
ANTS AND BEES.
BETWEEN THE FRENCH AND
THE DARWINIAN REVOLUTION

JEAN-MARC DROUIN

ABSTRACT. An entire chapter of *On the Origin of Species* is devoted to instincts. Two examples are borrowed from the study of the social insects: “the slave-making instinct of certain ants” and “the comb-making power of the hive-bee.” One of Darwin’s main references is the work of the Swiss entomologist Pierre Huber, son and collaborator of François Huber. This is an invitation to read the French-speaking literature concerning social insects within the fifty years preceding the publication of the *Origin of Species*. The most frequent themes are: the difference in scale between the world of insects and our own, the achievement of architecture, the destiny of the drones, the strong inequality between the queen and the workers. The most controversial issue is slave-making in ant colonies. The historian Michelet is depressed to see nature giving such bad example of injustice. Everybody agrees that social insects are a fascinating part of the display of nature, but authors differ on the meaning of such display.

KEY WORDS. Social insects, instinct, ethology, entomology, images of science, nature/society, Charles Darwin, François Huber, Pierre Huber, Jules Michelet.

“If Mozart, instead of playing the pianoforte at three years old with wonderfully little practice, had played with no practice at all, he might truly be said to have done so instinctively.” With this fictitious supposition, Charles Darwin (1809-1882) illustrates the resemblance between a habit and an instinct ¹. An entire chapter—the seventh in the first edition—of *On the Origin of Species*, is devoted to instincts, which are, in his own words, “as important as corporeal structure for the welfare of each species, under its present conditions of life ².” Among the animals taken as examples by Darwin in this chapter, the social insects occupy the first rank. To support the principle that the instinct of each species is good for that sole species and is not produced for the benefit of any another, he refutes the objection based on aphids excreting a sweet juice gathered by ants. According to Darwin, this juice is so viscid that “it is probably a convenience to the

Muséum national d’Histoire Naturelle, Centre Alexandre Koyré, Paris, France.
drouin@mnhn.fr

aphides to have it removed ³." A few pages later, among the three examples of "instincts in a state of nature" analyzed by Darwin, namely "the instinct of the cuckoo to lay her eggs in other birds' nest," "the slave-making instinct of certain ants" and "the comb-making power of the hive-bee," the second and the third one are borrowed from the study of social insects ⁴. Darwin proposes to explain them as simple instincts complicated by natural selection. The ancestors of the slave-making ants might have just displayed the instinct of stealing and storing the pupae of other species of ants as a source of food. Some of the pupae that were stored might have developed into workers. These workers might have followed "their proper instincts, and do what work they could." Their work being useful, natural selection gradually complicated the instinct of making raids on nests of other species of ants, and transformed this instinct into the habit of capturing workers. Concerning "the comb-making power of the hive-bee," the explanation rests upon a graduation from humble-bees "using the old cocoons to hold honey," to the hive-bee, *Apis mellifera*, constructing hexagonal prisms with bases made with three rhombs. In this gradation the Mexican bee, *Melipona domestica*, with its cylindrical cells plays the role of an intermediate stage. Darwin reports some experiments he performed with ants and bees. He also credited for their advice some of his fellow-countrymen: Frederick Smith (1805-1879), Georges Robert Waterhouse (1810-1888), William Bernhard Tegetmeier (1816-1912), all of them zoologists, and William Miller (1801-1880) a specialist on crystallography. However, his main reference is the work of the Swiss entomologist Pierre Huber (1779-1840), son and collaborator of François Huber (1750-1831). Darwin admires them both, even if his own observations on the construction of the cells differ from those made by the latter. In several of his letters during the year 1858 he refers to the work of François and Pierre Huber ⁵. The importance given by Darwin to these two naturalists is an invitation to read the French-speaking literature concerning social insects within the fifty years preceding the publication of the *Origin of Species*.

