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Bees. Their Place in the World of Insects

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Bees. Their place in the world of insects.

Are honeybees really tops in the insect world? What other insects feed on nectar? The answer to these and many other questions are given in this report.

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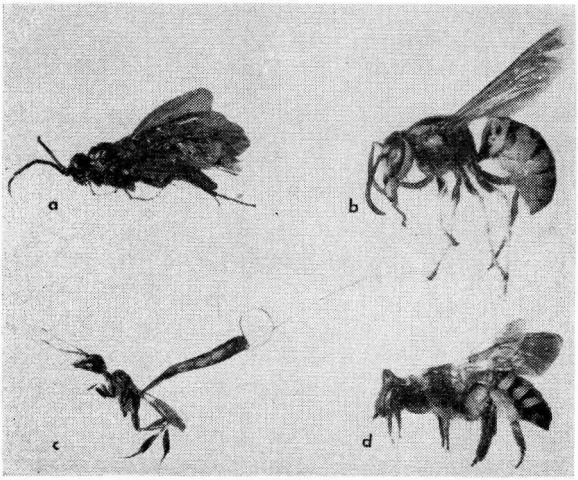
WHAT CHARACTERIZES the order Hymenoptera to which bees belong? The name means "membrane—wing," but that doesn't help much since most insects have membranous wings. Still, what simple name could be devised that would characterize the diverse assemblage of sawflies, parasitic wasps, stinging wasps, ants, and bees that make up the order?

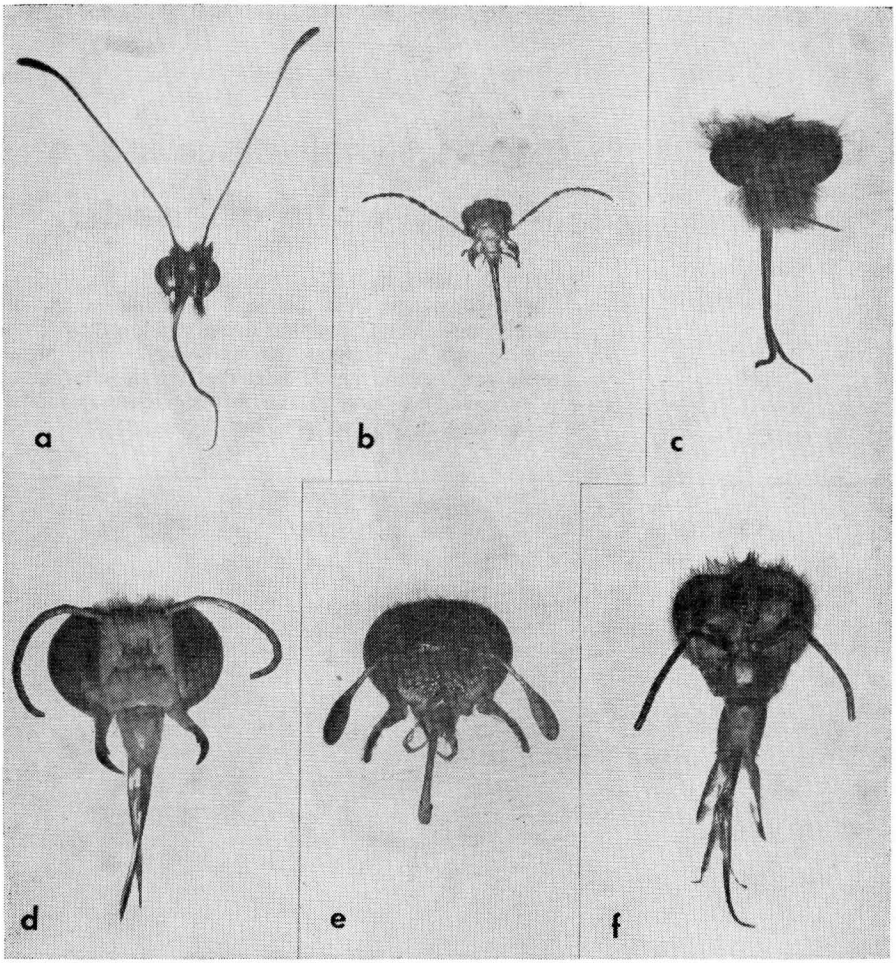


1. (a) Sawfly, (b) aculeate wasp, (c) parasitic wasp, and (d) bee (alkali bee).

There is probably no easily recognizable structure or habit that is unique and at the same time universal. If it were not for the broad-waisted sawflies and horntails, the extremely narrow waist might serve the purpose, especially when you consider that this body division occurs between the first and second abdominal segments. (How many beekeepers realize that the bee's first abdominal segment is plastered onto the thorax?) The sawflies with their mobile larvae also spoil the otherwise universal hymenopteran feature of having stationary larvae that depend on a complete food supply within easy-reaching distance. Certainly in no other order is there as great a contrast between the helpless, degenerate larva and the agile, responsive, and resourceful adult.

