

# THE LIFE OF THE CATERPILLAR

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# CHAPTER I

## THE PINE PROCESSIONARY: THE EGGS AND THE HATCHING

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THIS caterpillar has already had his story told by Réaumur<sup>1</sup> but it was a story marked by gaps. These were inevitable in the conditions under which the great man worked, for he had to receive all his materials by barge from the distant Bordeaux Landes. The transplanted insect could not be expected to furnish its biographer with other than fragmentary evidence, very weak in those biological details which form the principal charm of entomology. To study the habits of insects one must observe them long and closely on their native heath, so to speak, in the place where their instincts have full and natural play.

With caterpillars foreign to the Paris climate and brought from the other end of France, Réaumur therefore ran the risk of missing many most interesting facts. This is what actually happened, just as it did on a later occasion in the case of another alien, the Cicada.<sup>2</sup> Nevertheless, the information which he was able to extract from a few nests sent to him from the Landes is of the highest value.

Better served than he by circumstances, I will take up afresh the story of the Processionary Caterpillar of the Pine. If the subject does not come up to my hopes, it will certainly not be for lack of materials. In my *harmas*<sup>3</sup> laboratory, now stocked with a few trees in addition to its bushes, stand some vigorous fir-trees, the Aleppo pine and the black Austrian pine, a substitute for that of the Landes. Every year the caterpillar takes possession of them and spins his great purses in their branches. In the interest of the leaves, which are horribly ravaged, as though there had been a fire, I am obliged each winter to make a strict survey and to extirpate the nests with a long forked batten.

<sup>1</sup>René Antoine Ferchault de Réaumur (1683-1757), inventor of the Réaumur thermometer and author of *Memoires pour servir à l'histoire naturelle des insectes*.—*Translator's Note*.

<sup>2</sup>For the Cicada or *Cigale*, an insect remotely akin to the Grasshopper and found more particularly in the south of France, cf. *Social Life in the Insect World*, by J. H. Fabre, translated by Bernard Miall: chaps. i to iv.—*Translator's Note*.

<sup>3</sup>The *harmas* was the enclosed piece of waste ground in which the author used to study his insects in their natural state.—*Translator's Note*.

You voracious little creatures, if I let you have your way, I should soon be robbed of the murmur of my once so leafy pines! Today I will seek compensation for all the trouble I have taken. Let us make a compact. You have a story to tell. Tell it me; and for a year, for two years or longer, until I know more or less all about it, I shall leave you undisturbed, even at the cost of lamentable suffering to the pines.

Having concluded the treaty and left the caterpillars in peace, I soon have abundant material for my observations. In return for my indulgence I get some thirty nests within a few steps of my door. If the collection were not large enough, the pine-trees in the neighbourhood would supply me with any necessary additions. But I have a preference and a decided preference for the population of my own enclosure, whose nocturnal habits are much easier to observe by lantern-light. With such treasures daily before my eyes, at any time that I wish and under natural conditions, I cannot fail to see the Processionary's story unfolded at full length. Let us try.

And first of all the egg, which Réaumur did not see. In the first fortnight of August, let us inspect the lower branches of the pines, on a level with our eyes. If we pay the least attention, we soon discover, here and there, on the foliage, certain little whitish cylinders spotting the dark green. These are the Bombyx' eggs: each cylinder is the cluster laid by one mother.

The pine-needles are grouped in twos. Each pair is wrapped at its base in a cylindrical muff which measures about an inch long by a fifth or sixth of an inch wide. This muff, which has a silky appearance and is white slightly tinted with russet, is covered with scales that overlap after the manner of the tiles on a roof; and yet their arrangement, though fairly regular, is by no means geometrical. The general aspect is more or less that of an immature walnut-catkin.

The scales are almost oval in form, semitransparent and white, with a touch of brown at the base and of russet at the tip. They are free at the lower end, which tapers slightly, but firmly fixed at the upper end, which is wider and blunter. You cannot detach them either by blowing on them or by rubbing them repeatedly with a hair-pencil. They stand up, like a fleece stroked the wrong way, if the sheath is rubbed gently upwards, and retain this bristling position indefinitely; they resume their original arrangement when the friction is in the op-

posite direction. At the same time, they are as soft as velvet to the touch. Carefully laid one upon the other, they form a roof that protects the eggs. It is impossible for a drop of rain or dew to penetrate under this shelter of soft tiles.