THE HISTORIOGRAPHY OF THE SUBJECT

There are several well documented and stimulating studies on the image of insect societies, those of John Clark, Sarah Jansen, Charlotte Sleigh, Abigail Lustig ⁶. They deal mainly or solely with the second half of the nineteenth century ⁷. Other authors deal with the first half of that century and even earlier periods. So does Olivier Perru, in a comprehensive paper focused on Pierre-André Latreille's work ⁸. Marc Ratcliff places the study of insect societies in the context of the ideas in the eighteenth century concerning animal behavior. Frederick Prete deals with the specific prob-

lem of gender in British bee-keeping texts from the sixteenth to the eighteenth centuries¹⁰.

For my part, I published a paper, twelve years ago, concerning the representation of insect societies during the French Revolution¹¹. It can be summarized in a few lines. At the end of the eighteenth century, insect societies were pictured as a fascinating world, where the leadership belonged to females and where everyone abode by the law. After the fall of the French monarchy, the idea of the hive or the ant colony as a kingdom was violently dismissed. The image of insect societies has often been controversial, but in the period of the Revolution the debates gained great importance due to the political debates about monarchy and republic, and to the economical need to produce wax and honey. In any case, it can be said that the entomologists emphasized the philosophical aspects of their science as well as the practical ones in order to show its usefulness.

The current paper continues the same line of research and extends to the mid-nineteenth century. Its first version was presented and discussed in a workshop on "Moral Authority of Nature" organized by Lorraine Daston at the Max Planck Institute for History of Science in the Spring of 2001.

MASTERPIECES AND LANDMARKS

The literature concerning ants is abundant and diversified¹². Books concerning bees are even more numerous, as bee-keeping texts have to be added to scientific and fiction texts. In comparison, the termites—often improperly called "white ants"—have the meanest share.

The social insects have various taxonomic statuses. Ants, wasps and bees are, since the beginning of the eighteenth century, grouped in the Hymenoptera. The termites were placed in another order of insects, the Neuropteran, after that they were considered as forming the order of Isopteran. The importance given by naturalists to these taxonomic issues have changed according to the period considered. In the first half of the nineteenth century, naturalists generally intended to combine taxonomy, morphology and behavior observations.

The outstanding figure of the period in all fields of entomology is Pierre-André Latreille (1762-1833)¹³. He dealt with ants in an essay published in 1798 and entitled *Essai sur l'histoire des fourmis de la France*; this text was enlarged in 1802 under the title *Histoire naturelle des fourmis*. Concerning the specific topic of social insects, the three leading figures are those of Smeathman, François Huber and Pierre Huber.

Henry Smeathman (1750-1786) was a Danish born traveler, involved in the settlement of freed slaves. He wrote a memoir on the termites he observed in the Guinea coast. The memoir was published in the *Philosophical*

Transactions in 1781 and translated into French in 1786. It remained for a long time the main source of information on such species.

François Huber (1750-1831), born in Geneva, became blind at the age of twenty. Nevertheless, he made numerous observations and experiments on bees with the help of his servant. His book *Nouvelles observations sur les Abeilles*, was first published in 1792. His contribution is considered a turning point in the knowledge of bees; for instance, he discovered how the mating of the queen-bee with the drones occurs ¹⁴.

His son, Jean-Pierre Huber or Pierre Huber (1777-1840), published in 1814 a new issue of his father's work ¹⁵. He also made a similar work for ants. Pierre Huber's book, *Recherches sur les mœurs des Fourmis indigènes* published in 1810 (and translated into English in 1820 under the title *The Natural History of Ants*,) was highly praised by Darwin who considered its author "a better observer even than his celebrated father." Pierre Huber made numerous ethological observations; for instance, he observed the relationships between aphids and ants. His most famous contribution is the discovery of slave-making ants. He narrates this finding in a vivid style: "On June 17, 1804, while walking in the environs of Geneva, between four and five in the evening, I observed close at my feet, traversing the road, a legion of rufescent ants." He goes on describing this "army" attacking the ant-hill of ash-colored ants. "Success crowned their enterprise, and by the newly made breach the remainder of the army entered. Their sojourn was however of short duration, for in three or four minutes they returned by the same apertures which gave them entrance, each bearing off in its mouth a larva or a pupa ¹⁶."

