

ENTOMOLOGY

The Way of the Honeybee

The honeybee lives a short, active life, but she spends an amazing amount of time loafing. Cooperation is complete within the hive, Gloria Ball reports.

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► THE WORKER HONEYBEE begins her life as a janitor and ends it as a dancer. In between, she is all things—nurse, builder, honeymaker, guard and scout.

Throughout the short nine weeks of her lifetime, she works without being told what to do, for within the strange, communal society of the honeybee, there are no overlords, or orders, no coercion and no major decisions without unanimous consent.

There is, however, an irresistible force within the community. It is subtle; no bee can escape it. And it is believed to be the factor that makes every honeybee a selfless toiler for the common good.

The force is a group of chemicals, known as pheromones, secreted by the queen bee. In some way, these chemicals, which are passed from one bee to another by mouth, dictate the behavior and physiological responses of every bee in the community.

Essentially, the workers are drugged into behaving in a prescribed manner.

Thus endowed with a single purpose, the worker graduates from one type of work to another as her body matures. Immediately after she is born she begins cleaning up after her roommates who may number tens of thousands. At the age of three days the nurse glands in the head are nearing maturity and she assumes care of the larvae. About the tenth day the wax glands in the abdomen begin to secrete thin scales of wax and she builds the familiar six-sided cells of the comb.

Worker Graduates

The seventeen-day-old worker is engaged in storing pollen and concentrating nectar. At 20 days the bee stands guard at the hive entrance.

Beginning at three weeks of age and continuing to death, the worker is a forager, responsible for finding and delivering food and water.

Although workers may be concerned primarily with one type of work at any given age, they often perform several different tasks in the course of a 10- or 12-hour working day, particularly while they are still young and working in the hive. A worker whose main duty is nursing, for example, may spend a part of her day cleaning and capping brood cells, and building comb.

Since there are no bosses in beedom, each worker is her own informant and actually spends about 30% of her working time running about the hive, looking for something that needs to be done. When she finds it, she does it, and then looks for something else to do.

Strangely enough, bees spend a good deal of time loafing—some as much as 40% of the working day. This is necessary to a certain extent, for it means that there is always a supply of rested bees to meet any emergency.

Among the most fascinating aspects of honeybee society are the various methods of communication.

More than 20 years ago, Prof. Karl von Frisch of the University of Munich discovered that forager bees, one of which is seen on the cover of this week's SCIENCE NEWS LETTER, inform others of a newly found food source by dancing on the vertical surface of the comb. The pattern of the step tells the direction and distance of the find, and the scent on the dancer identifies the type of flower visited most recently.

Two Major Dances

There are two major dances; the round dance for sources near the hive and the tail-wagging dance for others farther away.

The rule among foragers is that a source with much to offer deserves a lengthy and vivacious dance. A collector delivering nectar of poor quality does not advertise her source and in the presence of a vigorous dancer, she will forsake her own field and fly off to the better source.

More recently, Dr. Martin Lindauer, formerly a student and now a colleague of Prof. von Frisch, reported that occasionally the forager who brings in a poor or watered-down load of nectar is sought eagerly by the hive workers. They assume a begging attitude and shun the bee bearing rich nectar.

Hive Workers Need Water

This switch in preference means only one thing; the hive is getting too hot and the hive workers need water. Already the nurses who first noticed the heat have regurgitated the water in their stomachs and have spread it in a thin film over the heated area. As the water evaporates it carries excess heat away. But the nurses need more water to spread out and to dilute the concentrated honey in their own stomachs, for they cannot feed this rich mixture to the larvae, but must dilute it to about 60% water. Most important of all, however, is the brood nest, which is kept between 94 and 96 degrees Fahrenheit regardless of the outside temperature.

Only the foragers can collect water, for they alone know the terrain and where to find water, which is gathered and delivered a drop at a time. If the need is great, a fact which the foragers judge by the speed with

which the water spreaders relieve them of their load, the foragers do a different dance to alert others to the needs of the hive.

When water needs have been met, the nurses begin to ignore the collectors and these bees themselves must enter the hive, looking for someone to relieve them of their load. While water deliveries must be started quickly, they must be stopped just as quickly, for there is no place to store water in the hive.

A unique experience of a bee colony is swarming. It occurs only once in the lifetime of a normal bee if she is lucky enough to be included in the grand move.

In May or June the spring baby boom begins, and food from abundant flowers rapidly fills up storage space in the hive. Thus swarming is the solution to general overcrowding.

Some 15 to 25 days before the old queen and half the bees actually leave the hive, certain changes occur within. The bees begin to warble.

This means that there is a change in the sounds coming from the hive. Normal bee sounds range from 100 to 600 cycles per second, well within the range of human hearing. But when the hive sounds become limited to a range of 225 to 285 cycles per second and drop 10 decibels from normal daytime intensity, swarming is imminent. Such changes can be detected by electronic means and can be used to predict future swarming.

Bees Look for New Home

During this pre-swarming time, foragers become less interested in food and the older ones begin to poke around in cracks and mouse holes that might make a suitable new home.

When they first leave the hive, the swarming queen and her followers settle temporarily on a limb out in the open. Immediately the scouts begin house hunting in earnest and return to dance out their information.

In house hunting, bees may dance for hours, telling their companions not only of the distance and location of the prospective home, but also of its qualities.

While the swarm hangs on the limb for a few days or as long as two weeks, scouts may bring back reports on 20 different possibilities. Groups in favor of one site try to outdance other factions and a virtual danceathon results.

Eventually, after inspecting a promising site for several days and appraising it under different conditions of wind and weather, bees favoring a particular place may decide that it is not suitable after all. These then shift preference to another site and when everyone agrees, the swarm moves off the limb, into the new home.

Invariably, Dr. Lindauer states, the bees make the right choice.

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