Sharp Ink

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CHAPTER I

THE EUMENES

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A wasp-like garb of black and yellow; a slender, graceful figure; wings that are not spread flat when resting, but are folded lengthwise in two; the abdomen a sort of chemist's retort, swelling into a gourd and fastened to the thorax by a long neck which first distends into a pear and then shrinks to a thread; a leisurely and silent flight; lonely habits. There we have a summary sketch of the Eumenes. My part of the country possesses two species: the larger *E. Amadei*, Lep., measures nearly an inch in length; the other, *E. pomiformis*, Fabr.,1 is a reduction of the first to half the scale.

Similar in form and colouring, both possess a like talent for architecture; and this [2]talent is expressed in a work of the highest perfection, which charms the most untutored eye. Their dwelling is a masterpiece. And yet the Eumenes follow the profession of arms, which is unfavourable to artistic effort: they stab and sting a victim; they pillage and plunder. They are predatory Wasps, victualling their larvæ with caterpillars. It must be interesting to compare their habits with those of the operator on the Grey Worm.2 Though the quarry—caterpillars in either case—remain the same, instinct, which is liable to vary with the species, may have fresh glimpses in store for us. Besides, the edifice built by the Eumenes in itself deserves inspection.

The Hunting Wasps whose story we have told hitherto3 are wonderfully well-versed in the art of wielding the lancet; they astound us with their surgical methods, which they [3]seem to have learnt from some physiologist who allows nothing to escape him; but these skilful slayers have no merit as builders of dwelling-houses. What is their home, in point of fact? An underground passage, with a cell at the end of it; a gallery, an excavation, a shapeless cave. It is miner's work, navvy's work: vigorous sometimes, artistic never. They use the pick for loosening, the crowbar for shifting, the rake for extracting the materials, but never the trowel for laying. Now in the Eumenes we see real masons, who build their houses bit by bit with stone and mortar and run them up in the open, either on firm rock or on the shaky support of a bough. Hunting alternates with architecture; the insect is a Nimrod or a Vitruvius4 by turns.

And, first of all, what sites do these builders select for their homes? Should you pass some little garden-wall, facing south, in a sun-scorched corner, look at the stones which are not covered with plaster, look at them one by one, especially the largest; examine the masses of boulders, at no great height from

the ground, where the fierce rays have heated them to the temperature of a Turkish [4]bath; and perhaps, if you search long enough, you will light upon the structure of *Eumenes Amadei*. The insect is scarce and lives apart; a meeting is an event upon which we must not count with too great confidence. It is an African species and loves the heat that ripens the carob and the date. It haunts the sunniest spots and selects rocks or firm stones as a foundation for its nest. Sometimes also, but seldom, it copies the Chalicodoma of the Walls5 and builds upon an ordinary pebble.

E. pomiformis is much more common and is comparatively indifferent to the nature of the foundation on which she constructs her cell. She builds on walls, on isolated stones, on the inner wooden surface of half-closed shutters; or else she adopts an aerial base, the slender twig of a shrub, the withered sprig of a plant of some sort. Any form of support serves her purpose. Nor does she trouble about shelter. Less chilly than her African cousin, she does not shun the unprotected spaces exposed to every wind that blows.

When erected on a horizontal surface, where nothing interferes with it, the structure [5]of *E. Amadei* is a symmetrical cupola, a spherical skull-cap, having at the top a narrow passage just wide enough for the insect and surmounted by a neatly-funnelled neck. It suggests the round hut of the Eskimo or of the ancient Gael, with its central chimney. An inch, more or less, represents the diameter; three-quarters of an inch the height. When the support is a perpendicular plane, the building still retains the domed shape, but the entrance- and exit-funnel opens at the side, upwards. The floor of this apartment calls for no labour: it is supplied direct by the bare stone.

Having chosen the site, the builder erects a circular fence about an eighth of an inch thick. The materials consist of mortar and small stones. The insect selects its stone-quarry in some well-trodden path or on some neighbouring highroad, at the driest, hardest spots. With its mandibles, it scrapes together a small quantity of dust and soaks it with saliva until the whole becomes a regular hydraulic mortar which soon sets and is no longer susceptible to damp. The Mason-bees have shown us a similar exploitation of the beaten paths and of the road-mender’s macadam. All these open-air builders, all these erectors of monuments exposed [6]to wind and weather require an exceedingly dry stone-dust; otherwise the material, already moistened with water, would not properly absorb the liquid that is to give it cohesion; and the edifice would soon be wrecked by the rains. They possess the sense of discrimination shown by the plasterer, who rejects plaster injured by the wet. We shall see presently how the insects that build under cover avoid this laborious macadam-scraping and give the preference to fresh earth already reduced to a paste by its own dampness. When common lime answers our purpose, we do not trouble about Roman cement. Now *Eumenes Amadei* requires a first-class cement, even superior to

that of the Chalicodoma of the Walls, for the work, when finished, does not receive the thick outer casing wherewith the Mason-bee protects her cluster of cells. And therefore the cupola-builder, as often as she can, uses the highway as her stone-pit.