The work of Amédée Lepeletier, count of Saint Fargeau (1770-1845), youngest brother of two revolutionaries, *Histoire naturelle des insectes. Hyménoptera* (1836) is not as famous as those of the two Hubers but deserves a notice, mainly because it contains an attempt to classify Hyménoptera according to their behavior. He gives this heterodox taxonomy a metaphysical justification, arguing that the "Author of Creation" has placed "instinct, like reason, above matter ¹⁷".

All this literature—with a few other texts—was well known by Jules Michelet (1798-1874), the French historian. In co-operation with his wife Athénaïs Mialaret (1824-1899) he wrote four popular books of natural history: *L'Oiseau* 1856, *L'Insecte* in 1857, *La Mer* in 1861, and *La Montagne* in 1868. Some of the scholars who studied the work of Michelet took these naturalist books into account ¹⁸. Despite his prophetic turn, Michelet's *L'Insecte* marked the end of a period.

The first issue, in 1874, of *Les Fourmis de la Suisse*, by August Forel (1848-1931) and the book of Alfred Espinas (1844-1922), *Les sociétés animales*, published in 1877, already belongs to another period, the second half of the nineteenth century and the beginning of the twentieth. To this period

belong the popular books of Maurice Maeterlinck (1862-1949): *La vie des Abeilles* (1901), *La vie des Termites* (1926), *La vie des Fourmis* (1930).

PREVAILING THEMES

One of the most frequent themes is the difference in scale between the world of insects and our own.

Michelet for instance, depicts the beetles wearing their heavy carapace as an armor of the Middle Ages and fancies that it is proportionally as a man bearing the obelisk of Louxor¹⁹. Many authors have shown from a mathematical point of view the fallacy of this kind of comparison. The strength of an animal being as the square of its length while the weight is proportioned to the cube of its length²⁰. But computing cannot refute a dream and the miniature world of insects still appeals strongly to the imagination.

Many authors stress the point of architecture. The huge constructions made by termites in Africa are admired and ants are praised for their flexibility and skill. But the most celebrated constructions are the hive-bees' cells with their geometrical shape. Darwin echoes and epitomizes a century of entomological literature on the subject when he writes:

He must be a dull man who can examine the exquisite structure of a comb, so beautifully adapted to its end, without enthusiastic admiration. We hear from mathematicians that bees have practically solved a recondite problem, and have made their cells of the proper shape to hold the greatest possible amount of honey, with the least possible consumption of precious wax in their construction²¹.

Another recurring theme is the ants reaping. The Bible says "Go to the ant, thou sluggard, consider her ways and be wise: which having no guide, overseer or ruler, provideth her meat in the summer and gathereth her food in the harvest" (Proverb, 6, 6-8). And La Fontaine shows the cicada asking the ant for some corn to live on to the next spring. The authors of the Bible and the Greek source of the fabulist lived in the Mediterranean region where some ants gather provisions. Among the French entomologists the question was controversial. Anyway, everyone agreed that the ants were hard-working creatures.

A more controversial problem is the use of the word "republic" for the hive or the ant colony. It is so widely used that one can take it for a synonym of "society," although the term "society" is also used. Besides, some texts show that the use of the word "republic" is not meaningless. A horticultural writer, Antoine Lacène, in 1822, claims that the hive is a monarchy, not a republic, and that the queen-bee is a real monarch, beloved by her faithful subjects²². Michelet, in 1857, assumes that the ant

is republican, and strongly so, because the ant does not need, contrary to the bee, to worship a Mother Goddess²³.

Anyway, equality is banished from these republics or soft monarchies. The male sex has the meanest share. The drones are just a harem of the queen, and they are slaughtered by the workers at the end of the summer. The males of the ants die shortly after the mating. Many authors are amazed, like Pierre Huber in 1810, to see a world where strength and military valor pertain to the female part of the society while weakness and idleness belong to the male one.

