; as we know not the being who watches us as we watch the bees.

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But the hive that we have selected is disturbed in its history by no interference of man; and as the beautiful day advances with radiant and tranquil steps beneath the trees, its ardour, still bathed in dew, makes the appointed hour seem laggard. Over the whole surface of the golden corridors that divide the parallel walls the workers are busily making preparation for the journey. And each one will first of all burden herself with provision of honey sufficient for five or six days. From this honey that they bear within them they will distil, by a chemical process still unexplained, the wax required for the immediate construction of buildings. They will provide themselves also with a certain amount of propolis, a kind of resin with which they will seal all the crevices in the new dwelling, strengthen weak places, varnish the walls, and exclude the light; for the bees love to work in almost total obscurity, guiding themselves with their many-faceted eyes, or with their antennae perhaps, the seat, it would seem, of an unknown sense that fathoms and measures the darkness.

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They are not without prescience, therefore, of what is to befall them on this the most dangerous day of all their existence. Absorbed by the cares, the prodigious perils of this mighty adventure, they will have no time now to visit the gardens and meadows; and tomorrow, and after tomorrow, it may happen that rain may fall, or there may be wind; that their wings may be frozen or the flowers refuse to open. Famine and death would await them were it not for this foresight of theirs. None would come to their help, nor would they seek help of any. For one city knows not the other, and assistance never is given. And even though the bee-keeper deposit the hive, in which he has gathered the old queen and her attendant cluster of bees, by the side of the abode they have but this moment quitted, they would seem, be the disaster never so great that shall now have befallen them, to have wholly forgotten the peace and the happy activity that once they had known there, the abundant wealth and the safety that had then been their portion; and all, one by one, and down to the last of them, will perish of hunger and cold around their unfortunate queen rather than return to the home of their birth, whose sweet odour of plenty, the fragrance, indeed, of their own past assiduous labour, reaches them even in their distress.

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That is a thing, some will say, that men would not do—a proof that the bee, notwithstanding the marvels of its organisation, still is lacking in intellect and veritable consciousness. Is this so certain? Other beings, surely, may possess an intellect that differs from ours, and produces different results, without therefore being inferior. And besides, are we, even in this little human parish of ours, such infallible judges of matters that pertain to the spirit? Can we so readily divine the thoughts that may govern the two or three people we may chance to see moving and talking behind a closed window, when their words do not reach us? Or let us suppose that an inhabitant of Venus or Mars were to contemplate us from the height of a mountain, and watch the little black specks that we form in space, as we come and go in the streets and squares of our towns. Would the mere sight of our movements, our buildings, machines, and canals, convey to him any precise idea of our morality, intellect, our manner of thinking, and loving, and hoping—in a word, of our real and intimate self? All he could do, like ourselves when we gaze at the hive, would be to take note of some facts that seem very surprising; and from these facts to deduce conclusions probably no less erroneous, no less uncertain, than those that we choose to form concerning the bee.

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This much at least is certain; our “little black specks” would not reveal the vast moral direction, the wonderful unity, that are so apparent in the hive. “Whither do they tend, and what is it they do?” he would ask, after years and centuries of patient watching. “What is the aim of their life, or its pivot? Do they obey some God? I can see nothing that governs their actions. The little things that one day they appear to collect and build up, the next they destroy and scatter. They come and they go, they meet and disperse, but one knows not what it is they seek. In numberless cases the spectacle they present is altogether inexplicable. There are some, for instance, who, as it were, seem scarcely to stir from their place. They are to be distinguished by their glossier coat, and often too by their more considerable bulk. They occupy buildings ten or twenty times larger than ordinary dwellings, and richer, and more ingeniously fashioned. Every day they spend many hours at their meals, which sometimes indeed are prolonged far into the night. They appear to be held in extraordinary honour by those who approach them; men come from the neighbouring houses, bringing provisions, and even from the depths of the country, laden with presents. One can only assume that these persons must be indispensable to the race, to which they render essential service, although our means of investigation have not yet enabled us to discover what the precise nature of this service may be. There are others, again, who are incessantly engaged in the most wearisome labour, whether it be in great sheds full of wheels that forever turn round and round, or close by the shipping, or in obscure hovels, or on small plots of earth that from sunrise to sunset they are constantly delving and digging. We are led to believe that this labour must be an offence, and punishable. For the persons guilty of it are housed in filthy, ruinous, squalid cabins. They are clothed in some colourless hide. So great does their ardour appear for this noxious, or at any rate useless activity, that they scarcely allow themselves time to eat or to sleep. In numbers they are to the others as a thousand to one. It is remarkable that the species should have been able to survive to this day under conditions so unfavourable to its development. It should be mentioned, however, that apart from this characteristic devotion to their wearisome toil, they appear inoffensive and docile; and satisfied with the leavings of those who evidently are the guardians, if not; the saviours, of the race.”

