
JEAN-HENRI FABRE
THE MASON-BEES

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CHAPTER 1. THE MASON-BEES.

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Reaumur (Rene Antoine Ferchault de Reaumur (1683–1757), inventor of the Reaumur thermometer and author of "Memoires pour servir a l'histoire naturelle des insectes."—Translator's Note.) devoted one of his papers to the story of the Chalicodoma of the Walls, whom he calls the Mason-bee. I propose to go on with the story, to complete it and especially to consider it from a point of view wholly neglected by that eminent observer. And, first of all, I am tempted to tell how I made this Bee's acquaintance.

It was when I first began to teach, about 1843. I had left the normal school at Vaucluse some months before, with my diploma and all the simple enthusiasm of my eighteen years, and had been sent to Carpentras, there to manage the primary school attached to the college. It was a strange school, upon my word, notwithstanding its pompous title of 'upper'; a sort of huge cellar oozing with the perpetual damp engendered by a well backing on it in the street outside. For light there was the open door, when the weather permitted, and a narrow prison-window, with iron bars and lozenge panes set in lead. By way of benches there was a plank fastened to the wall all round the room, while in the middle was a chair bereft of its straw, a black-board and a stick of chalk.

Morning and evening, at the sound of the bell, there came rushing in some fifty young imps who, having shown themselves hopeless dunces with their Cornelius Nepos, had been relegated, in the phrase of the day, to 'a few good years of French.' Those who had found mensa too much for them came to me to get a smattering of grammar. Children and strapping lads were there, mixed up together, at very

different educational stages, but all incorrigibly agreed to play tricks upon the master, the boy master who was no older than some of them, or even younger.

To the little ones I gave their first lessons in reading; the intermediate ones I showed how they should hold their pen to write a few lines of dictation on their knees; to the big ones I revealed the secrets of fractions and even the mysteries of Euclid. And to keep this restless crowd in order, to give each mind work in accordance with its strength, to keep attention aroused and lastly to expel dullness from the gloomy room, whose walls dripped melancholy even more than dampness, my one resource was my tongue, my one weapon my stick of chalk.

For that matter, there was the same contempt in the other classes for all that was not Latin or Greek. One instance will be enough to show how things then stood with the teaching of physics, the science which occupies so large a place to-day. The principal of the college was a first-rate man, the worthy Abbe X., who, not caring to dispense beans and bacon himself, had left the commissariat-department to a relative and had undertaken to teach the boys physics.

Let us attend one of his lessons. The subject is the barometer. The establishment happens to possess one, an old apparatus, covered with dust, hanging on the wall beyond the reach of profane hands and bearing on its face, in large letters, the words stormy, rain, fair.

'The barometer,' says the good abbe, addressing his pupils, whom, in patriarchal fashion, he calls by their Christian names, 'the barometer tells us if the weather will be good or bad. You see the words written on the face—stormy, rain—do you see, Bastien?'

'Yes, I see,' says Bastien, the most mischievous of the lot.

He has been looking through his book and knows more about the barometer than his teacher does.

'It consists,' the abbe continues, 'of a bent glass tube filled with mercury, which rises and falls according to the weather. The shorter leg of this tube is open; the other… the other… well, we'll see. Here, Bastien, you're the tallest, get up on the chair and just feel with your finger if the long leg is open or closed. I can't remember for certain.'

Bastien climbs on the chair, stands as high as he can on tip-toe and fumbles with his finger at the top of the long column. Then, with a discreet smile spreading under the silky hairs of his dawning moustache:

'Yes,' he says, 'that's it. The long leg is open at the top. There, I can feel the hole.'

And Bastien, to confirm his mendacious statement, keeps wriggling his forefinger at the top of the tube, while his fellow-conspirators suppress their enjoyment as best they can.

'That will do,' says the unconscious abbe. 'You can get down, Bastien. Take a note of it, boys: the longer leg of the barometer is open; take a note of it. It's a thing you might forget; I had forgotten it myself.'

Thus was physics taught. Things improved, however: a master came and came to stay, one who knew that the long leg of the barometer is closed. I myself secured tables on which my pupils were able to write instead of scribbling on their knees; and, as my class was daily increasing in numbers, it ended by being divided into two. As soon as I had an assistant to look after the younger boys, things assumed a different aspect.