Besides the inversion of gender roles, there is also a strong inequality between the queen and the workers. In ant colonies the largest part of the individuals are deprived of wings and from of the sweet pleasure of love.

However, as Latreille, Pierre Huber and Michelet stress it, all these hard-working virgins take care of the young ones and in this way can enjoy the tenderness of maternity. In fact, these authors say, they are the ones who have the real power; they can even make a new queen.

This harmonious representation of the insect society—which even the slaughter of the drones or the chastity of the workers cannot threaten—is challenged by wars and slave-making.

Michelet observed in his garden a “civil war” between large and small ants, and was horrified by the cruel revenge of the small ones. Anyhow, the greatest moral problem is slavery. In Michelet’s eyes, rearing aphids is fair, like cattle breeding. But the problem is different when ants capture the pupae of another species of ants to take them back to their own nest, where the newborn ants will work for them for their whole lives. This was discovered by Pierre Huber and named by him *slavery*. Though still used in entomological text-books, the word *slave* is questionable as far as the slaves and their masters belong to the same family—the Formicidae—but not to the same species. The slave-makers observed by Pierre Huber are amazon ants (*Polyergus rufescens*) while their so-called slaves belong to another species: ash-colored ants (*Formica rufa*). At least, this phenomenon of social parasitism can be compared to cattle breeding as well as to slavery²⁴. This taxonomical point of view does not occur here, and all authors use the word *slave* without considering it metaphoric. If they agree on the name and the description of the phenomenon, authors differ in their moral judgment. Pierre Huber stresses the fact that slaves have no memories of their motherland and describe them as perfectly happy in their new colony²⁵. Michelet, on the opposite side, is depressed to see nature giving such bad example of injustice and servitude.

What! I turn aside from the history of men in search of innocence; I hope at least to discover among beasts the even-handed justice of nature, the primitive rectitude of the plan of creation. I seek in this people whom I had previously

loved and esteemed for their laboriousness and temperateness, the severe and touching image of republican virtue and I find this indescribable horror ²⁶!

Upset as he is by this treason of nature, Michelet seeks comfort in an evolutionistic interpretation of ant societies. He suggests that slave-maker colonies are monstrous societies, deprived of the working part of the people and where the soldiers are compelled to steal workers, which in turn will manage their new colony in their own way.

THE LESSONS OF NATURE

So, to Michelet's relief, nature, far from legitimating injury reveals it as a degeneration. As Roland Barthes says in his essay on this author, "Michelet does not naturalize morality, he moralizes nature ²⁷."

Can the same thing be said of all the authors in this period? Everybody agrees that social insects are a fascinating part of the display of nature, but authors differ on the meaning of such display.

Even François Huber, the observer of bees, and his son, Pierre Huber, the observer of ants, are not on the same line in this respect. While François Huber cautiously analyzes the anthropomorphism of many of his fellow entomologists ²⁸, Pierre Huber boldly contrasts the imperfection of human society and the supposed perfection of insect societies whose laws come directly from God. And he comes back to the subject of slavery comparing the mild slavery in ant colonies to the *abuse* of slavery in human society ²⁹.

Michelet and his wife also found lessons in the observation of insects, but they did not idealize insect societies, they just learned to respect their life ³⁰.

Despite the enlightened philosophy of François Huber, insects are still seen by some authors as models of virtue. They are also seen—by Michelet, for example—as partners for humankind. The placing of insects and human societies in an evolutionary frame is not yet at stake. A period is coming to an end, and a new one is on the verge of appearing. However, the changing view on this field induced by the Darwinian revolution must not be overrated. When Darwin explains why he wanted to verify the observation of slave-making ants, he excused himself for "doubting the truth of so extraordinary and odious an instinct ³¹." A surprising sentence; one can understand that it is difficult to admit an extraordinary fact, but why is it more difficult to admit an odious one?