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Is it not strange that the hive, which we vaguely survey from the height of another world, should provide our first questioning glance with so sure and profound a reply? Must we not admire the manner in which the thought or the god that the bees obey is at once revealed by their edifices, wrought with such striking conviction, by

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their customs and laws, their political and economical organisation, their virtues, and even their cruelties? Nor is this god, though it be perhaps the only one to which man has as yet never offered serious worship, by any means the least reasonable or the least legitimate that we can conceive. The god of the bees is the future. When we, in our study of human history, endeavour to gauge the moral force or greatness of a people or race, we have but one standard of measurement—the dignity and permanence of their ideal, and the abnegation wherewith they pursue it. Have we often encountered an ideal more conformable to the desires of the universe, more widely manifest, more disinterested or sublime; have we often discovered an abnegation more complete and heroic?

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Strange little republic, that, for all its logic and gravity, its matured conviction, and prudence, still falls victim to so vast and precarious a dream! Who shall tell us, O little people that are so profoundly in earnest, that have fed on the warmth and the light and on nature's purest, the soul of the flowers, wherein matter for once seems to smile, and put forth its most wistful effort towards beauty and happiness—who shall tell us what problems you have resolved, but we not yet, what certitudes you have acquired that we still have to conquer? And if you have truly resolved these problems, and acquired these certitudes, by the aid of some blind and primitive impulse and not through the intellect, then to what enigma, more insoluble still, are you not urging us on? Little city abounding in faith and mystery and hope, why do your myriad virgins consent to a task that no human slave has ever accepted? Another spring might be theirs, another summer, were they only a little less wasteful of strength, a little less self-forgetful in their ardour for toil; but at the magnificent moment when the flowers all cry to them, they seem to be stricken with the fatal ecstasy of work; and in less than five weeks they almost all perish, their wings broken, their bodies shrivelled and covered with wounds.

“Tantus amor florum, et generandi gloria mellis!”

cries Virgil in the fourth book of the *Georgics*, wherein he devotes himself to the bees, and hands down to us the charming errors of the ancients, who looked on nature with eyes still dazzled by the presence of imaginary gods.

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Why do they thus renounce sleep, the delights of honey and love, and the exquisite leisure enjoyed, for instance, by their winged brother, the butterfly? Why will they not live as he lives? It is not hunger that urges them on. Two or three flowers suffice, for their nourishment, and in one hour they will visit two or three hundred, to collect a treasure whose sweetness they never will taste. Why all this toil and distress, and whence comes this mighty assurance? Is it so certain, then, that the new generation whereunto you offer your lives will merit the sacrifice; will be more beautiful, happier, will do something you have not done? Your aim is clear to us, clearer far than our own; you desire to live, as long as the world itself, in those that come after; but what can the aim be of this great aim; what the mission of this existence eternally renewed?

And yet may it not be that these questions are idle, and we who are putting them to you mere childish dreamers, hedged round with error and doubt? And, indeed, had successive evolutions installed you all-powerful and supremely happy; had you gained the last heights, whence at length you ruled over nature's laws; nay, were you immortal goddesses, we still should be asking you what your desires might be, your ideas of progress; still wondering where you imagined that at last you would rest and declare your wishes fulfilled. We are so made that nothing contents us; that we can regard no single thing as having its aim self-contained, as simply existing, with no thought beyond existence. Has there been, to this day, one god out of all the multitude man has conceived, from the vulgarest to the most thoughtful) of whom it has not been required that he shall be active and stirring) that he shall create countless beings and things, and have myriad aims outside himself? And will the time ever come when we shall be resigned for a few hours tranquilly to represent in this world an interesting form of material activity; and then, our few hours over, to assume, without surprise and without regret, that other form which is the unconscious, the unknown, the slumbering, and the eternal?