With the mortar, bricks are needed. These are bits of gravel of an almost unvarying size—that of a pepper-corn—but of a shape and kind that differ greatly, according to the places worked. Some are sharp-cornered, with facets determined by chance fractures; some are round, polished [7]by friction under water. Some are of limestone, others of flinty material. The favourite stones, when the neighbourhood of the nest permits, are smooth, semitransparent little lumps of quartz. These are selected with minute care. The insect weighs them, so to say, measures them with the compass of its mandibles and does not accept them until after making sure that they possess the requisite qualities of size and hardness.

A circular fence, we were saying, is begun on the bare rock. Before the mortar sets, which does not take long, the mason, as the work advances, sticks a few stones into the soft mass. She dabs them half-way into the cement, so as to leave them jutting out to a large extent, without penetrating to the inside, where the wall must remain smooth for the sake of the larva’s comfort. If necessary, she adds a little plaster, to tone down any inner excrescences. The solidly-embedded stonework alternates with the pure mortarwork, of which each fresh course receives its facing of tiny encrusted pebbles. As the edifice is raised, the builder slopes the construction a little towards the centre and fashions the curve which will give the spherical shape. We [8]employ arched centerings to support the masonry of a dome while building; the Eumenes, more daring than we, erects her cupola without any scaffolding.

A round opening is contrived at the top; and above this opening rises a funnelled mouth built of pure cement. It might be the graceful neck of some Etruscan vase. When the cell is victualled and the egg laid, the mouth is closed with a cement plug; and in this plug is set a little pebble, one alone, no more: the ritual never varies. This work of rustic architecture has naught to fear from the inclemencies of the weather; it does not yield to the pressure of the fingers; it resists the knife that attempts to remove it without breaking it. Its nipple-shape and the bits of gravel wherewith it bristles all over the outside remind one of certain cromlechs of olden time, of certain tumuli whose domes are strewn with Cyclopean blocks of stone.

Such is the appearance of the edifice when the cell stands alone; but the Wasp nearly always fixes other domes against her first, to the number of five or six or more. This shortens the labour by allowing her to use the same partition for two adjoining rooms. The original elegant symmetry is lost and [9]the whole now forms a cluster which, at first sight, might be merely a clod of dry mud,

sprinkled with little pebbles. But examine the shapeless mass more closely; and we perceive the number of chambers composing the habitation with the funnelled mouths, each quite distinct and each furnished with its gravel stopper set in the cement.

The Chalicodoma of the Walls employs the same building-methods as *Eumenes Amadei*: in the courses of cement, she fixes, on the outside, small stones of minor bulk. Her work begins by being a turret of rustic art, not without a certain prettiness; then, when the cells are placed side by side, the whole construction degenerates into a lump governed apparently by no architectural rule. Moreover, the Mason-bee covers her mass of cells with a thick layer of cement, which conceals the original rockwork edifice. The Eumenes does not resort to this general coating: her building is too strong to need it; she leaves the pebbly facings uncovered, as well as the entrances to the cells. The two sorts of nests, though constructed of similar materials, are therefore easily distinguished.

The Eumenes' cupola is a piece of artist's work; and the artist would be sorry to hide [10]her masterpiece under whitewash. I crave forgiveness for a suggestion which I advance with all the reserve befitting so delicate a subject. Would it not be possible for the cromlech-builder to take a pride in her handiwork, to look upon it with some affection and to feel gratified by this evidence of her cleverness? Might there not be an insect science of æsthetics? I seem at least to catch a glimpse, in the Eumenes, of a propensity to beautify her product. The nest must be first and foremost a solid habitation, an inviolable stronghold; but, should ornament intervene without jeopardizing the power of resistance, will the worker remain indifferent to it? Who could say?

Let us set forth the facts. The orifice at the top, if left as a mere hole, would suit the purpose quite as well as an elaborate door: the insect would lose nothing in regard to facilities for coming and going and would gain by shortening the labour. Yet we find, on the contrary, the mouth of an amphora, gracefully curved, worthy of a potter's wheel. Choice cement and careful work are needed for the confection of its slender, funnelled shaft. Why this nice finish, [11]if the builder be wholly absorbed in the solidity of her work?

Here is another detail: among the bits of gravel employed for the outer covering of the cupola, grains of quartz predominate. They are polished and translucent; they glitter slightly and please the eye. Why are these little pebbles preferred to chips of limestone, when both materials exist in equal abundance around the nest?

