

numbers, as furnishing both more laborers for the construction of the nest and more warriors for defence against common enemies, such as alien ants, birds, monkeys and smaller mammals, and second, the colonies of the two species together are comparable to a single colony in which the polymorphism and therefore the physiological division of labor among the workers is extreme. The tendency to develop such types of polymorphism, which manifests itself in many phylogenetically unrelated ants (*Pheidologeton diversus*, *Solenopsis geminata*, many species of *Pheidole*, *Camponotus*, *Azteca*, *Dorylinae*, etc.) implies an increased range of activities of a worker caste and is tantamount to increasing the efficiency of the colony as a whole. In the case under consideration the combined parabiotic colony may be said to exhibit a greatly increased range of effective worker polymorphism extending from individuals measuring only 2.3 to 2.7 mm., the length of the *Crematogaster parabiatica* workers, to those measuring 4 to 9 mm., the length of *Camponotus femoratus* workers.

A review of the various known cases of typical parabiosis recorded in this paper shows that *Crematogaster parabiatica* exhibits the most pronounced tendency to associate with other ants. It is now known to nest with three different species in different parts of its range: with *Dolichoderus parabiaticus* in Colombia, Panama and Guatemala, with *D. bispinosus* in Brazil and with *Camponotus femoratus* in British Guiana, and in each instance its associate is a larger and more pugnacious species. The same conditions are exhibited by *D. rufescens* and *Odontomachus mayi*. All of these cases may be due both to a small feeble ant seeking out and profiting by the protection of a more powerful species and to the advantages accruing to both associates in forming a single large colony with increased range of worker polymorphism. The fact that in every case the pair of species living in parabiosis belong to different taxonomic subfamilies very probably prevents them from uniting their broods and fusing completely to form a mixed colony.

It is evident that the various species of *Crematogaster*, *Camponotus*, *Azteca* and *Anochetus* together with the numerous epiphytes growing on their nests constitute a peculiar biocoenose, but I fail to see that its evolution or the ethological relations of its animal and plant components have been satisfactorily elucidated by Ule. In his first paper (1901) he advances the following considerations in support of his contention that the seeds of the epiphytes are sown and the plants cared for by the ants:

"1. We are unable to believe that these ant-nests are always established where there happen to be seeds of the plants, and that such numbers of often very different seeds can find their way into the ant-nests through the agency of birds or any other animals, except ants. Then, too, the ant-gardens are often established in places where other epiphytes are never seen.

"2. My contention is supported by the fact that particular species of plants occur nowhere but in the ant-nests.