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But we are Forgetting the hive wherein the swarming bees have begun to lose patience, the hive whose black and vibrating waves are bubbling and overflowing, like a brazen cup beneath an ardent sun. It is noon; and the heat so great that the assembled trees would seem almost to hold back their leaves, as a man holds his breath before something very-tender but very grave. The bees give their honey and sweet-smelling wax to the man who attends them; but more precious gift still is their summoning him to the gladness of June, to

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the joy of the beautiful months; for events in which bees take part happen only when skies are pure, at the winsome hours of the year when flowers keep holiday. They are the soul of the summer, the clock whose dial records the moments of plenty; they are the untiring wing on which delicate perfumes float; the guide of the quivering light-ray, the song of the slumberous, languid air; and their flight is the token, the sure and melodious note, of all the myriad fragile joys that are born in the heat and dwell in the sunshine. They teach us to tune our ear to the softest, most intimate whisper of these good, natural hours. To him who has known them and loved them, a summer where there are no bees becomes as sad and as empty as one without flowers or birds.

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The man who never before has beheld the swarm of a populous hive must regard this riotous, bewildering spectacle with some apprehension and diffidence. He will be almost afraid to draw near; he will wonder can these be the earnest, the peace-loving, hard-working bees whose movements he has hitherto followed? It was but a few moments before he had seen them troop in from all parts of the country, as pre-occupied, seemingly, as little housewives might be, with no thoughts beyond household cares. He had watched them stream into the hive, imperceptibly almost, out of breath, eager, exhausted, full of discreet agitation; and had seen the young amazons stationed at the gate salute them, as they passed by, with the slightest wave of antennae. And then, the inner court reached, they had hurriedly given their harvest of honey to the adolescent portresses always stationed within, exchanging with these at most the three or four probably indispensable words; or perhaps they would hasten themselves to the vast magazines that encircle the brood-cells, and deposit the two heavy baskets of pollen that depend from their thighs, thereupon at once going forth once more, without giving a thought to what might be passing in the royal palace, the work-rooms, or the dormitory where the nymphs lie asleep; without for one instant joining in the babel of the public place in front of the gate, where it is the wont of the cleaners, at time of great heat, to congregate and to gossip.

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To-day this is all changed. A certain number of workers, it is true, will peacefully go to the fields, as though nothing were happening; will come back, clean the hive, attend to the brood-cells, and hold altogether aloof from the general ecstasy. These are the ones

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that will not accompany the queen; they will remain to guard the old home, feed the nine or ten thousand eggs, the eighteen thousand larvae, the thirty-six thousand nymphs and seven or eight royal princesses, that to-day shall all be abandoned. Why they have been singled out for this austere duty, by what law, or by whom, it is not in our power to divine. To this mission of theirs they remain inflexibly, tranquilly faithful; and though I have many times tried the experiment of sprinkling a colouring matter over one of these resigned Cinderellas, that are moreover easily to be distinguished in the midst of the rejoicing crowds by their serious and somewhat ponderous gait, it is rarely indeed that I have found one of them in the delirious throng of the swarm.