A yet more remarkable feature: we find pretty often, encrusted on the dome, a few tiny empty Snail-shells, bleached by the sun. The species usually selected by the Eumenes is one of the smaller Helices, *Helix strigata*, frequent on our

parched slopes. I have seen nests where this Helix took the place of pebbles almost entirely. They were like boxes made of shells, the work of a patient hand.

A comparison suggests itself. Certain Australian birds, notably the Bower-birds, build themselves covered walks or arbours with interwoven twigs and decorate the two entrances to the portico by strewing the threshold with anything that they can find in the shape of glittering, polished or bright-coloured objects. Every doorsill is a cabinet [12]of curiosities where the collector gathers smooth pebbles, variegated shells, empty Snail-shells, Parrots' feathers, bones that have come to look like sticks of ivory. Even the odds and ends mislaid by man find a home in the bird's museum, where we see pipe-stems, brass buttons, strips of cotton stuff and stone axe-heads.

The collection at either entrance to the bower is large enough to fill half a bushel. As these things are of no use to the bird, its only motive for accumulating them must be an art-lover's hobby. Our common Magpie has similar tastes: any shiny thing that he comes upon he picks up, hides and hoards.

Well, the Eumenes, who shares this passion for bright pebbles and empty Snail-shells, is the Bower-bird of the insect world; but she is a more practical collector, knows how to combine the useful and the ornamental and employs her discoveries in the construction of her nest, which is both a fortress and a museum. When she finds bits of translucent quartz, she rejects everything else: the building will be all the prettier for them. When she comes across a little white shell, she hastens to beautify her dome with it; should fortune smile and empty Snail-shells [13]abound, she encrusts the whole fabric with them, until it becomes the supreme expression of her artistic taste. Is this so or not? Who shall decide?

The nest of *Eumenes pomiformis* is the size of an average cherry and constructed of pure mortar, without any outer pebblework. Its shape is exactly similar to that which we have just described. When built upon a large enough horizontal base, it is a dome with a central neck, funnelled like the mouth of an urn. But, when the foundation is reduced to a mere point, as on the twig of a shrub, the nest becomes a spherical capsule, always, of course, surmounted by a neck. It is then a miniature specimen of exotic pottery, a big-bellied alcarraza. Its thickness is very slight, less than that of a sheet of paper; it crushes under the least finger-pressure. The outside is not quite even. It displays wrinkles and seams, due to the different courses of mortar, or else knotty projections distributed almost concentrically.

Both Wasps accumulate caterpillars in their coffers, whether domes or jars. Let us give an abstract of the bill of fare. These documents, for all their dryness, possess a value: they will enable whoso [14]cares to interest himself in the Eumenes to perceive to what extent instinct modifies the diet, according to

place and season. The food is plentiful but lacks variety. It consists of tiny caterpillars, by which I mean the grubs of small Butterflies or Moths. This is proclaimed by the structure, for we observe the usual caterpillar organism in the prey selected by either Wasp. The body is composed of twelve segments, not including the head. The first three have true legs, the next two are legless, then come four segments with prolegs, two legless segments and, lastly, a terminal segment with prolegs. It is exactly the same organization which we saw in the Ammophila's Grey Worm.

My old notes give the following description of the caterpillars found in the nest of *E. Amadei*: a pale-green or, less often, yellowish body covered with short white hairs; head wider than the front segment, dead-black and also bristling with hairs. Length: 16 to 18 millimetres;6 width: about 3 millimetres.7 It is more than a quarter of a century since I jotted down this descriptive sketch; and today, at Sérignan, I [15]find in the Eumenes' larder the same sort of game that I saw long ago at Carpentras. Time and distance have not altered the nature of the provisions.

I know one exception and one alone in this fidelity to the ancestral diet. My observations mention a single dish that differs greatly from those which accompany it. This is a caterpillar of the Looper group8 with only three pairs of prolegs, placed under the eighth, ninth and twelfth segments. The body tapers slightly at either end, is contracted at the junction of the different rings and is pale green with faint black veinings, visible under the magnifying-glass, and a few sparse black cilia. Length: 15 millimetres;9 width: 2½ millimetres.10

E. pomiformis also has her preferences. Her game consists of small caterpillars about 7 millimetres long by 1⅓ wide.11 The body is pale green, pretty sharply contracted at the junction of the segments. The head is narrower than the rest of the body and is spotted with brown. Pale ocellated [16]circles are distributed in two transversal rows over the middle segments and have a black dot in the centre, surmounted by a black cilium. On the third and fourth and also on the penultimate segment, each circle has two black dots and two cilia. This is the rule.

The exception is supplied by two head of game in the whole course of my observations. These two had a pale yellow body, with five longitudinal brick-red stripes and a few very rare cilia. Head and prothorax brown and shiny; length and diameter as above.