Among the subjects taught, one in particular appealed to both masters and pupils. This was open-air geometry, practical surveying. The college had none of the necessary outfit; but, with my fat pay—seven hundred francs a year, if you please!—I could not hesitate over the expense. A surveyor's chain and stakes, arrows, level, square and

compass were bought with my money. A microscopic graphometer, not much larger than the palm of one's hand and costing perhaps five francs, was provided by the establishment. There was no tripod to it; and I had one made. In short, my equipment was complete.

And so, when May came, once every week we left the gloomy school-room for the fields. It was a regular holiday. The boys disputed for the honour of carrying the stakes, divided into bundles of three; and more than one shoulder, as we walked through the town, felt the reflected glory of those erudite rods. I myself—why conceal the fact?—was not without a certain satisfaction as I piously carried that most delicate and precious apparatus, the historic five-franc graphometer. The scene of operations was an untilled, flinty plain, a harmas, as we call it in the district. (Cf. "The Life of the Fly", by J. Henri Fabre, translated by Alexander Teixeira de Mattos: chapter 1.—Translator's Note.) Here, no curtain of green hedges or shrubs prevented me from keeping an eye upon my staff; here—an indispensable condition—I had not the irresistible temptation of the unripe apricots to fear for my scholars. The plain stretched far and wide, covered with nothing but flowering thyme and rounded pebbles. There was ample scope for every imaginable polygon; trapezes and triangles could be combined in all sorts of ways. The inaccessible distances had ample elbow-room; and there was even an old ruin, once a pigeon-house, that lent its perpendicular to the graphometer's performances.

Well, from the very first day, my attention was attracted by something suspicious. If I sent one of the boys to plant a stake, I would see him stop frequently on his way, bend down, stand up again, look about and stoop once more, neglecting his straight line and his signals. Another, who was told to pick up the arrows, would forget the iron pin and take up a pebble instead; and a third deaf to the measurements of angles, would crumble a clod of earth

between his fingers. Most of them were caught licking a bit of straw. The polygon came to a full stop, the diagonals suffered. What could the mystery be?

I enquired; and everything was explained. A born searcher and observer, the scholar had long known what the master had not yet heard of, namely, that there was a big black Bee who made clay nests on the pebbles in the harmas. These nests contained honey; and my surveyors used to open them and empty the cells with a straw. The honey, although rather strong-flavoured, was most acceptable. I acquired a taste for it myself and joined the nest-hunters, putting off the polygon till later. It was thus that I first saw Reaumur's Mason-bee, knowing nothing of her history and nothing of her historian.

The magnificent Bee herself, with her dark-violet wings and black-velvet raiment, her rustic edifices on the sun-blistered pebbles amid the thyme, her honey, providing a diversion from the severities of the compass and the square, all made a great impression on my mind; and I wanted to know more than I had learnt from the schoolboys, which was just how to rob the cells of their honey with a straw. As it happened, my bookseller had a gorgeous work on insects for sale. It was called "Histoire naturelle des animaux articules", by de Castelnau (Francis Comte de Castelnau de la Porte (1812–1880), the naturalist and traveller. Castelnau was born in London and died at Melbourne.—Translator's Note.), E. Blanchard (Emile Blanchard (born 1820), author of various works on insects, Spiders, etc.—Translator's Note.) and Lucas (Pierre Hippolyte Lucas (born 1815), author of works on Moths and Butterflies, Crustaceans, etc.—Translator's Note.), and boasted a multitude of most attractive illustrations; but the price of it, the price of it! No matter: was not my splendid income supposed to cover everything, food for the mind as well as food for the body? Anything extra that I gave to the one I could save upon the

other; a method of balancing painfully familiar to those who look to science for their livelihood. The purchase was effected. That day my professional emoluments were severely strained: I devoted a month's salary to the acquisition of the book. I had to resort to miracles of economy for some time to come before making up the enormous deficit.