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And yet, the attraction must seem irresistible. It is the ecstasy of the perhaps unconscious sacrifice the god has ordained; it is the festival of honey, the triumph of the race, the victory of the future: the one day of joy, of forgetfulness and folly; the only Sunday known to the bees. It would appear to be also the solitary day upon which all eat their fill, and revel, to heart's content, in the delights of the treasure themselves have amassed. It is as though they were prisoners to whom freedom at last had been given, who had suddenly been led to a land of refreshment and plenty. They exult, they cannot contain the joy that is in them. They come and go aimlessly—they whose every movement has always its precise and useful purpose—they depart and return, sally forth once again to see if the queen be ready, to excite their sisters, to beguile the tedium of waiting. They fly much higher than is their wont, and the leaves of the mighty trees round about all quiver responsive. They have left trouble behind, and care. They no longer are meddling and fierce, aggressive, suspicious, untamable, angry. Man—the unknown master whose sway they never acknowledge, who can subdue them only by conforming to their every law, to their habits of labour, and following step by step the path that is traced in their life by an intellect nothing can thwart or turn from its purpose, by a spirit whose aim is always the good of the morrow—on this day man can approach them, can divide the glittering curtain they form as they fly round and round in songful circles; he can take them up in his hand, and gather them as he would a bunch of grapes; for to-day, in their gladness, possessing nothing, but foil of faith in the future, they will submit to everything and injure no one, provided only they be not separated from the queen who bears that future within her.

We shall pass over many intermediary species, wherein we may see the gradual lengthening of the tongue, enabling more nectar to be extracted from the cups of corollas, and the dawning formation and subsequent development of the apparatus for collecting pollen—hairs, tufts, brushes on the tibia, on the tarsus, and abdomen—as also claws and mandibles becoming stronger, useful secretions being formed, and the genius that presides over the construction of dwellings seeking and finding extraordinary improvement in every direction. Such a study would need a whole volume. I will merely outline a chapter of it, less than a chapter, a page, which shall show how the hesitating endeavours of the will to live and be happier result in the birth, development, and affirmation of social intelligence.

We have seen the unfortunate *Prosopis* silently bearing her solitary little destiny in the midst of this vast universe charged with terrible forces. A certain number of her sisters, belonging to species already more skilful and better supplied with utensils, such as the well-clad *Colletes*, or the marvellous cutter of rose-leaves, the *Megachile Centuncularis*, live in an isolation no less profound; and if by chance some creature attach itself to them, and share their dwelling, it will either be an enemy, or, more often, a parasite.

For the world of bees is peopled with phantoms stranger than our own; and many a species will thus have a kind of mysterious and inactive double, exactly similar to the victim it has selected, save only that its immemorial idleness has caused it to lose one by one its implements of labour, and that it exists solely at the expense of the working type of its race.¹²

Among the bees, however, which are somewhat too arbitrarily termed the “solitary *Apidae*,” the social instinct already is smouldering, like a flame crushed beneath the overwhelming weight of matter that stifles all primitive life. And here and there, in unexpected directions, as though reconnoitring, with timid and sometimes fantastic outbursts, it will succeed in piercing the mass that oppresses it, the pyre that some day shall feed its triumph.

If in this world all things be matter, this is surely its most immaterial movement. Transition is called for from a precarious, egotistic and incomplete life to a life that shall be fraternal, a little more certain, a little more happy. The spirit must ideally unite that which in the body is actually separate; the individual must sacrifice himself for the race, and substitute for visible things the things that cannot be seen. Need we wonder that the bees do not at the first glance realise what we have not yet disentangled, we who find ourselves at the privileged spot whence instinct radiates from all sides into our consciousness? And it is curious too, almost touching, to see how the new idea gropes its way, at first, in the darkness that enfolds all things that come to life on this earth. It emerges from matter, it is

still quite material. It is cold, hunger, fear, transformed into something that as yet has no shape. It crawls vaguely around great dangers, around the long nights, the approach of winter, of an equivocal sleep which almost is death. . . .

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The Xylocopae are powerful bees which worm their nest in dry wood. Their life is solitary always. Towards the end of summer, however, some individuals of a particular species, the *Xylocopa Cyanescens*, may be found huddled together in a shivering group, on a stalk of asphodel, to spend the winter in common. Among the Xylocopae this tardy fraternity is exceptional, but among the Ceratinae, which are of their nearest kindred, it has become a constant habit. The idea is germinating. It halts immediately; and hitherto has not succeeded, among the Xylocopae, in passing beyond this first obscure line of love.

