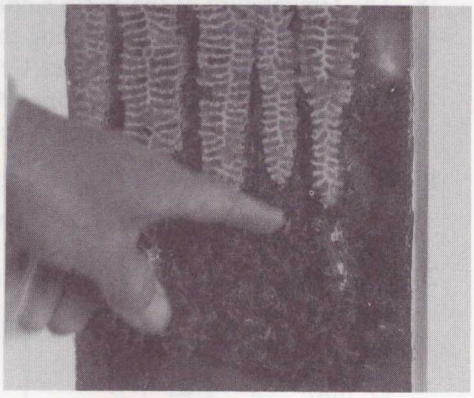
MATHEMATICS AROUND US

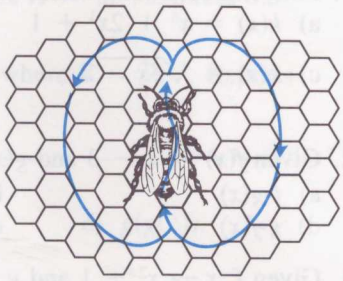
The Waggle Dance of Honeybees

In 1973, Karl von Frisch received a Nobel Prize for his research in animal behaviour. One of his discoveries concerns a method used by honeybees to communicate the location of a food source to other bees inside a hive. Von Frisch observed bees returning to the hive when they had discovered a food source. Shortly after a bee returned, hundreds of bees left the hive, and went directly to the food source, although the bee which had found the food remained inside the hive. Somehow, the bee had informed the others where the food was located.

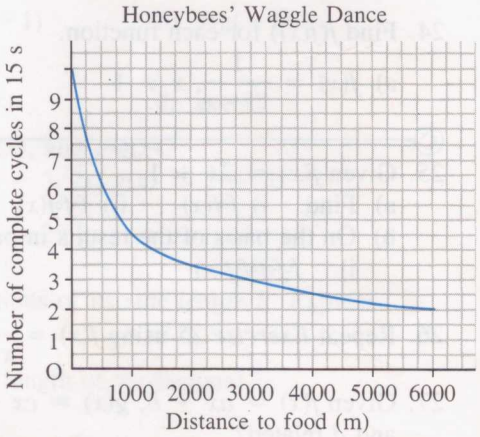


By marking the bees with paint, and using glass-walled hives, von Frisch learned how they do this. The bee which found the food performs a dance on the honeycomb inside the hive. It follows a figure-8 pattern and wags its body in the central part. Von Frisch observed that:

- the orientation of the central portion indicates the direction of the food source,
- the speed of the dance indicates the distance to the food.



Von Frisch made thousands of observations, comparing the speeds of the bees' dances with the distances to the food, and summarized his results on a graph like the one shown.



QUESTIONS

1. If the food is 1 km away, how many complete cycles does the bee make in 15 s? in 1 min?
2. If the bee makes 10 complete cycles in one minute, how far away is the food?
3. How would the graph differ if it were drawn to show the number of complete cycles in one minute instead of 15 s?