Development Through the Ages

The sawflies and their allies are obviously links with now extinct ancestors that probably also gave rise to other orders with complete metamorphosis. They were already in existence in the remote days when conifers were the only seed-bearing plants.



2. Head and mouthparts of (a) butterfly (Ansonia), (b) blister beetle (**Nemognatha**), (c) bee fly (**Bombylius**), (d) bembicid wasp (**Steniolia**), (e) masarid wasp (**Pseudomasaris**), and (f) honeybee.

Sometime near the beginning of the Cretaceous geological period (about 100 million years ago) there was an occurrence of great importance to the evolution of all terrestrial life—the development of flowering plants. The earliest flowering plants were pollinated by insects. Beetles must have been the benefactors since they were about the only flower-loving insects around at the time. By the end of the Cretaceous period most of the modern orders and many of the modern families and even genera of flowering plants were flourishing. Unfortunately, the fossil record on insects of this period is so poor that we can't identify the insects that must have been present to pollinate the early flowers and guide their evolution.

The abundant insect records of the next period (Tertiary, beginning about 60 million years ago) show clearly, by the diversity of moths, butterflies, flies, and narrow-waisted Hymenoptera, that these forms must have originated in the Cretaceous period while the flowering plants were making such great advances. Simple logic tells us this must have been the case, because neither the flowers nor the insects could have developed their many specialized forms alone.

Of what good would be the deeply hidden nectar of the larkspur without the long-tongued bees to utilize it and, incidentally, to pollinate the flowers?

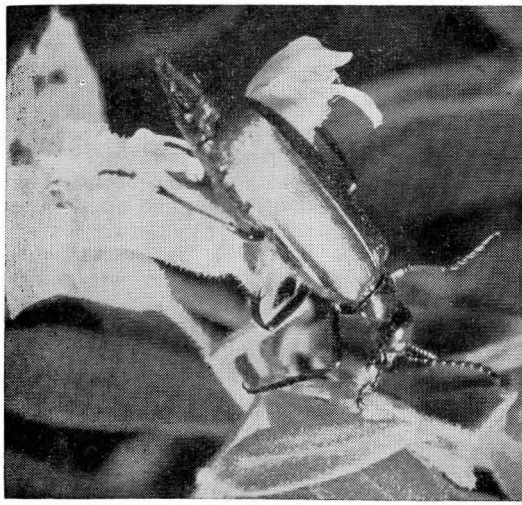
Of what good would be long tongues without deeply hidden nectaries to be tapped?

Ants appeared early on the scene. Their activities are seldom associated with flowers directly, and it seems likely that they arose before the flowering plants. Beautifully preserved specimens

in Baltic amber show that most of the genera in the early Tertiary period were already set in the patterns that exist today. Caste systems were fully developed, and associations with plant lice were already formed. At the same time many bees were present, but they nearly all belonged to primtive genera now extinct.

Insects as Nectar Feeders

The habit of feeding on nectar from flowers is found among less than half of the beetles, about half of the flies, more than half of the Hymenoptera,



3. Blister beetle (Lytta) feeding on blossoms of wild sweet pea.

and nearly all of the butterflies and moths. The degree of specialization for this purpose follows about the same order, although at least a few members of each of these orders are highly specialized for taking nectar from flowers with long, narrow corolla tubes (Fig. 2).

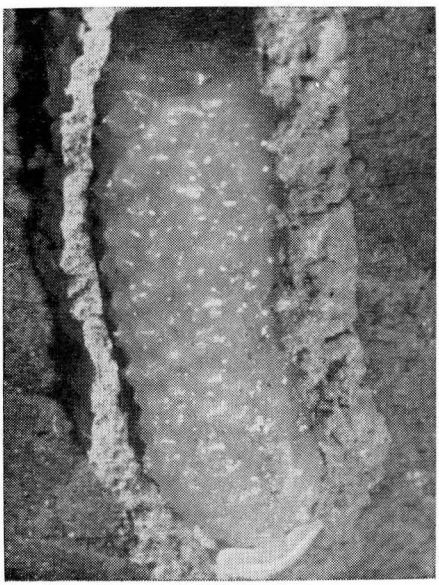
Among the Hymenoptera only a few groups are highly specialized for taking nectar. Most of them simply use their short tongues to lap the exposed or partially hidden droplets of nectar from such flowers as maple, carrot, and sunflower. However, the long tongue is by no means restricted to bees. Certain genera in widely different groups, such as cuckoo wasps, sand wasps, and masarid wasps, have mouth parts as long and specialized as almost any found among bees (Fig. 2).

Although many insects feed on nectar directly from flowers, bees are almost the only ones that store it for future use. However, a few other stinging (aculeate) Hymenoptera, such as honey ants, honey wasps, and masarid wasps, supply their nests with honey made from nectar and honeydew. As many of you may already know, the honey ants store their honey in the bodies of a special caste of ants instead of in cells.