Among other Apiens, this groping idea assumes other forms. The Chalicodomae of the out-houses, which are building-bees, the Dasypodae and Halicti, which dig holes in the earth, unite in large colonies to construct their nests. But it is an illusory crowd composed of solitary units, that possess no mutual understanding, and do not act in common. Each one is profoundly isolated in the midst of the multitude, and builds a dwelling for itself alone, heedless of its neighbour. "They are," M. Perez remarks, "a mere congregation of individuals, brought together by similar tastes and habits, but observing scrupulously the maxim of each one for itself; in fact, a mere mob of workers, resembling the swarm of a hive only as regards their number and zeal. Such assemblies merely result from a great number of individuals inhabiting the same locality."

But when we come to the Panurgi, which are cousins of the Dasypodae, a little ray of light suddenly reveals the birth of a new sentiment in this fortuitous crowd. They collect in the same way as the others, and each one digs its own subterranean chambers; but the entrance is common to all, as also the gallery which leads from the surface of the ground to the different cells. "And thus," M. Perez adds, "as far as the work of the cells is concerned, each bee acts as though she were alone; but all make equal use of the gallery that conducts to the cells, so that the multitude profit by the labours of an individual, and are spared the time and trouble required for the construction of separate galleries. It would be interesting to discover whether this preliminary work be not executed in common, by relays of females, relieving each other in turn."

However this may be, the fraternal idea has pierced the wall that divided two worlds. It is no longer wild and unrecognisable, wrested from instinct by cold and hunger, or by the fear of death; it is

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prompted by active life. But it halts once more; and in this instance arrives no further. No matter, it does not lose courage; it will seek other channels. It enters the humble-bee, and, maturing there, becomes embodied in a different atmosphere, and works its first decisive miracles.

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The humble-bees, the great hairy, noisy creatures that all of us know so well, so harmless for all their apparent fierceness, lead a solitary life at first. At the beginning of March the impregnated female who has survived the winter starts to construct her nest, either underground or in a bush, according to the species to which she belongs. She is alone in the world, in the midst of awakening spring. She chooses a spot, clears it, digs it and carpets it. Then she erects her somewhat shapeless waxen cells, stores these with honey and pollen, lays and hatches the eggs, tends and nourishes the larvae that spring to life, and soon is surrounded by a troop of daughters who aid her in all her labours, within the nest and without, while some of them soon begin to lay in their turn. The construction of the cells improves; the colony grows, the comfort increases. The foundress is still its soul, its principal mother, and finds herself now at the head of a kingdom which might be the model of that of our honeybee. But the model is still in the rough. The prosperity of the humble-bees never exceeds a certain limit, their laws are ill-defined and ill-obeyed, primitive cannibalism and infanticide reappear at intervals, the architecture is shapeless and entails much waste of material; but the cardinal difference between the two cities is that the one is permanent, and the other ephemeral. For, indeed, that of the humble-bee will perish in the autumn; its three or four hundred inhabitants will die, leaving no trace of their passage or their endeavours; and but a single female will survive, who, the next spring, in the same solitude and poverty as her mother before her, will recommence the same useless work. The idea, however, has now grown aware of its strength. Among the humble-bees it goes no further than we have stated, but, faithful to its habits and pursuing its usual routine, it will immediately undergo a sort of unwearying metempsychosis, and re-incarnate itself trembling with its last triumph, rendered all-powerful now and nearly perfect, in another group, the last but one of the race, that which immediately precedes our domestic bee wherein it attains its crown; the group of the *Meliponitae*, which comprises the tropical *Meliponae* and *Trigonae*.

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Here the organisation is as complete as in our hives. There is an unique mother, there are sterile workers and males. Certain details even seem better devised. The males, for instance, are not wholly idle; they secrete wax. The entrance to the hive is more carefully guarded; it has a door that can be closed when nights are cold, and when these are warm a kind of curtain will admit the air.