The number of pieces served for the meal of each larva interests us more than the quality. In the cells of *E. Amadei* I find sometimes five caterpillars and sometimes ten, which means a difference of a hundred per cent in the quantity of the food, for the pieces are of exactly the same size in both cases. Why this unequal supply, which gives a double portion to one larva and a single portion to another? The consumers have the same appetite: what one nurseling demands

a second must demand, unless there be here a *menu* differing according to the sexes. In the perfect stage, the males are smaller than the females, are hardly [17]half as much in weight or volume. The amount of victuals, therefore, required to bring them to their final development may be reduced by one-half. In that case, the well-stocked cells belong to females; the others, more meagrely supplied, belong to males.

But the egg is laid when the provisions are stored; and this egg has a determined sex, although the most minute examination is not able to discover the differences which will decide the hatching of a female or a male. We are therefore needs driven to this strange conclusion: the mother knows beforehand the sex of the egg which she is about to lay;12 and this knowledge enables her to fill the larder according to the appetite of the future grub. What a strange world, so wholly different from ours! We fall back upon a special sense to explain the Ammophila's hunting; what can we fall back upon to account for this intuition of the future? Can the theory of chances play a part in the hazy problem? If nothing is logically arranged with a foreseen object, how is this clear vision of the invisible acquired? [18]

The capsules of *E. pomiformis* are literally crammed with game. It is true that the morsels are very small. My notes speak of fourteen green caterpillars in one cell and sixteen in a second. I have no other information about the integral diet of this Wasp, whom I have neglected somewhat, preferring to study her cousin, the builder of rockwork domes. As the two sexes differ in size, though not so greatly as in *E. Amadei*, I am inclined to think that those two well-filled cells belonged to females and that the males' cells must have a less sumptuous table. Not having seen for myself, I am content to set down this mere suspicion.

What I have seen and often seen is the pebbly nest, with the larva inside and the provisions partly consumed. To continue the rearing at home and follow my charges' progress from day to day was a business which I could not resist; besides, so far as I was able to see, it was easily managed. I had had some practice in this foster-father's trade; my association with the Bembex, the Ammophila, the Sphex13 and many others had turned me into a passable insect-breeder. [19]I was no novice in the art of dividing an old pen-box into compartments in which I laid a bed of sand and on this bed the larva, with her provisions, delicately removed from the maternal cell. Success was almost certain at each attempt: I used to watch the larvæ at their meals, I saw my nurselings grow up and spin their cocoons. Relying upon the experience thus gained, I reckoned on success in raising my Eumenes.

The results, however, in no way answered to my expectations. All my endeavours failed; and the larva allowed itself to die a piteous death without touching its provisions.

I ascribed my reverse to this, that and the other cause: perhaps I had injured the frail grub when demolishing the fortress; perhaps a splinter of masonry bruised it when I forced open the hard dome with my knife; perhaps a too-sudden exposure to the sun surprised it when I withdrew it from the darkness of its cell; the open air again might have dried up its moisture. I did the best I could to remedy all these probable reasons of failure. I went to work with every possible caution in breaking open the home; I cast the shadow of my body [20]over the nest, to save the grub from sunstroke; I at once transferred larva and provisions into a glass tube and placed this tube in a box which I carried in my hand, to minimize the jolting on the journey. Nothing was of avail: the larva, when taken from its dwelling, always pined away and died.

For a long time, I persisted in explaining my failure by the difficulties attending the removal. The cell of *Eumenes Amadei* is a strong casket which cannot be forced without sustaining a shock; and the demolition of a work of this kind entails such varied accidents that we are always liable to think that the grub has been bruised by the wreckage. As for carrying home the nest intact on its support, with a view to opening it with greater care than is permitted by a rough and ready operation in the fields, that is out of the question: the nest nearly always stands on an immovable rock or on some big stone forming part of a wall. If I failed in my attempts at rearing, it was because the larva had suffered when I was breaking up her house. The reason seemed a good one; and I let it go at that.

In the end, another idea occurred to me and made me doubt whether my rebuffs [21]were always due to clumsy accidents. The Eumenes' cells are crammed with game: there are ten caterpillars in the cell of *E. Amadei* and fifteen in that of *E. pomiformis*. These caterpillars, stabbed no doubt, but stabbed in a fashion unknown to me, are not entirely motionless. The mandibles seize upon what is presented to them, the body buckles and unbuckles, the hinder half lashes out briskly when stirred with the point of a needle. At what spot is the egg laid amid that swarming mass, where thirty mandibles can make a hole in it, where a hundred and twenty pair of legs can tear it? When the victuals consist of a single head of game, these perils do not exist; and the egg is laid on the victim not at hazard, but upon a judiciously chosen spot. Thus, for instance, the Hairy Ammophila fixes hers, by one end, across the Grey Worm, on the side of the first prolegged segment. The egg hangs over the caterpillar's back, away from the legs, whose proximity might be dangerous. The worm, moreover, stung in the greater number of its nerve-centres, lies on its side, motionless and incapable of bodily contortions or sudden jerks of its hinder segments. If the mandibles try to snap, if the legs give [22]a kick or two, they find nothing in front of them: the Ammophila's egg is in the opposite direction.