The book was devoured; there is no other word for it. In it, I learnt the name of my black Bee; I read for the first time various details of the habits of insects; I found, surrounded in my eyes with a sort of halo, the revered names of Reaumur, Huber (Francois Huber (1750–1831), the Swiss naturalist, author of "Nouvelles observations sur les abeilles." He early became blind from excessive study and conducted his scientific work thereafter with the aid of his wife.—Translator's Note.) and Leon Dufour (Jean Marie Leon Dufour (1780–1865), an army surgeon who served with distinction in several campaigns, and subsequently practised as a doctor in the Landes, where he attained great eminence as a naturalist. Fabre often refers to him as the Wizard of the Landes. Cf. "The Life of the Spider", by J. Henri Fabre, translated by Alexander Teixeira de Mattos: chapter 1; and "The Life of the Fly": chapter 1.—Translator's Note.); and, while I turned over the pages for the hundredth time, a voice within me seemed to whisper:

'You also shall be of their company!'

Ah, fond illusions, what has come of you? (The present essay is one of the earliest in the "Souvenirs Entomologiques."—Translator's Note.)

But let us banish these recollections, at once sweet and sad, and speak of the doings of our black Bee. Chalicodoma, meaning a house of pebbles, concrete or mortar, would be a most satisfactory title, were it not that it has an odd sound to any one unfamiliar with Greek. The name is given to Bees who build their cells with materials similar to those which

we employ for our own dwellings. The work of these insects is masonry; only it is turned out by a rustic mason more used to hard clay than to hewn stone. Reaumur, who knew nothing of scientific classification—a fact which makes many of his papers very difficult to understand—named the worker after her work and called our builders in dried clay Mason-bees, which describes them exactly.

We have two of them in our district: the Chalicodoma of the Walls (Chalicodoma muraria), whose history Reaumur gives us in a masterly fashion; and the Sicilian Chalicodoma (C. sicula) (For reasons that will become apparent after the reader has learnt their habits, the author also speaks of the Mason-bee of the Walls and the Sicilian Mason-bee as the Mason-bee of the Pebbles and the Mason-bee of the Sheds respectively. Cf. Chapter 4 footnote.—Translator's Note.), who is not peculiar to the land of Etna, as her name might suggest, but is also found in Greece, in Algeria and in the south of France, particularly in the department of Vaucluse, where she is one of the commonest Bees to be seen in the month of May. In the first species the two sexes are so unlike in colouring that a novice, surprised at observing them come out of the same nest, would at first take them for strangers to each other. The female is of a splendid velvety black, with dark-violet wings. In the male, the black velvet is replaced by a rather bright brick-red fleece. The second species, which is much smaller, does not show this contrast of colour: the two sexes wear the same costume, a general mixture of brown, red and grey, while the tips of the wings, washed with violet on a bronzed ground, recall, but only faintly, the rich purple of the first species. Both begin their labours at the same period, in the early part of May.

As Reaumur tells us, the Chalicodoma of the Walls in the northern provinces selects a wall directly facing the sun and one not covered with plaster, which might come off and imperil the future of the cells. She confides her buildings

only to solid foundations, such as bare stones. I find her equally prudent in the south; but, for some reason which I do not know, she here generally prefers some other base to the stone of a wall. A rounded pebble, often hardly larger than one's fist, one of those cobbles with which the waters of the glacial period covered the terraces of the Rhone Valley, forms the most popular support. The extreme abundance of these sites might easily influence the Bee's choice: all our less elevated uplands, all our arid, thyme-clad grounds are nothing but water-worn stones cemented with red earth. In the valleys, the Chalicodoma has also the pebbles of the mountain-streams at her disposal. Near Orange, for instance, her favourite spots are the alluvia of the Aygues, with their carpets of smooth pebbles no longer visited by the waters. Lastly, if a cobble be wanting, the Mason-bee will establish her nest on any sort of stone, on a mile-stone or a boundary-wall.

The Sicilian Chalicodoma has an even greater variety of choice. Her most cherished site is the lower surface of the projecting tiles of a roof. There is not a cottage in the fields, however small, but shelters her nests under the eaves. Here, each spring, she settles in populous colonies, whose masonry, handed down from one generation to the next and enlarged year by year, ends by covering considerable surfaces. I have seen some of these nests, under the tiles of a shed, spreading over an area of five or six square yards. When the colony was hard at work, the busy, buzzing crowd was enough to make one giddy. The under side of a balcony also pleases the Mason-bee, as does the embrasure of a disused window, especially if it is closed by a blind whose slats allow her a free passage. But these are popular resorts, where hundreds and thousands of workers labour, each for herself. If she be alone, which happens pretty often, the Sicilian Mason-bee instals herself in the first little nook handy, provided that it supplies a solid foundation and

warmth. As for the nature of this foundation, she does not seem to mind. I have seen her build on the bare stone, on bricks, on the wood of a shutter and even on the window-panes of a shed. One thing only does not suit her: the plaster of our houses. She is as prudent as her kinswoman and would fear the ruin of her cells, if she entrusted them to a support which might possibly fall.