But the republic is less strong, general life less assured, prosperity more limited, than with our bees; and wherever these are introduced, the *Meliponitae* tend to disappear before them. In both races the fraternal idea has undergone equal and magnificent development, save in one point alone, wherein it achieves no further advance among the *Meliponitae* than among the limited offspring of the humble-bees. In the mechanical organisation of distributed labour, in the precise economy of effort; briefly, in the architecture of the city, they display manifest inferiority. As to this I need only refer to what I said in section 42 of this book, while adding that, whereas in the hives of our *Apitae* all the cells are equally available for the rearing of the brood and the storage of provisions, and endure as long as the city itself, they serve only one of these purposes among the *Meliponitae*, and the cells employed as cradles for the nymphs are destroyed after these have been hatched.¹³ It is in our domestic bees, therefore, that the idea, of whose movements we have given a cursory and incomplete picture, attains its most perfect form. Are these movements definitely, and for all time, arrested in each one of these species, and does the connecting-line exist in our imagination alone? Let us not be too eager to establish a system in this ill-explored region. Let our conclusions be only provisional, and preferentially such as convey the utmost hope; for, were a choice forced upon us, occasional gleams would appear to declare that the inferences we are most desirous to draw will prove to be truest. Besides, let us not forget that our ignorance still is profound. We are only learning to open our eyes. A thousand experiments that could be made have as yet not even been tried. If the *Prosopes*, for instance, were imprisoned, and forced to cohabit with their kind, would they, in course of time, overstep the iron barrier of total solitude, and be satisfied to live the common life of the *Dasypodae*, or to put forth the fraternal effort of the *Panurgi*? And if we imposed abnormal conditions upon the *Panurgi*, would these, in their turn, progress from a general corridor to general cells? If the mothers of the humble-bees were compelled to hibernate together, would they arrive at a mutual understanding, a mutual division of labour? Have combs of foundation-wax been offered to the *Meliponitae*? Would they accept them, would they make use of them, would they conform their habits to this unwonted architecture? Questions, these, that we put to very tiny creatures; and yet they contain the great word of our greatest secrets. We cannot answer them, for our experience dates but from yesterday. Starting with Réaumur, about a hundred and

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these truths, which must blend and accord in our mind; and to remain faithful to the destiny imposed on us, which is to subdue, and to some extent raise within and around us the obscure forces of life. None of these, perhaps, will survive the new revelation; but the soul of those who shall up to the end have fulfilled the mission that is pre-eminently the mission of man, must inevitably be in the front rank of all to welcome this revelation; and should they learn therefrom that indifference, or resignation to the unknown, is the veritable duty, they will be better equipped than the others for the comprehension of this final resignation and indifference, better able to turn these to account.

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But such speculations may well be avoided. Let not the possibility of general annihilation blur our perception of the task before us; above all, let us not count on the miraculous aid of chance. Hitherto, the promises of our imagination notwithstanding, we have always been left to ourselves, to our own resources. It is to our humblest efforts that every useful, enduring achievement of this earth is due. It is open to us, if we choose, to await the better or worse that may follow some alien accident, but on condition that such expectation shall not hinder our human task. Here again do the bees, as Nature always, provide a most excellent lesson. In the hive there has truly been prodigious intervention. The bees are in the hands of a power capable of annihilating or modifying their race, of transforming their destinies; the bees' thralldom is far more definite than our own. Therefore none the less do they perform their profound and primitive duty. And, among them, it is precisely those whose obedience to duty is most complete who are able most fully to profit by the supernatural intervention that to-day has raised the destiny of their species. And indeed, to discover the unconquerable duty of a being is less difficult than one imagines. It is ever to be read in the distinguishing organs, whereto the others are all subordinate. And just as it is written in the tongue, the stomach, and mouth of the bee that it must make honey, so is it written in our eyes, our ears, our nerves, our marrow, in every lobe of our head, that we must make cerebral substance; nor is there need that we should divine the purpose this substance shall serve. The bees know not whether they will eat the honey they harvest, as we know not who it is shall reap the profit of the cerebral substance we shall have formed, or of the intelligent fluid that issues therefrom and spreads over the universe, perishing when our life ceases or persisting after our death. As they go from flower to flower collecting more honey than themselves and their offspring can need, let us go from reality to reality seeking food for the incomprehensible flame, and thus, certain of having fulfilled our

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organic duty, preparing ourselves for whatever befall. Let us nourish this flame on our feelings and passions, on all that we see and think, that we hear and touch, on its own essence, which is the idea it derives from the discoveries, experience and observation that result from its every movement. A time then will come when all things will turn so naturally to good in a spirit that has given itself to the loyal desire of this simple human duty, that the very suspicion of the possible aimlessness of its exhausting effort will only render the duty the clearer, will only add more purity, power, disinterestedness, and freedom to the ardour wherewith it still seeks.