The origin of this defensive covering is self-evident: the mother has stripped a part of her body to protect her eggs. Like the Eider-duck, she has made a warm overcoat for them out of her own down. Réaumur had already suspected as much from a very curious peculiarity of the Moth. Let me quote the passage:

“The females,” he says, “have a shiny patch on the upper part of their body, near the hind-quarters. The shape and gloss of this disk attracted my attention the first time that I saw it. I was holding a pin, with which I touched it, to examine its structure. The contact of the pin produced a little spectacle that surprised me: I saw a cloud of tiny spangles at once detach themselves. These spangles scattered in every direction: some seemed to be shot into the air, others to the sides; but the greater part of the cloud fell softly to the ground.

“Each of those bodies which I am calling spangles is an extremely slender lamina, bearing some resemblance to the atoms of dust on the Moths’ wings, but of course much bigger. . . . The disk that is so noticeable on the hind-quarters of these Moths is therefore a heap—and an enormous heap—of these scales. . . . The females seem to use them to wrap their eggs in; but the Moths of the Pine Caterpillar refused to lay while in my charge and consequently did not enlighten me as to whether they use the scales to cover their eggs or as to what they are doing with all those scales gathered round their hinder part, which were not given them and placed in that position to serve no purpose.”

You were right, my learned master: that dense and regular crop of spangles did not grow on the Moth’s tail for nothing. Is there anything that has no object? You did not think so; I do not think so either. Everything has its reason for existing. Yes, you were well-inspired when you foresaw that the cloud of scales which flew out under the point of your pin must serve to protect the eggs.

I remove the scaly fleece with my pincers and, as I expected, the eggs appear, looking like little white-enamel beads. Clustering closely

together, they make nine longitudinal rows. In one of these rows I count thirty-five eggs. As the nine rows are very nearly alike, the contents of the cylinder amount in all to about three hundred eggs, a respectable family for one mother

The eggs of one row or file alternate exactly with those in the two adjoining files, so as to leave no empty spaces. They suggest a piece of bead-work produced with exquisite dexterity by patient fingers. It would be more correct still to compare them with a cob of Indian corn, with its neat rows of seeds, but a greatly reduced cob, the tinniness of whose dimensions makes its mathematical precision all the more remarkable. The grains of the Moth's spike have a slight tendency to be hexagonal, because of their mutual pressure; they are stuck close together, so much so that they cannot be separated. If force is used, the layer comes off the leaf in fragments, in small cakes always consisting of several eggs apiece. The beads laid are therefore fastened together by a glutinous varnish; and it is on this varnish that the broad base of the defensive scales is fixed.

It would be interesting, if a favourable opportunity occurred, to see how the mother achieves that beautifully regular arrangement of the eggs and also how, as soon as she has laid one, all sticky with varnish, she makes a roof for it with a few scales removed one by one from her hind-quarters. For the moment, the very structure of the finished work tells us the course of the procedure. It is evident that the eggs are not laid in longitudinal files, but in circular rows, in rings, which lie one above the other, alternating their grains. The laying begins at the bottom, near the lower end of the double pine-leaf; it finishes at the top. The first eggs in order of date are those of the bottom ring; the last are those of the top ring. The arrangement of the scales, all in a longitudinal direction and attached by the end facing the top of the leaf, makes any other method of progression inadmissible.

Let us consider in the light of reflection the elegant edifice now before our eyes. Young or old, cultured or ignorant, we shall all, on seeing the Bombyx' pretty little spike, exclaim:

“How handsome!”

And what will strike us most will be not the beautiful enamel pearls, but the way in which they are put together with such geometrical regularity. Whence we can draw a great moral, to wit, that an exquisite

order governs the work of a creature without consciousness, one of the humblest of the humble. A paltry Moth follows the harmonious laws of order.

