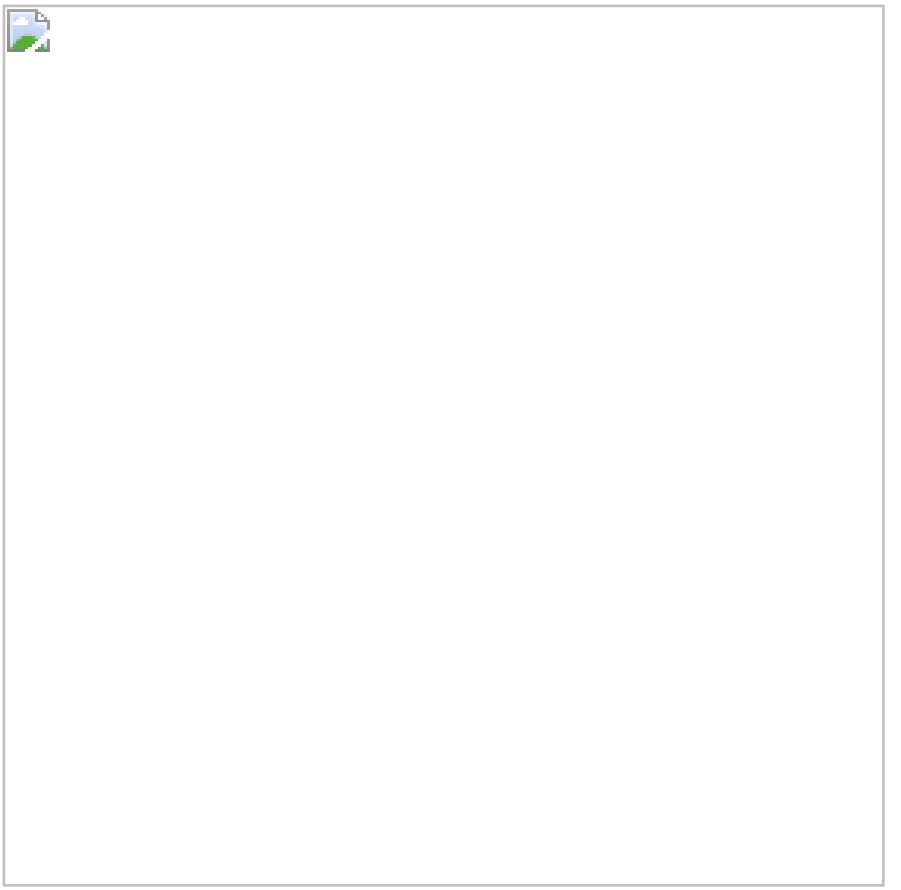

The Superorganisms. The Beauty, Elegance and Strangeness of Insect Societies (Review Translated by Howard Frank)

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HÖLLDOBLER, B, AND WILSON, E. O. 2008. The Superorganisms. The Beauty, Elegance and Strangeness of Insect Societies. W. W. Norton, New York. xxi + 522 pp. ISBN 9780393067040, hardback, $55.

It was Karl von Frisch who wrote: "The life of bees is like a magic well. The more you extract, the more there remains to extract." Thus it is in the magic well of this beautiful book. Eugene Marais, who inspired Materlinck, wrote in Afrikaans 6 years before the Belgian poet a book with a title in the English translation, "The Soul of the White Ant." Maeterlinck talked about the spirit of the hive, of the ant nest, of the termite mound, but I think it was Wheeler who created the concept of the superorganism. Among the approximately 2600 families of insects and diverse other organisms, only 15 contain eusocial species. Superorganisms are defined as being colonies of individuals narrowly focused by an altruistic cooperation, a complex communication, and a division of labor often involving castes. This is a good example of what Richard Dawkins calls the extended phenotype. In social insects, the complex nest structures result from group action and also represent the extended phenotype. Stigmergy, incitement to work, was the concept coined by Grassé en 1959, after Huber, 1810, to explain the construction of termite mounds.