Appendix

TO give a complete bibliography of the bee were outside the scope of this book; we shall be satisfied, therefore, merely to indicate the more interesting works:—

The Historical Development of Apiarian Science:

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F. Dujardin, "Memoires sur le Systeme nerveux des Insectes;" Dumas and Milne Edwards, "Sur la Production de la Cire des Abeilles;" E. Blanchard, "Recherches anatomiques sur le Systeme nerveux des Insectes;" L. R. D. Brougham, "Observations, Demonstrations, and Experiences upon the Structure of the Cells of Bees;" P. Cameron, "On Parthenogenesis in the Hymenoptera" (Transactions Natural Society of Glasgow, 1888); Erichson, "De Fabrica et Usu Antennarum in Insectis;" B. T. Lowne, "On the Simple and Compound Eyes of Insects" (Philosophical Transactions, 1879); G. K. Waterhouse, "On the Formation of the Cells of Bees and Wasps;" Dr. C. T. E. von Siebold, "On a True Parthenogenesis in Moths and Bees;" F. Leydig, "Das Auge der Gliederthiere;" Pastor Schonfeld, "Bienen-Zeitung," 1854-1883; "Illustrierte Bienen-Zeitung," 1885-1890; Assmuss, "Die Parasiten der Honigbiene."

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Fabre, "Souvenirs Entomologiques" (3d series); Romanes, "Mental Evolution in Animals;" id., "Animal Intelligence;" Lepeletier et Fargeau, "Histoire Naturelle des Hymenopteres;" V. Mayet, "Mémoire sur les Mœurs et sur les Metamorphoses d'une Nouvelle Espèce de la Famille des Vesicants" (Ann. Soc. Entom. de France, 1875); H. Muller, "Ein Beitrag zur Lebensgeschichte der *Dasypoda Hirtipes*;" E. Hoffer, "Biologische Beobachtungen an Hummeln und Schmarotzerhummeln;" Jesse, "Gleanings in Natural History;" Sir John Lubbock, "Ants, Bees, and Wasps;" id., "The Senses, Instincts, and Intelligence of Animals;" Walkenaer, "Les Haclites;" Westwood, "Introduction to the Study of Insects;" V. Rendu, "De l'Intelligence des Bêtes;" Espinas, "Animal Communities," etc.

¹By observation-hive is meant a hive of glass, furnished with black curtains or shutters. The best kind have only one comb, thus permitting both faces to be studied. These hives can be placed in a drawing-room, library, etc., without inconvenience or danger. The bees that inhabit the one I have in my study in Paris are able even in the stony desert of that great city, to find the wherewithal to nourish themselves and to prosper.

²The figures given here are scrupulously exact. They are those of a well-filled hive in full prosperity.

³The stranger queen is usually brought into the hive enclosed in a little cage, with iron wires, which is hung between two combs. The cage has a door made of wax and honey, which the workers, their anger over, proceed to gnaw, thus freeing the prisoner, whom they will often receive without any ill-will. Mr. Simmins, manager of the great apiary at Rottingdean, has recently discovered another method of introducing a queen, which, being extremely simple and almost invariably successful, bids fair to be generally adopted by apiarists who value their art. It is the behaviour of the queen that usually makes her introduction a matter of so great difficulty. She is almost distracted, flies to and fro, hides, and generally comports herself as an intruder, thus arousing the suspicions of the bees, which are soon confirmed by the workers' examination. Mr. Simmins at first completely isolates the queen he intends to introduce, and lets her fast for half an hour. He then lifts a corner of the inner cover of the orphaned hive, and places the strange queen on the top of one of the combs. Her former isolation having terrified her, she is delighted to find herself in the midst of the bees; and being famished she eagerly accepts the food they offer her. The workers, deceived by her assurance, do not examine her, but probably imagine that their old queen has returned, and welcome her joyfully. It would seem, therefore, that, contrary to the opinion of Huber and all other investigators, the bees are not capable of recognising their queen. In any event, the two explanations, which are both equally plausible—though the truth may lurk, perhaps, in a third, that is not yet known to us—only prove once again how complex and obscure is the psychology of the bee. And from this, as from all questions that deal with life, we can draw one conclusion only: that, till better obtain, curiosity still must rule in our heart.