Pollen-feeding insects are somewhat less numerous than nectar feeders. Some of the beetles are well-known pollen feeders, but the trouble with them as pollinators is that they often feed on stamens, pistils, and petals as well (Fig. 3). Most of the Hymenoptera eat small amounts of pollen while they are imbibing nectar from flowers, but outside of the bees, only the masarid wasps store pollen in their nests (Fig. 4). In spite of the similarity in their habits, bees and masarids originated from widely different kinds of insect-storing wasps.

Are Honeybees on Top of the Heap?

We like to think that the honeybee represents the height of industry, fecundity, social development, and insect intelligence. Perhaps we do the lowly ants an injustice. They have had the

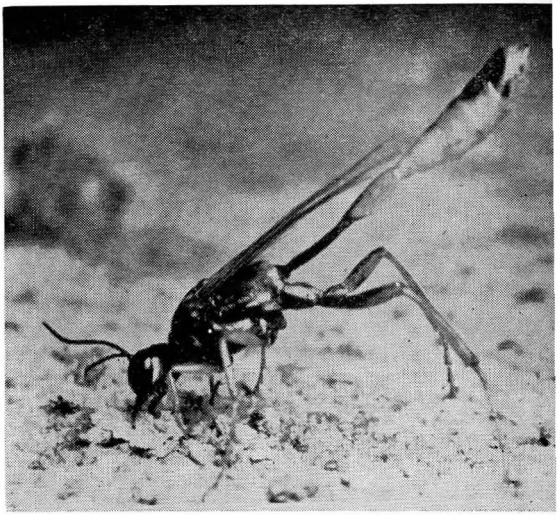


4. Cell of masarid wasp (Pseudomasaris) opened to show the egg, the jelly-like honey and pollen.

social habit much longer than bees, and the many kinds of ants have invaded (and sometimes all but conquered) a much wider variety of habitats. Most species have a greater diversity of specialized forms than the honeybee, and who can doubt their industry?

Some ant colonies far outstrip honeybee colonies in size, and many queen ants are more "queenly" in proportions than the honeybee. In these connections the ants themselves are put to shame by the still more lowly termites, some of which have colonies that number their individuals in the millions.

The queen termite is an egg-laying machine without peer. Some of the more specialized queens turn out 6,000 to 7,000 eggs a day for 15 to 20 years. Queens of one species of African termite were observed to lay eggs at the rate of one every two seconds, or 43,000 a day. Maybe we should be promoting royal jelly produced by termites!



5. A thread-waisted wasp (Sphex) tamping her sealed nest with a clod of earth.

Honeybees outdo the crawling creatures when it comes to flexibility of habits and trackless pathfinding, but some of the solitary wasps also excel in these fields. Furthermore, it is only among certain solitary wasps that inanimate objects are used as tools. The more advanced species of **Sphex** tamp their nests with pebbles or clods (Fig. 5). This places them among a select company of tool users that includes the weaver birds, bower birds, higher apes, and man.

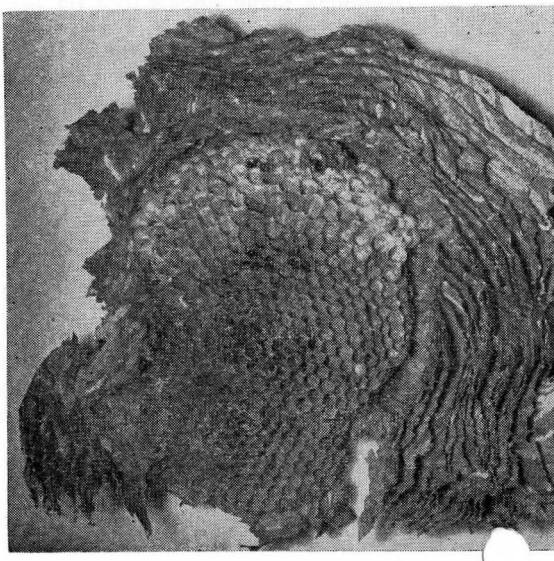
Perhaps the proudest boast of the honeybee is the mathematical precision of her architecture and the orderliness of her housekeeping. Most of the social insects build their quarters according to a rough plan but with a style that is crude and apparently haphazard. Even in this department honeybees are rivaled by the paper-making wasps, whose hexagonal combs resemble those of the honeybee (Fig. 6). Some of the tropical wasps have spiral ramps between combs and specialized storage facilities that would reflect credit on a modern city planner.

The superiority of the honeybee is most evident when we compare it in overall advancement with any other one kind of insect. Termites may excel in fecundity, but they live a life of darkness, extending their aimless galleries into a continuous food supply.

The ants have developed many specialized ways of food gathering and plundering, but their communication depends upon the simplicity of scent trails rather than the complex symbolism of the "language" of the bees.

Some of the paper wasp nests are things of beauty, but they are doomed to annual destruction except in the perpetual summer of the Tropics. Solitary wasps may show great individual ingenuity, but they lack the social organization that enables the honeybee to control its environment.

The conclusion is inescapable: the honeybee is at the pinnacle of the insect world. It is our good fortune that it should also be our greatest ally among the insects.



6. Abandoned nest of a yellow jacket (Vespula) showing hexagonal paper cells.