Rowan Hooper said that many of our bodily cells are not ours and are not even human. There are bacteria, fungi, protozoans, and viruses, if one can assimilate virus into cells, because they are inside. A kilogram of bacteria prospers even within our intestine. To him, we are hybrid people-bacteria, which is to say that our bodies are superorganisms, and even the internet is to him an artificial superorganism. Hooper is not nearly a sophist, but to be concrete we talk here about insect societies, especially ants and a few parallel organisms. Apart from ants, Halictidae, Sphecidae, Vespidae, Apidae, termites (Isoptera), thrips (Thysanoptera), Platypodidae, and Aphididae contain the only eusocial insects. And, apart from insects, we can mention as eusocial the genus *Synalphaeus*, (Alphaeidae), crustaceans that live in sponges, and 2 species of mole-rats (Bathyergidae) in which a queen exercises matriarchy. In certain Alphaeidae there are even soldiers and workers, a queen and very likely a single king. The problem is the origin of eusociality. Hölldobler and Wilson are not of the same opinion, differing in the relative importance of parentage in the evolution of this social complex. Wilson, as the sociobiologist, should have written this chapter, but it was Hölldobler who wrote it. Finally, the 2 authors agreed to disagree. The chapter on eusociality is the best compromise they could reach, as Wilson announced that he could live with his friend's text so long as he could refer to his own position. This makes more work on perpectives for future philosophers. The epilog on insect societies is not finished. The network of individuals cooperating in the societies has even suggested new models of ordinators.

The other societies of insects and arachnids, the semisocial or presocial, the pariahs of the system, but all interesting, were the subject of a big book by J. Costa with a preface by Hölldobler and Wilson (The Other Insect Societies, Harvard University Press, 2006), that I reviewed recently. Costa rehabilitated my discovery cycloalexy, an effect of the group, which figures in the content. These groups are sometimes just as complex, but they lack matriarchy and the formation of non-reproductives and soldiers.

The genus *Atta*, among the leaf-cutters, has the most complex division of labor with minors, mediums, majors, and super-majors. Other genera such as *Pheidole* are also well differentiated into workers and soldiers. This system has needed 100 million years of evolution since the mid-Cretaceous. Certain categories of social insects have an impressive memory capacity even compared with human standards. The determination of caste remains an extraordinarily complex phenomenon, genetically, environmentally, and nutritionally. The question is of an adaptive demography. Teamwork is particularly efficacious in *Oecophylla* and *Eciton*. Bee workers die of old age in a few weeks, the life of ants is very short, but certain workers can live several years. The queens have a very long life and Grassé talked of 100 years for certain termite queens, which seems to me a bit exaggerated.

The important chapter 6 is dedicated to communication. It is marvelously documented and illustrated, and the multiplicity and complexity of the systems used by ants is astonishing. It was recently published that in a certain manner and in their own way, ants as well as cicadas keep account of time and can in some way count. Two Russian authors, Reznikova and Ryablko, even suggest that ants are capable of addition and subtraction in the manner of Roman numerals. This transmission of abstract information by antennation is mentioned on p. 256 of the book, although it needs confirmation. On p. 303, Hölldobler and Wilson describe the ritual combats, which they call tourneys, in some species of *Myrmecocystus*, and they compare with those of Papuans in New Guinea, tourneys which can escalate into raids if the forces are not equal. In some Ponerinae, the female cuts the end of the abdomen of the unfortunate male after a minute or two of mating.

Workers of most ants except Ponerinae have a degenerate spermatheca and they cannot mate, and if they oviposit, the eggs are male. Workers of some ants leave the nest when they are at the point of death. Many of them climb to the apex of plant stems and from there disseminate their par-

asites and fungal spores. The leaf-cutters, Attinae, are the most perfected of the superorganisms, having the most perfect communication system, the most elaborate caste, the most sophisticated conditioning of the nest, and a population of millions of individuals. Army ants, which carry out raids, and leaf-stitching ants, *Oecophylla*, also have enormous nests and their structure is equally sophisticated.

We congratulate the authors who have yet again produced a masterpiece, and the publishers who produced this magnificent bound work illustrated by 100 color photographs and 100 in black and white. A glossary ends the book. I would like to make a very small criticism: footnotes have always irritated me, but finally I recognize that this makes consultation easier. Will the authors get a third well-merited Pulitzer Prize for this work?

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