The little grub is thus able, as soon as it hatches, to dig into the giant's belly in full security.

How different are the conditions in the Eumenes' cell! The caterpillars are imperfectly paralysed, perhaps because they have received but a single stab; they toss about when touched with a pin; they are bound to wriggle when bitten by the larva. If the egg is laid on one of them, this first morsel will, I admit, be consumed without danger, on condition that the point of attack be wisely chosen; but there remain others which are not deprived of every means of defence. Let a movement take place in the mass; and the egg, shifted from the upper layer, will tumble into a trap of legs and mandibles. The least thing is enough to jeopardize its existence; and this least thing has every chance of being brought about in the disordered heap of caterpillars. The egg, a tiny cylinder, transparent as crystal, is extremely delicate: a touch withers it; the least pressure crushes it.

No, its place is not in the mass of provisions, for the caterpillars, I repeat, are [23]not sufficiently harmless. Their paralysis is incomplete, as is proved by their contortions when I irritate them and evidenced moreover by a very important fact. I have sometimes taken from the cell of *Eumenes Amadei* a few head of game half-transformed into chrysalids. It is evident that the transformation was effected in the cell itself and therefore after the operation which the Wasp had performed upon them. Whereof does this operation consist? I cannot say precisely, never having seen the huntress at work. The sting most certainly has played its part; but where? And how often? This is what we do not know. What we can declare is that the torpor is not very profound, inasmuch as the patient sometimes retains enough vitality to shed its skin and become a chrysalis. Everything thus tends to make us ask by what stratagem the egg is shielded from danger.

This stratagem I longed to discover; I would not be put off by the scarcity of nests, by the irksomeness of the search, by the risk of sunstroke, by the time taken up in the vain breaking open of unsuitable cells; I meant to see and I saw. Here is my method: with the point of a knife and a pair of nippers, I make a side opening, a window, [24]beneath the dome of *E. Amadei* and *E. pomiformis*. I work with the greatest care, so as not to injure the recluse. I used to attack the cupola from the top; I now attack it from the side. I stop when the breach is large enough to allow me to see the state of things within.

What is this state of things? I pause to give the reader time to reflect and to think out for himself a means of safety that will protect the egg and afterwards the grub in the perilous conditions which I have set forth. Seek, think and contrive, such of you as have inventive minds. Have you guessed it? Do you give it up? I may as well tell you.

The egg is not laid upon the provisions; it hangs from the top of the cupola by a thread which vies with that of a Spider's web for slenderness. The dainty cylinder quivers and swings at the least breath; it reminds me of the famous pendulum hung from the dome of the Panthéon to prove the rotation of the earth. The victuals are heaped up underneath.

Second act of this wondrous spectacle. In order to witness it, we must open a window in cell after cell until fortune deigns to smile upon us. The larva is hatched and [25]already fairly large. Like the egg, it hangs perpendicularly, by its rear-end, from the ceiling; but the suspension-cord has gained considerably in length and consists of the original thread eked out by a sort of ribbon. The grub is at dinner: head downwards, it is digging into the limp belly of one of the caterpillars. I touch up the game that is still intact with a straw. The caterpillars grow restless. The grub forthwith retires from the fray. And how? Marvel is added to marvel: what I took for a flat cord, for a ribbon, at the lower end of the suspension-thread, is a sheath, a scabbard, a sort of ascending gallery wherein the grub crawls backwards and makes its way up. The cast shell of the egg, retaining its cylindrical form and perhaps lengthened by a special operation on the part of the new-born larva, forms this safety-channel. At the least sign of danger in the heap of caterpillars, the larva retreats into its sheath and climbs back to the ceiling, where the swarming rabble cannot reach it. When peace is restored, it slides down its case and returns to table, with its head over the viands and its rear upturned and ready to withdraw in case of need.

Third and last act. Strength and vigour [26]have come; the larva is sturdy enough not to dread the movements of the caterpillars' bodies. Besides, the caterpillars, mortified by fasting and weakened by a prolonged torpor, become more and more incapable of defence. The perils of the tender babe are succeeded by the security of the lusty stripling; and the grub, henceforth scorning its sheathed lift, lets itself drop upon the game that remains. And thus the banquet ends in normal fashion.