⁴The brain of the bee, according to the calculation of Dujardin, constitutes the 1—174th part of the insect's weight, and that of the ant the 1—296th. On the other hand the peduncular parts, whose development usually keeps pace with the triumphs the intellect achieves over instinct, are somewhat less important in the bee than in the ant. It would seem to result from these estimates—which are of course hypothetical, and deal with a matter that is exceedingly obscure—that the intellectual value of the bee and the ant must be more or less equal.

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⁵It was as well, perhaps, that this standard was not adopted. For although the diameter of the cells is admirably regular, it is, like all things produced by a living organism, not *mathematically* invariable in the same hive. Further, as M. Maurice Girard has pointed out, the apothem of the cell varies among different races of bees, so that the standard would alter from hive to hive, according to the species of bee that inhabited it.

⁶It is generally admitted to-day that workers and queens, after the hatching of the egg, receive the same nourishment—a kind of milk, very rich in nitrogen, that a special gland in the nurses' head secretes. But after a few days the worker larvae are weaned, and put on a coarser diet of honey and pollen; whereas the future queen, until she be fully developed, is copiously fed on the precious milk known as "royal jelly."

⁷Professor McLain has recently succeeded in causing a few queens to be artificially impregnated; but this has been the result of a veritable surgical operation, of the most delicate and complicated nature. Moreover, the fertility of the queens was restricted and ephemeral.

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¹ The scientific classification of the domestic bee is as follows :

Class	Insecta
Order	Hymenoptera
Family	Apidae
Genus	Apis
Species	Mellifica

The term "Mellifica" is that of the Linn scan classification. It is not of the happiest, for all the Apidae, with the exception of certain parasites perhaps, are producers of honey. Scopoli uses the term "Cerifera;" Réaumur "Domestica;" Geoffroy "Gregaria." The "Apis Ligustica," the Italian bee, is another variety of the "Mellifica."

⁹As we are now concerned with the construction of the bee, we may note, in passing, a strange peculiarity of the Apis Florea. Certain walls of its cells for males are cylindrical instead of hexagonal. Apparently she has not yet succeeded in passing from one form to the other, and indefinitely adopting the better.

¹⁰Büchmer cites an analogous fact. In the Barbadoes, the bees whose hives are in the midst of the refineries, where they find sugar in abundance during the whole year, will entirely abandon their visits to the flowers.

¹¹It is important that the terms we shall successively employ, adopting the classification of M. Emile Blanchard—"APIENS, APIDAE and APITAE"—should not be confounded. The tribe of the Apiens comprises all families of bees. The Apidae constitute the first of these families, and are subdivided into three groups: the Meliponae, the Apitae, and the Bombi (humble-bees). And, finally, the Apitae include all the different varieties of our domestic bees.

¹²The humble-bees, for instance, have the Psithyri as parasites, while the Stelites live on the Anthidia. "As regards the frequent identity of the parasite with its victim," M. J. Perez very justly remarks in his book "The Bees," "one must necessarily admit that the two genera are only different forms of the same type, and are united to each other by the closest affinity. And to naturalists who believe in the theory of evolution this relationship is not purely ideal, but real. The parasitic genus must be regarded as merely a branch of the foraging genus, having lost its foraging organs because of its adaptation to parasitic life."

¹³It is not certain that the principle of unique royalty, or maternity, is strictly observed among the Meliponitae. Blanchard remarks very justly, that as they possess no sting and are consequently less readily able than the mothers of our own bees to kill each other, several queens will probably live together in the same hive. But

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certainty on this point has hitherto been unattainable owing to the great resemblance that exists between queens and workers, as also to the impossibility of rearing the *Meliponitae* in our climate.