Animal communication as language : –

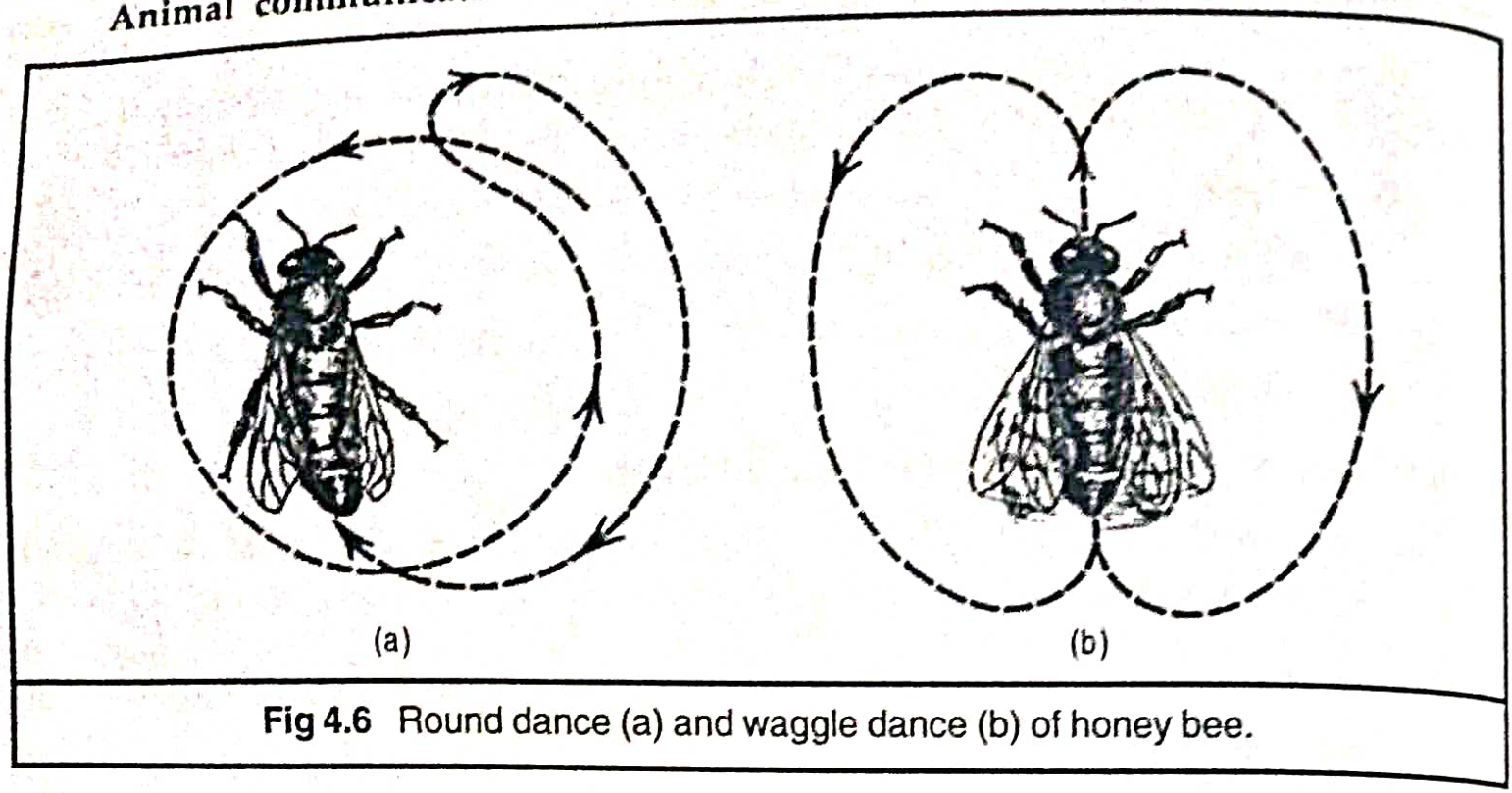

Fig 4.6 Round dance (a) and waggle dance (b) of honey bee.

DANCES OF HONEY BEES

Honeybee has shown a very interesting and highly developed pattern of orientation. Honey bees have an elaborate communication system to signal to the other bees of the hive the location of the food. Honeybees leave the hive and have to go for a distance for nectar quite far from the hive. When they return, other bees gather around and detect the odour (smell) of the nectar source the scout/forager has discovered. The scout performs a **dance** of the wall of the hive (comb) which indicated the distance and often the direction of food (Von Frisch, 1967;Gould 1976).

This dance of bees is of following types :

1. **Round dance.** If food is near the hive (less than 90 metres from hive), a scout bee of the species *Apis mellifera* performs the **round dance.** In a round dance the forager or scout bees turn in circles first to the right and then to the left. Round dance intimates the recruited workers of hive that

the source of food is less than 90 metres from hive but *give no indication of direction.* Round dance facilitates fellow workers to search the correct food source by comparing the two smell (*i.e.*, sample of smell provided by the forager bees and the smell of target flower).

2. **Waggle dance.** When the food source is located farther than 90 meters away, the scout/forager bees performs waggle dance (or tail waggling dance). Waggle dance indicated both *direction* and *distance* of the source discovered by the forager or scout bees and is regarded as language of bee. Waggle dance might be performed on the walls (vertical surface) of the hive or on horizontal surface at the entrance of the hive.