Despite the change of paradigm and the shift of political issues, an everlasting characteristic still remains. It was ironically expressed during the French Revolution by Michel de Cubières (1752-1820), a nearly forgotten poet. Among his works there is a poem entitled *Les abeilles ou l'heureux gouvernement*, which means "The bees or the happy government," pub-

lished in 1793. In its preface he compares his own poem with Virgil's (70-19 BC) *Georgics* and to Bernard Mandeville's (1670-1733) *The Fable of the Bees* (1714). He states that Virgil made a "descriptive poem" where he gave advice for bee-keeping; he interprets Mandeville's fable as a criticism to the defects of governments, and presents his own poem as partaking the nature of Virgil's and Mandeville's ones. At last he concludes: "bees were for us like the clouds; each of us saw in them what he wanted to see³²." A conclusion that can be a guideline in the appraisal of any attempt to compare insect with primate societies and especially to human ones. Such skeptical a statement does not mean that we are wrong when we project our political issues on the ant colony or the bee-hive, it just means that we cannot draw moral lessons from such mirrors.

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NOTES

- 1 Darwin, 1859, p. 209.
- 2 Darwin, 1859, p. 209.
- 3 Darwin, 1859, p. 211.
- 4 Darwin, 1859, p. 216.
- 5 Darwin 1991, p. 96, 119, 154, 160.
- 6 Clark, 1997; Jansen, 2001; Sleight, 2001; Sleight, 2002; Lustig, 2004.
- 7 See also Perru, 2003a.
- 8 Perru, 2003b.
- 9 Ratcliff, 1996.
- 10 Prete, 1991.
- 11 Drouin, 1992. Cf. also Drouin, 1987.
- 12 For an anthology, see Lhoste and Casewitz-Weulerse, 1997.
- 13 On Latreille, cf. Dupuis, 1974 and Burkhardt, 1970.
- 14 Cf. Caullery, 1942, pp. 17-20.
- 15 Cf. Buscaglia, 1987, pp. 303-305; Cherrix, 1990.
- 16 Huber 1820, p. 249, quoted in Lubbock 1882, 81-82. The rufescent ants are *Polyergus rufescens*, and the ash-colored ants are *Formica fusca*, cf. John Clark, 1997, p. 66-71.
- 17 Lepeletier de Saint-Fargeau 1836, p. 231.
- 18 Barthes, 1954; Orr, 1977; Kaplan, 1978; Gusdorf, 1985.
- 19 Michelet 1857, p. 133.
- 20 D'Arcy Thompson, 1961, pp. 15-48. We refer to the posthumous and abridged edition by John T. Bonner.
- 21 Darwin, 1859, p. 224. Concerning the geometrical problem of the bee's cells, cf. d'Arcy Thompson, 1961, pp. 107-119.
- 22 Lacène, 1822, p. 25. I have no information concerning this author.
- 23 « La fourmi est franchement, fortement républicaine, n'ayant nul besoin d'un symbole visible et vivant de la Cité [...] L'abeille, au contraire [...] trouve un soutien moral dans le culte de la Mère commune », Michelet, 1857, pp. 357-358.
- 24 For a short but interesting discussion on this point, cf. Hölldobler & Wilson, 1996, p. 144.
- 25 Huber 1810, p. 210.
- 26 « Quoi ! je quitte l'histoire des hommes pour chercher l'innocence ; j'espère trouver tout au moins chez les bêtes la justice de la nature, la primitive rectitude du plan de la création; je cherche chez ce peuple, que jusque là j'aimais et estimais, peuple laborieux, peuple sobre, image sévère et touchante des vertus de la république et j'y trouve cette chose sans nom ! », Michelet, 1857, pp. 259-260, English translation quoted in Kaplan, 1977, p. 87.
- 27 Barthes, 1954, p. 35.
- 28 Huber, 1792, lettre 11.
- 29 Huber, 1810, p. 314.
- 30 Michelet, 1857, p. 359.
- 31 Darwin, 1859, p. 220.
- 32 Dorat-Cubières, 1793, pp. 19-20.

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