That is what I saw in the nests of both species of Eumenes, that is what I showed to friends who were even more surprised than I by these ingenious tactics. The egg hanging from the ceiling, at a distance from the provisions, has naught to fear from the caterpillars, which flounder about below. The newly-hatched worm, whose suspension-cord is lengthened by the sheath of the egg, reaches the game and takes a first cautious bite at it. If there be danger, it climbs back to the ceiling by retreating inside the scabbard. This explains the failure of my earlier attempts. Not knowing of the safety-thread, so slender and so easily broken, I gathered at one time the egg, at another the young larva, after my inroads at the top had caused them to fall into the [27]midst of the live provisions. Neither of them was able to thrive when brought into direct contact with the dangerous game.

If any one of my readers, to whom I appealed just now, has thought out something better than the Eumenes' invention, I beg that he will let me know, for there is a curious parallel to be drawn between the inspirations of reason and those of instinct. [28]

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1 I include three species promiscuously under this one name, that is to say, *E. pomiformis*, Fabr., *E. bipunctis*, Sauss., and *E. dubius*, Sauss. As I did not distinguish between them in my first investigations, which date a very long time back, it is not possible for me to-day to attribute to each of them its respective nest. But their habits are the same, for which reason this confusion does not injure the order of ideas in the present chapter.—*Author's Note.*↑

2 The Grey Worm is the caterpillar of *Noctua segetum*, the Dart or Turnip Moth. It is hunted by the Hairy Ammophila, for whom cf. *The Hunting Wasps*, by J. Henri Fabre, translated by Alexander Teixeira de Mattos: chap. xviii.—*Translator's Note.*↑

3 Cf. *The Hunting Wasps*: *passim*; *Insect Life*, by J.H. Fabre, translated by the author of *Mademoiselle Mori*: chaps. iii. to xii., xiv. to xvii. and xix.; *The Life and Love of the Insect*, by J. Henri Fabre, translated by Alexander Teixeira de Mattos: chaps. xi. to xii.; and *Social Life of the Insect World*, by J.H. Fabre, translated by Bernard Miall: chap. xiii.—*Translator's Note.*↑

4 Marcus Vitruvius Pollio, the Roman architect and engineer.—*Translator's Note.*↑

5 Cf. *The Mason-bees*, by J. Henri Fabre, translated by Alexander Teixeira de Mattos: chaps. i. to iii. *et passim*.—*Translator's Note.*↑

6 .63 inch to .7 inch.—*Translator's Note.*↑

7 .12 inch.—*Translator's Note.*↑

8 Also known as the Measuring-worm, the caterpillar of the Geometrid Moth.—*Translator's Note.*↑

9 .585 inch.—*Translator's Note.*↑

10 .098 inch.—*Translator's Note.*↑

11 .27 by .50 inch.—*Translator's Note.*↑

12 Cf. *Bramble-bees and Others*, by J. Henri Fabre, translated by Alexander Teixeira de Mattos: chap. iv.—*Translator's Note.*↑

13 Cf. *The Hunting Wasps*: chaps. iv. to viii. and xiii. to xx.—*Translator's Note.*↑

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CHAPTER II

THE ODYNERI

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The Eumenes' suspension-cord and ascending-sheath are rendered necessary by the large number and the incomplete paralysis of the caterpillars provided for the larva; the object of the ingenious system is to avert danger. This, at least, is how I regard the concatenation of causes and effects. But I yield to no one in my distrust of whys and wherefores; I know how slippery our footing becomes when we venture on interpretations; and, before declaring the reasons of any fact observed, I seek for a batch of proofs. If the singular installation of the Eumenes' egg is really due to the reasons suggested, then, wherever we find similar conditions of danger, namely, a multiplicity of dishes combined with incomplete torpor, we must also find a similar method of protection, or some other method having an equivalent effect. The repetition of the act will bear witness to the correctness of the interpretation; and, if it is not reproduced elsewhere, with such variations [29]as may be required, the case of the Eumenes will remain a very curious instance, without acquiring the far-reaching significance which I suspect it of bearing. Let us generalize, the better to establish the facts.

Now not far removed from the Eumenes are the Odyneri, the Solitary Wasps observed by Réaumur.[1] They have the same costumes, the same wings folded lengthwise, the same predatory instincts and, above all, as the supreme condition, the same accumulations of prey retaining sufficient power of movement to be dangerous. If my arguments are well-founded, if I am right in my conjectures, the egg of the Odynerus should be slung from the ceiling of the cell like the egg of the Eumenes. My conviction, based upon logic, is so positive that I already seem to see this egg, recently laid, quivering at the end of the life-line.