Lastly, for reasons which I am still unable to explain to my own satisfaction, the Sicilian Mason-bee often changes the position of her building entirely, turning her heavy house of clay, which would seem to require the solid support of a rock, into an aerial dwelling. A hedge-shrub of any kind whatever—hawthorn, pomegranate, Christ's thorn—provides her with a foundation, usually as high as a man's head. The holm-oak and the elm give her a greater altitude. She chooses in the bushy clump a twig no thicker than a straw; and on this narrow base she constructs her edifice with the same mortar that she would employ under a balcony or the ledge of a roof. When finished, the nest is a ball of earth, bisected by the twig. It is the size of an apricot when the work of a single insect and of one's fist if several have collaborated; but this latter case is rare.

Both Bees use the same materials: calcareous clay, mingled with a little sand and kneaded into a paste with the mason's own saliva. Damp places, which would facilitate the quarrying and reduce the expenditure of saliva for mixing the mortar, are scorned by the Mason-bees, who refuse fresh earth for building even as our own builders refuse plaster and lime that have long lost their setting-properties. These materials, when soaked with pure moisture, would not hold properly. What is wanted is a dry dust, which greedily absorbs the disgorged saliva and forms with the latter's albuminous elements a sort of readily-hardening Roman cement, something in short resembling the cement which we obtain with quicklime and white of egg.

The mortar-quarry which the Sicilian Mason-bee prefers to work is a frequented highway, whose metal of chalky flints, crushed by the passing wheels, has become a smooth surface, like a continuous flagstone. Whether settling on a twig in a hedge or fixing her abode under the eaves of some rural dwelling, she always goes for her building-materials to the nearest path or road, without allowing herself to be distracted from her business by the constant traffic of people and cattle. You should see the active Bee at work when the road is dazzling white under the rays of a hot sun. Between the adjoining farm, which is the building-yard, and the road, in which the mortar is prepared, we hear the deep hum of the Bees perpetually crossing one another as they go to and fro. The air seems traversed by incessant trails of smoke, so straight and rapid is the worker's flight. Those on the way to the nest carry tiny pellets of mortar, the size of small shot; those who return at once settle on the driest and hardest spots. Their whole body aquiver, they scrape with the tips of their mandibles and rake with their front tarsi to extract atoms of earth and grains of sand, which, rolled between their teeth, become impregnated with saliva and form a solid mass. The work is pursued so vigorously that the worker lets herself be crushed under the feet of the passers-by rather than abandon her task.

On the other hand, the Mason-bee of the Walls, who seeks solitude, far from human habitations, rarely shows herself on the beaten paths, perhaps because these are too far from the places where she builds. So long as she can find dry earth, rich in small gravel, near the pebble chosen as the site of her nest, that is all she asks.

The Bee may either build an entirely new nest on a site as yet unoccupied, or she may use the cells of an old nest, after repairing them. Let us consider the former case first. After selecting her pebble, the Mason-bee of the Walls arrives with a little ball of mortar in her mandibles and lays

it in a circular pad on the surface of the stone. The fore-legs and above all the mandibles, which are the mason's chief tools, work the material, which is kept plastic by the salivary fluid as this is gradually disgorged. In order to consolidate the clay, angular bits of gravel, the size of a lentil, are inserted separately, but only on the outside, in the as yet soft mass. This is the foundation of the structure. Fresh layers follow, until the cell has attained the desired height of two or three centimetres. (Three-quarters of an inch to one inch.—Translator's Note.)

