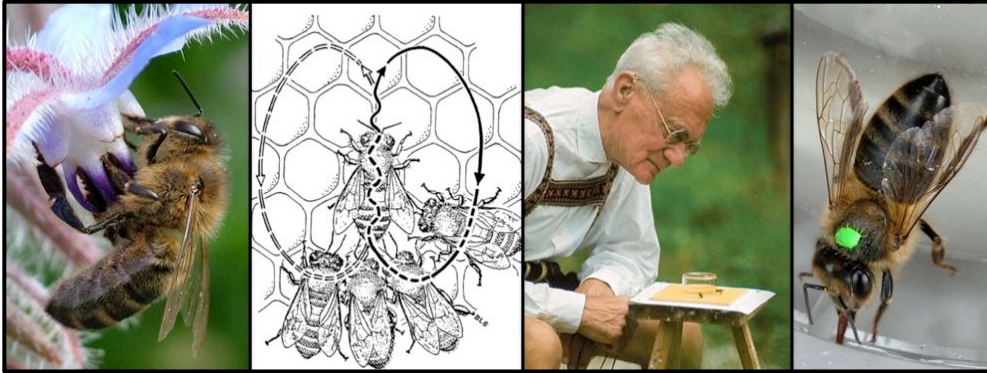


The Honey Bee Dance Language

The 20th century saw many remarkable discoveries in biology. One of the most unexpected was the discovery of the honey bee "dance language" by the Austrian scientist Karl von Frisch (1886-1982). For this he received the 1973 Nobel Prize for Physiology or Medicine. The prize was shared by von Frisch, Konrad Lorenz and Nikolaas Tinbergen, all for their work on animal behaviour.



- Honey bee forager collecting nectar from a borage flower. On returning to the colony it can use the waggle dance to tell its nestmates the location of the flower patch it has just visited.
- A forager bee that has returned to the colony is making a waggle dance (centre). The dance has a figure-of-8 shape. Information is transmitted to a few dance followers (lower).
- Karl von Frisch, dressed in lederhosen, observes worker bees collecting syrup at a feeder.
- A paint-marked worker bee collecting syrup from a feeder.

The honey bee, *Apis mellifera*, is a species of social insect, living in a colony with queen and workers. To coordinate colony activities and to increase efficiency, social insects communicate with their nestmates. The honey bee dance language helps the colony function more efficiently by allowing a forager to communicate the location of the flower patch it was just visiting.

When a forager worker returns to her colony, she may carry out a special behaviour called the waggle dance. She vibrates her abdomen from side to side while walking forward one step. This is known as the waggle run. She then turns in a semicircle and walks back to the starting place to repeat the waggle run, this time returning to the starting place by turning in the opposite direction. The dance is detected by a few nearby dance follower bees. These are unemployed foragers or young bees about to begin their foraging career.

The duration of the waggle run communicates the distance of the flower patch to the dance followers. One second of wagging corresponds to 1km, approximately. The direction of the flowers is given by the angle of the dancing

bee's body. Dancing takes place on the vertical honeycomb. If the bee dances with her body pointing vertically up the comb, this means that the flowers are in the direction of the sun. Vertically down means in the opposite direction to the sun, 75 degrees to the right of vertical means 75 degrees to the right of the sun, and so on. Because the sun's position moves, a bee will adjust the angle of her body if she dances for the same flower patch at different times of day. In the morning, for example, the sun is in the east. A bee dancing for a patch of flowers to the south would make a waggle run to the right of vertical as the flowers are to the right of the sun. In the afternoon the sun would be in the west and the same bee would now make a waggle run to the left of vertical.

Von Frisch studied the waggle dance by training worker bees to syrup feeders at different distances and angles to the hive. He marked foragers with paint dots so that he could recognize them when they returned to their glass-walled observation hive. Many students, colleagues, and his family helped him in his work. He called his discovery the dance language, or *Tanzsprache* in German. Is it a language like English or German? Not really, as it can only communicate one thing—location. Whether or not it is a true language, the waggle dance is the most complex communication signal found in any animal.

Did You Know?

- * Honey bees use the waggle dance to communicate the location of flower patches, but also locations to collect water and tree resin. During swarming, scout bees who have found a suitable nest cavity communicate their locations using waggle dances.
- * Most honey bee foragers find flowers by following dances. But about 10%, known as scouts, locate new patches of flowers without following dances.
- * Although ants do not make waggle dances, many species communicate feeding locations to their nestmates by using pheromone trails or by leading them directly.

How Amazing!

- * The waggle dance is one of the few scientific discoveries to win a Nobel Prize that can be seen with the naked eye. It helps, also, to have an observation hive.
- * The waggle dance also shows that bees have accurate internal clocks. Able, for example, to measure the short duration of a waggle run.
- * Only foragers that have found highly rewarding flower patches dance. For a top quality patch, a forager may make as many as 100 waggle runs.