Ah, I confess that it needed a robust faith to cherish the audacious hope of discovering anything further when the masters had seen nothing! I read and reread Réaumur's essay on the Solitary Wasp. [30]The Insect's Herodotus gives us a host of particulars, but says nothing, absolutely nothing, about the hanging egg. I consult Léon Dufour,[2] who treats subjects of this kind with his usual raciness: he has seen the egg; he describes it; but of the suspension-thread not a word. I consult Lepeletier,[3] Audouin,[4] Blanchard:[5] they are absolutely silent on the means of protection which I expect to find. Is it possible that a detail of such great importance can have escaped all these observers? Am I the dupe of my imagination? Is the protective system, though proved to my mind by close logical reasoning, merely one of my [31]dreams? Either the Eumenes have lied

to me or my hopes are justified. As a disciple rebelling against his masters, a disciple strong in arguments which I believed invincible, I set to work investigating, convinced that I should succeed. And I did succeed; I found what I was looking for; I found something better still. Let me set things down in detail.

There are various Odyneri established in my neighbourhood. I know one who takes possession of the abandoned nests of *Eumenes Amadei*. This nest, a structure of unusual solidity, is not a ruin when its owner moves away; it loses only its neck. The cupola, preserved untouched, is a fortified retreat of too convenient a nature to remain vacant. Some Spider adopts the cavern, after lining it with silk; Osmiæ[6] take refuge in it in rainy weather, or else make it their dormitory, wherein to spend the night; an Odynerus divides it, by means of clay partitions, into three or four chambers, which become the cradles of as many larvæ. A second species uses the deserted nests of the Pelopæus;[7] a third, removing the pith from [32]a dry bramble-stem, obtains, for the use of her family, a long sheath, which she subdivides into stories; a fourth bores a gallery in the dead wood of some fig-tree; a fifth digs herself a shaft in the soil of a footpath and surmounts it with a cylindrical, vertical kerb. All these industries are worth studying, but I should have preferred to discover that which Réaumur and Dufour have rendered famous.

On a steep bank of red clay, I at length recognize, in no great profusion, the signs of a village of Odyneri. Here are the characteristic chimneys mentioned by the two historians, that is to say, the curved tubes, with their guilloche-work, that hang at the entrance to the dwelling. The bank is exposed to the heat of the noonday sun. A little tumbledown wall surmounts it; behind is a dense screen of pines. The whole forms a warm refuge, such as the Wasp requires for setting up house. Moreover, we are now in the second fortnight of the month of May, which is just the working-season, according to the masters. The outside architecture, the site and the period all agree with what Réaumur and Léon Dufour have told us. Have I really chanced upon one or other of their Odyneri? This remains [33]to be seen and without delay. Not one of the ingenious constructors of guilloche porticoes shows herself, not one arrives; I must wait. I take up my position close by, to watch the homing insects.

Ah, how long the hours seem, spent motionless, under a burning sun, at the foot of a declivity which sends the heat of an oven beating down upon you! Bull, my inseparable companion, has retired some distance into the shade, under a clump of evergreen oaks. He has found a layer of sand whose depths still retain some traces of the last shower. He digs himself a bed; and in the cool furrow the sybarite stretches himself flat upon his belly. Lolling his tongue and

thrashing the boughs with his tail, he keeps his soft, deep gaze fixed upon me:

“What are you doing over there, you booby, baking in the heat? Come here, under the foliage; see how comfortable I am!”

That is what I seem to read in my companion’s eyes.

“Oh, my Dog, my friend,” I should answer, if you could only understand, “man is tormented by a desire for knowledge, whereas your torments are confined to a desire [34]for bones and, from time to time, a desire for your sweetheart! This, notwithstanding our devoted friendship, creates a certain difference between us, even though people nowadays say that we are more or less related, almost cousins. I feel the need to know things and am content to bake in the heat; you feel no such need and retire into the cool shade.”

Yes, the hours drag when you lie waiting for an insect that does not come. In the pinewood hard by, a couple of Hoopoes are chasing each other with the amorous provocations of spring:

“*Oopoopoo!*” cries the cock, in a muffled tone. “*Oopoopoo!*”

Latin antiquity called the Hoopoe *Upupa*; Greek antiquity named it ῞Εποψ. But Pliny turned the ἔ into *ou* and must have pronounced the word *Oupoupa*, as the cry imitated by the name teaches me to do. Rarely have I received a lesson in Latin pronunciation better authenticated than yours,8 you beautiful bird,

who provide a diversion for my long hours of weariness. Faithful to your idiom, you say "*Oopoopoo!*" as you said in the days of [35]Aristotle and Pliny, as you said when your note sounded for the first time. But our own idioms, our primitive idioms, what has become of them? The scholar cannot even recover their traces. Man alters; animals do not change.

At last, here we are at last! See, the Odynerus arrives, with a flight as silent as the Eumenes'. She disappears into the curved cylinder of the vestibule, bringing home a grub beneath her abdomen. I place a small glass test-tube at the entrance to the nest. When the insect emerges, it will be caught. Done! The Wasp is caught and at once decanted into the asphyxiating-flask, with its strips of paper steeped in bisulphide of carbon. And now, my Dog, still lolling your tongue and frisking your tail, we can be off; the day has not been wasted. We will come back to-morrow.