Man's masonry is formed of stones laid one above the other and cemented together with lime. The Chalicodoma's work can bear comparison with ours. To economise labour and mortar, the Bee employs coarse materials, big pieces of gravel, which to her represent hewn stones. She chooses them carefully one by one, picks out the hardest bits, generally with corners which, fitting one into the other, give mutual support and contribute to the solidity of the whole. Layers of mortar, sparingly applied, hold them together. The outside of the cell thus assumes the appearance of a piece of rustic architecture, in which the stones project with their natural irregularities; but the inside, which requires a more even surface in order not to hurt the larva's tender skin, is covered with a coat of pure mortar. This inner whitewash, however, is put on without any attempt at art, indeed one might say that it is ladled on in great splashes; and the grub takes care, after finishing its mess of honey, to make itself a cocoon and hang the rude walls of its abode with silk. On the other hand, the Anthophorae and the Halicti, two species of Wild Bees whose grubs weave no cocoon, delicately glaze the inside of their earthen cells and give them the gloss of polished ivory.

The structure, whose axis is nearly always vertical and whose orifice faces upwards so as not to let the honey escape, varies a little in shape according to the supporting

base. When set on a horizontal surface, it rises like a little oval tower; when fixed against an upright or slanting surface, it resembles the half of a thimble divided from top to bottom. In this case, the support itself, the pebble, completes the outer wall.

When the cell is finished, the Bee at once sets to work to victual it. The flowers round about, especially those of the yellow broom (Genista scoparia), which in May deck the pebbly borders of the mountain streams with gold, supply her with sugary liquid and pollen. She comes with her crop swollen with honey and her belly yellowed underneath with pollen dust. She dives head first into the cell; and for a few moments you see some spasmodic jerks which show that she is disgorging the honey-syrup. After emptying her crop, she comes out of the cell, only to go in again at once, but this time backwards. The Bee now brushes the lower side of her abdomen with her two hind-legs and rids herself of her load of pollen. Once more she comes out and once more goes in head first. It is a question of stirring the materials, with her mandibles for a spoon, and making the whole into a homogeneous mixture. This mixing-operation is not repeated after every journey: it takes place only at long intervals, when a considerable quantity of material has been accumulated.

The victualling is complete when the cell is half full. An egg must now be laid on the top of the paste and the house must be closed. All this is done without delay. The cover consists of a lid of pure mortar, which the Bee builds by degrees, working from the circumference to the centre. Two days at most appeared to me to be enough for everything, provided that no bad weather—rain or merely clouds—came to interrupt the labour. Then a second cell is built, backing on the first and provisioned in the same manner. A third, a fourth, and so on follow, each supplied with honey and an egg and closed before the foundations of the next are laid.

Each task begun is continued until it is quite finished; the Bee never commences a new cell until the four processes needed for the construction of its predecessor are completed: the building, the victualling, the laying of the egg and the closing of the cell.

As the Mason-bee of the Walls always works by herself on the pebble which she has chosen and even shows herself very jealous of her site when her neighbours alight upon it, the number of cells set back to back upon one pebble is not large, usually varying between six and ten. Do some eight grubs represent the Bee's whole family? Or does she afterwards go and establish a more numerous progeny on other boulders? The surface of the same stone is spacious enough to provide a support for further cells if the number of eggs called for them; the Bee could build there very comfortably, without hunting for another site, without leaving the pebble to which she is attached by habit and long acquaintance. It seems to me therefore, exceedingly probable that the family is a small one and that it is all installed on the one stone, at any rate when the Mason-bee is building a new home.

The six to ten cells composing the cluster are certainly a solid dwelling, with their rustic gravel covering; but the thickness of their walls and lids, two millimetres (.078 inch—Translator's Note.) at most, seems hardly sufficient to protect the grubs against the inclemencies of the weather. Set on its pebble in the open air, without any sort of shelter, the nest will have to undergo the heat of summer, which will turn each cell into a stifling furnace, followed by the autumn rains, which will slowly wear away the stonework, and by the winter frosts, which will crumble what the rains have respected. However hard the cement may be, can it possibly resist all these agents of destruction? And, even if it does resist, will not the grubs, sheltered by too thin a wall,

have to suffer from excess of heat in summer and of cold in winter?