If Micromégas<sup>1</sup> took it into his head to leave Sirius once more and visit our planet, would he find anything to admire among us? Voltaire shows him to us using one of the diamonds of his necklace as a magnifying glass in order to obtain some sort of view of the three-master which has run aground on his thumb-nail. He enters into conversation with the crew. A nail-paring, curved like a horn, encompasses the ship and serves as a speaking-trumpet; a tooth-pick, which touches the vessel with its tapering end and the lips of the giant, some thousand fathoms above, with the other, serves as a telephone. The outcome of the famous dialogue is that, if we would form a sound judgment of things and see them under fresh aspects, there is nothing like changing one's planet.

The probability then is that the Sirian would have had a rather poor notion of our artistic beauties. To him our masterpieces of statuary, even though sprung from the chisel of a Phidias, would be mere dolls of marble or bronze, hardly more worthy of interest than the children's rubber dolls are to us; our landscape-paintings would be regarded as dishes of spinach smelling unpleasantly of oil; our opera-scores would be described as very expensive noises.

These things, belonging to the domain of the senses, possess a relative aesthetic value, subordinated to the organism that judges them. Certainly the Venus of Melos and the Apollo Belvedere are superb works; but even so it takes a special eye to appreciate them. Micromégas, if he saw them, would be full of pity for the leanness of human forms. To him the beautiful calls for something other than our sorry, frog-like anatomy.

Show him, on the other hand, that sort of abortive windmill by means of which Pythagoras, echoing the wise men of Egypt, teaches us the fundamental properties of the right triangle. Should the good giant, contrary to our expectation, happen not to know about it, explain to him what the windmill means. Once the light has entered his mind, he will find, just as we do, that there is beauty there, real beauty, not certainly in that horrible hieroglyphic, the figure, but in the un-

<sup>1</sup>The eponymous hero of Voltaire's story of "the little great man," published in 1752 in imitation of *Gulliver's Travels*.—Translator's Note.

changeable relation between the lengths of the three sides; he will admire as much as we do geometry the eternal balancer of space.

There is, therefore, a severe beauty, belonging to the domain of reason, the same in every world, the same under every sun, whether the suns be single or many, white or red, blue or yellow. This universal beauty is order. Everything is done by weight and measure, a great statement whose truth breaks upon us all the more vividly as we probe more deeply into the mystery of things. Is this order, upon which the equilibrium of the universe is based, the predestined result of a blind mechanism? Does it enter into the plans of an Eternal Geometer, as Plato had it? Is it the ideal of a supreme lover of beauty, which would explain everything?

Why all this regularity in the curve of the petals of a flower, why all this elegance in the chasings on a Beetle's wing-cases? Is that infinite grace, even in the tiniest details, compatible with the brutality of uncontrolled forces? One might as well attribute the artist's exquisite medallion to the steam-hammer which makes the slag sweat in the melting.

These are very lofty thoughts concerning a miserable cylinder which will bear a crop of caterpillars. It cannot be helped. The moment one tries to dig out the least detail of things, up starts a why which scientific investigation is unable to answer. The riddle of the world has certainly its explanation elsewhere than in the little truths of our laboratories. But let us leave Micromegas to philosophize and return to the commonplaces of observation.

The Pine Bombyx has rivals in the art of gracefully grouping her egg-beads. Among their number is the Neustrian Bombyx, whose caterpillar is known by the name of "Livery," because of his costume. Her eggs are assembled in bracelets around little branches varying greatly in nature, apple- and pear-branches chiefly. Any one seeing this elegant work for the first time would be ready to attribute it to the fingers of a skilled stringer of beads. My small son Paul opens eyes wide with surprise and utters an astonished "Oh!" each time that he comes upon the dear little bracelet. The beauty of order forces itself upon his dawning attention.

Though not so long and marked above all by the absence of any wrapper, the ring of the Neustrian Bombyx reminds one of the other's

cylinder, stripped of its scaly covering. It would be easy to multiply these instances of elegant grouping, contrived now in one way, now in another, but always with consummate art. It would take up too much time, however. Let us keep to the Pine Bombyx.

The hatching takes place in September, a little earlier in one case, a little later in another. So that I may easily watch the newborn caterpillars in their first labours, I have placed a few egg-laden branches in the window of my study. They are standing in a glass of water which will keep them properly fresh for some time.

The little caterpillars leave the egg in the morning, at about eight o'clock. If I just lift the scales of the cylinder in process of hatching, I see black heads appear, which nibble and burst and push back the torn ceilings. The tiny creatures emerge slowly, some here and some there, all over the surface.