Upon investigation, my Odynerus does not correspond with what I expected to see. This is not the species of which Réaumur speaks (*O. spinipes*); nor is it the species studied by Dufour (*O. Reaumurii*); it is another. (*O. reniformis*, Latr.), a different one, though addicted to the same arts. Already the naturalist of the Landes had [36]allowed himself to be deceived by that similarity in architecture, provisions and habits; he thought that he was observing Réaumur's Solitary Wasp, whereas

in reality his tube-builder presented specific differences.

We know the worker; it remains for us to become acquainted with her work. The entrance to the nest opens in the perpendicular wall of the bank. It is a round hole, on the edge of which is built a curved tube, with the orifice turned downwards. Made with the materials cleared from the burrow under construction, this tubular vestibule is composed of grains of earth, not arranged in continuous courses, but leaving small vacant intervals. It is a species of open-work, a lacework of clay. Its length is about an inch and its internal diameter a fifth of an inch. This portico is continued by the gallery, of the same diameter, which slants into the soil to a depth of nearly six inches. Here this main gallery branches into short corridors, each giving access to a cell which is independent of its neighbours. Each larva has its chamber, which can be reached by a special passage. I have counted as many as ten of them; and there may be more. These chambers have nothing [37]remarkable about them, either in construction or in capacity; they are just *culs-de-sac* ending the corridors that give access to them. Some are horizontal, some more or less sloping; there is no fixed rule. When a cell contains what it is meant to contain, the egg and the provisions, the Odynerus closes the entrance with a little earthen lid; she then digs another near it, on one side of the principal gallery. Lastly, the common road to the cells is

blocked with earth; the tube at the entrance is demolished, to furnish material for the work done inside the nest; and every vestige of the habitation disappears.

The surface of the bank is of clay baked in the sun; it is almost brick. I break into it with difficulty, making use of a small pocket-trowel. Underneath, it is much less hard.

How does the frail miner manage to sink a gallery in this brick? She employs, I cannot doubt, the method described by Réaumur. I will therefore reproduce a passage from the master's writings, to give my younger readers a glimpse into the habits of the Odyneri, habits which my very small colony did not enable me to observe in all their details: [38]

> **"It is at the end of May that these Wasps set to work; and one can see them busily labouring during the whole of June. Though their actual object is only to dig in the sand a hole a few inches deep and not much wider than their bodies, one might suppose that they had another end in view; for, to make this hole, they build on the outside a hollow tube, which has as its base the circumference of the entrance to the hole and which, after following a direction perpendicular to the surface containing that aperture, turns downwards. This tube becomes longer in proportion as the hole becomes deeper; it is built of the sand drawn from the hole; it is**

fashioned in coarse filigree, or a sort of guilloche. It is made of big, granular, winding fillets, which do not touch at all points. The gaps left in between make it look as if it were artistically constructed, whereas it is only a sort of scaffolding by means of which the mother's tactics are rendered swifter and surer.

"Though I knew these insects' two teeth to be capital instruments, capable of breaking into very hard substances, the task which they had to perform appeared to me rather severe for them. The sand on which they had to act was scarcely less hard than ordinary [39]stone; at least, one's finger-nails made but a poor impression upon its outer layer, which the sun's rays had dried more thoroughly than the rest. But, when I succeeded in observing these workers at the moment when they were beginning to bore a hole, they taught me that they did not need to subject their teeth to so harsh an ordeal.

"I saw that the Wasp begins by softening the sand which she proposes to remove. Her mouth discharges upon it a drop or two of water, which is promptly swallowed by the sand, turning it instantly into a soft paste which her teeth scrape and remove without difficulty. Two of her legs, the foremost pair, immediately proceed to gather it into a little

pellet, about the size of a currant-seed. It is with this pellet, the first one removed, that the Wasp lays the foundations of the tube which we have described. She carries her pellet of mortar to the edge of the hole which she has just made by removing it; her teeth and feet turn it about, flatten it and make it stand up higher than it did before. This done, the Wasp again sets about removing sand and loads herself with another pellet of mortar. Soon she contrives to have extracted enough [40]sand to make the entrance of the hole perceptible and to have laid the foundation of the tube.

“But the work can proceed quickly only so long as the Wasp is able to moisten the sand. She is obliged to take trouble to renew her store of water. I do not know whether she simply went to take in water at some stream, or whether she drew, from some plant or fruit, a more sticky fluid; what I do know is that she returned without delay and set to work with renewed zeal. I observed one Wasp who managed, in about an hour, to sink a hole the length of her body and who raised a chimney as tall as the hole was deep. At the end of a few hours the tube stood two inches high and she was still deepening the hole that lay underneath.