Without arguing all this out, the Bee nevertheless acts wisely. When all the cells are finished, she builds a thick cover over the group, formed of a material, impermeable to water and a bad conductor of heat, which acts as a protection at the same time against damp, heat and cold. This material is the usual mortar, made of earth mixed with saliva, but on this occasion with no small stones in it. The Bee applies it pellet by pellet, trowelful by trowelful, to the depth of a centimetre (.39 inch—Translator's Note.) over the cluster of cells, which disappear entirely under the clay covering. When this is done, the nest has the shape of a rough dome, equal in size to half an orange. One would take it for a round lump of mud which had been thrown and half crushed against a stone and had then dried where it was. Nothing outside betrays the contents, no semblance of cells, no semblance of work. To the inexperienced eye, it is a chance splash of mud and nothing more.

This outer covering dries as quickly as do our hydraulic cements; and the nest is now almost as hard as a stone. It takes a knife with a strong blade to break open the edifice. And I would add, in conclusion, that, under its final form, the nest in no way recalls the original work, so much so that one would imagine the cells of the start, those elegant turrets covered with stucco-work, and the dome of the finish, looking like a mere lump of mud, to be the product of two different species. But scrape away the crust of cement and we shall easily recognize the cells below and their layers of tiny pebbles.

Instead of building a brand-new nest, on a hitherto unoccupied boulder, the Mason-bee of the Walls is always glad to make use of the old nests which have lasted through the year without suffering any damage worth mentioning. The mortar dome has remained very much what it was at

the beginning, thanks to the solidity of the masonry, only it is perforated with a number of round holes, corresponding with the chambers, the cells inhabited by past generations of larvae. Dwellings such as these, which need only a little repair to put them in good condition, save a great deal of time and trouble; and the Mason-bees look out for them and do not decide to build new nests except when the old ones are wanting.

From one and the same dome there issue several inhabitants, brothers and sisters, ruddy males and black females, all the offspring of the same Bee. The males lead a careless existence, know nothing of work and do not return to the clay houses except for a brief moment to woo the ladies; nor do they reck of the deserted cabin. What they want is the nectar in the flower-cups, not mortar to mix between their mandibles. There remain the young mothers, who alone are charged with the future of the family. To which of them will the inheritance of the old nest revert? As sisters, they have equal rights to it: so our code would decide, since the day when it shook itself free of the old savage right of primogeniture. But the Mason-bees have not yet got beyond the primitive basis of property, the right of the first occupant.

When, therefore, the laying-time is at hand, the Bee takes possession of the first vacant nest that suits her and settles there; and woe to any sister or neighbour who shall henceforth dare to contest her ownership. Hot pursuits and fierce blows will soon put the newcomer to flight. Of the various cells that yawn like so many wells around the dome, only one is needed at the moment; but the Bee rightly calculates that the others will be useful presently for the other eggs; and she watches them all with jealous vigilance to drive away possible visitors. Indeed I do not remember ever seeing two Masons working on the same pebble.

The task is now very simple. The Bee examines the old cell to see what parts require repairing. She tears off the strips of cocoon hanging from the walls, removes the fragments of clay that fell from the ceiling when pierced by the last inhabitant to make her exit, gives a coat of mortar to the dilapidated parts, mends the opening a little; and that is all. Next come the storing, the laying of the eggs and the closing of the chamber. When all the cells, one after the other, are thus furnished, the outer cover, the mortar dome, receives a few repairs if it needs them; and the thing is done.

The Sicilian Mason-bee prefers company to a solitary life and establishes herself in her hundreds, very often in many thousands, under the tiles of a shed or the edge of a roof. These do not constitute a true society, with common interests to which all attend, but a mere gathering, where each works for herself and is not concerned with the rest, in short, a throng of workers recalling the swarm of a hive only by their numbers and their eagerness. The mortar employed is the same as that of the Mason-bee of the Walls, equally unyielding and waterproof, but thinner and without pebbles. The old nests are used first. Every free chamber is repaired, stocked and sealed up. But the old cells are far from sufficient for the population, which increases rapidly from year to year. Then, on the surface of the nest, whose chambers are hidden under the old general mortar covering, new cells are built, as the needs of the laying-time call for them. They are placed horizontally, or nearly so, side by side, with no attempt at orderly arrangement. Each architect has plenty of elbow-room and builds as and where she pleases, on the one condition that she does not hamper her neighbours' work; otherwise she can look out for rough handling from the parties interested. The cells, therefore, accumulate at random in this workyard where there is no organization. Their shape is that of a thimble divided down