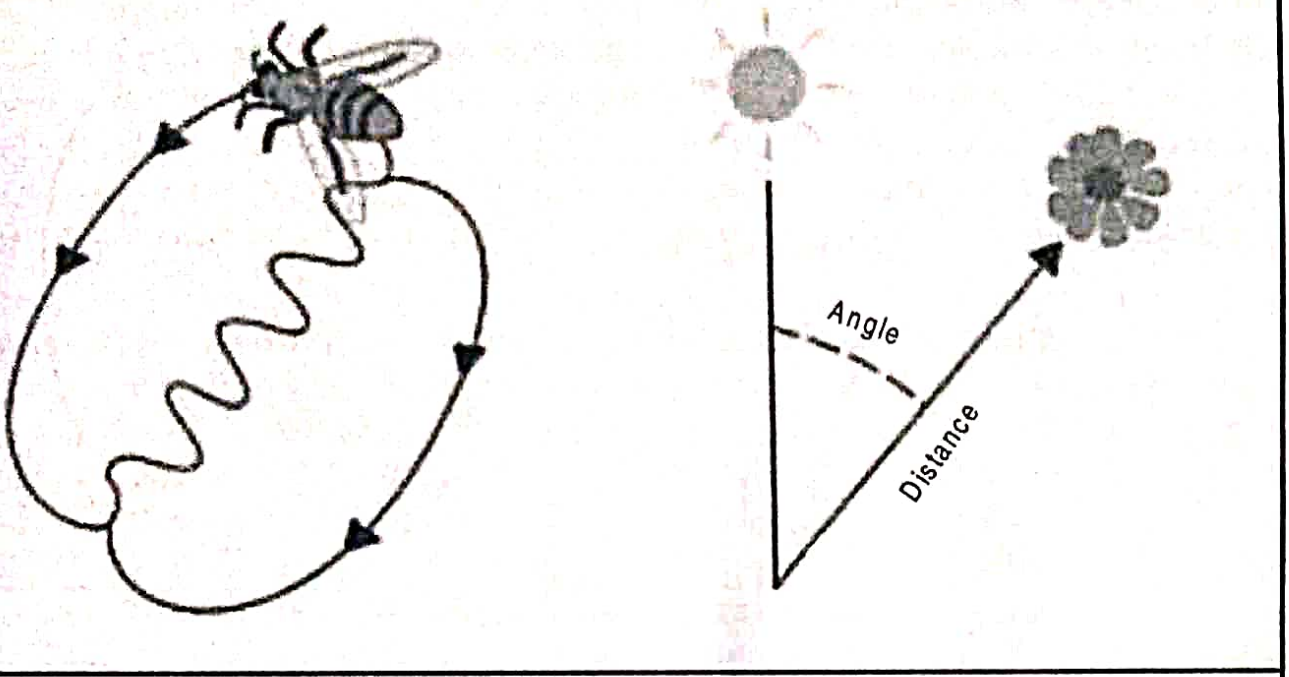

Fig 4.7 Waggle dances of honeybees as they change in relation to the direction of the food sources from the hive relative to the sun.

The waggle dance is shaped in a figure of eight (*i.e.*,8) looping first to left and then to right with waggling of abdomen. Thus, a typical waggle dance consists of a middle or straight run *while the abdomen is waggled vigorously,* then the bee makes a *semicircular turn* and waggles in straight line again. This is followed by another semicircular turn in the opposite direction and another straight waggle run. The dance is repeated many times. Von Frisch noted that the direction of the straight run indicates the direction of food and tempo of the dance signals distance. The foraging bees use the sum as compass and when there are clouds they can tell the location of the sun by the patterns of light (*i.e.* polarized light) in the sky. When the food is towards the sun, the dance will be in tune to keep the middle run of eight *vertically up* the hive. It the food is in the opposite direction of sun, the middle/straight run will go *straight down*; otherwise, the angle of waggle run to the vertical line equals to the angle formed between position of sun and food zone.

Since the waggle dances are generally performed within the darkness of the hive where vision is impossible, the worker bees must follow the dancing pattern of the scout by tactile sensation; they feel her position with their antennae.

The conclusion that the dance displays of bees encode fairly specific information about the distance and direction to good foraging sites was reached by Kari Von Frisch after 20 years of experimental work. By watching the dances of these trained bees in specially constructed **observation hives** he saw that their behaviour changed in highly predictable ways depending on the distance and direction to a food source. More importantly still, his dancing bees were able to direct others to a food source they had found.

Some believed that recruited workers might rely exclusively on the flower odour present on the body of dancing bee as a guide for their search (Olfaction hypothesis of Wenner *et al.*). Some recent evidence too have suggested that bees may use high-frequency sound to communicate sources of food to other workers. However, the findings that a mechanical or robot "bee" can apparently induce recruits to search for food in a particular direction offers evidence in favour of the proposition that workers derive useful information from the dances (**Michelsen** et al. 1989, 1992).

The bee dance has several notable attributes, two of which are features one might otherwise think of as unique to human languages. One is that it is symbolic **language,** since information about distance and direction and encoded in features of the dance in a stylised way. The other point is that the bees are **communicating,** as we often do, about events which are distance in time and space from Where the communication is taking place. In other words, in the darkness of the hive they are telling each other where the food is even though this may be some kilometers away.