After the hatching, the scaly cylinder is as regular and as fresh in appearance as if it were still inhabited. We do not perceive that it is deserted until we raise the spangles. The eggs, still arranged in regular rows, are now so many yawning goblets of a slightly translucent white; they lack the cap-shaped lid, which has been rent and destroyed by the new-born grubs.

The puny creatures measure a millimetre at most in length. Devoid as yet of the bright red that will soon be their adornment, they are pale-yellow, bristling with hairs, some shortish and black, others rather longer and white. The head, of a glossy black, is big in proportion. Its diameter is twice that of the body. This exaggerated size of the head implies a corresponding strength of jaw, capable of attacking tough food from the start. A huge head, stoutly clad in horn, is the predominant feature of the budding caterpillar.

These macrocephalous ones are, as we see, well-armed against the hardness of the pineneedles, so well-armed in fact that the meal begins almost immediately. After roaming for a few moments at random among the scales of the common cradle, most of the young caterpillars make for the double leaf that served as an axis for the native cylinder and spread themselves over it at length. Others go to the adjacent leaves. Here as well as there they fall to; and the gnawed leaf is hollowed into faint and very narrow grooves, bounded by the veins, which are left intact.

From time to time, three or four who have eaten their fill fall into line and walk in step, but soon separate, each going his own way. This is practice for the coming processions. If I disturb them ever so little, they sway the front half of their bodies and wag their heads with a jerky movement similar to the action of an intermittent spring.

But the sun reaches the corner of the window where the careful rearing is in progress. Then, sufficiently refreshed, the little family retreats to its native soil, the base of the double leaf, gathers into an irregular group and begins to spin. Its work is a gauze globule of extreme delicacy, supported on some of the neighbouring leaves. Under this tent, a very wide-meshed net, a siesta is taken during the hottest and brightest part of the day. In the afternoon, when the sun has gone from the window, the flock leaves its shelter, disperses around, sometimes forming a little procession within a radius of an inch, and starts browsing again.

Thus the very moment of hatching proclaims talents which age will develop without adding to their number. In less than an hour from the bursting of the egg, the caterpillar is both a processionary and a spinner. He also flees the light when taking refreshment. We shall soon find him visiting his grazing grounds only at night.

The spinner is very feeble, but so active that in twenty-four hours the silken globe attains the bulk of a hazel-nut and in a couple of weeks that of an apple. Nevertheless, it is not the nucleus of the great establishment in which the winter is to be spent. It is a provisional shelter, very light and inexpensive in materials. The mildness of the season makes anything else unnecessary. The young caterpillars freely gnaw the logs, the poles between which the threads are stretched, that is to say, the leaves contained within the silken tent. Their house supplies them at the same time with board and lodging. This excellent arrangement saves them from having to go out, a dangerous proceeding at their age. For these puny ones, the hammock is also the larder.

Nibbled down to their veins, the supporting leaves wither and easily come unfastened from the branches; and the silken globe becomes a hovel that crumbles with the first gust of wind. The family then moves on and goes elsewhere to erect a new tent, lasting no longer than the first. Even so does the Arab move on, as

the pastures around his camel-hide dwelling become exhausted. These temporary establishments are renewed several times over, always at greater heights than the last, so much so that the tribe, which was hatched on the lower branches trailing on the ground, gradually reaches the higher boughs and sometimes the very summit of the pine-tree.

In a few weeks' time, a first moult replaces the humble fleece of the start, which is pale-coloured, shaggy and ugly, by another which lacks neither richness nor elegance. On the dorsal surface, the various segments, excepting the first three, are adorned with a mosaic of six little bare patches, of a bright red, which stand out a little above the dark background of the skin. Two, the largest, are in front, two behind and one, almost dot-shaped, on either side of the quadrilateral. The whole is surrounded by a palisade of scarlet bristles, divergent and lying almost flat. The other hairs, those of the belly and sides, are longer and whitish.

In the centre of this crimson marquetry stand two clusters of very short bristles, gathered into flattened tufts which gleam in the sun like specks of gold. The length of the caterpillar is now about two centimetres and his width three or four millimetres. Such is the costume of middle age, which, like the earlier one, was unknown to Réaumur.

