GROOMING DANCE AND ASSOCIATED ACTIVITIES OF THE HONEYBEE COLONY

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It is not within the province of this paper to describe the construction of a glass-sided observation hive for a colony of honeybees, but such a structure is highly recommended as a unit of instruction for every high school biology classroom. An established colony of bees may serve as a constant source of interest with a very low cost of installation, if the hive is constructed in a manual training or farm shop course.

Observations of honeybee activities may range all the way from entrance guarding activites to the innermost secrets of colonial life. These include the attention given the royal queen, her own activities in laying the eggs from which the entire ever-changing population of the colony develops, and the activities of the female workers in maintaining cluster temperatures, in carrying for the young, and in storing their food supplies.

Associated with the latter activities are certain well-known phenomena such as the pollen, nectar, and water dances. These dances are now considered to be a means of communication by which the incoming field bees pass on information to their fellow workers that sources of supply of pollen, nectar, and water are available.

In addition to these communication dances, other muscular exhibitions are designed principally for the creation of heat through the release of energy, either to warm the winter cluster to a highest temperature within the cluster of 75° to 85° F., or when brood rearing is in progress, to maintain an optimum temperature of near 93° F. in the brood rearing area. These heat producing activities consist of rapid breathing, vibration of the wings of individual workers for periods of several minutes, and at times a vigorous shaking of the body by individual bees within the cluster. There seems to be no doubt but that this last mentioned activity often has not been clearly differentiated from another hive activity on which we wish to report.

It has long been known by those who watch honeybees in observation hives that grooming or cleansing of the bodies of other bees is a service often rendered by one worker for a sister worker. Only recently, after sitting down to closely observe and possibly to describe this activity in detail, did we observe a more striking phenomenon, which to our knowledge has not been described previously. Much to our amazement, we soon noted that the grooming act is actually in response to a definite invitation by a worker apparently desirous of such attention.

Although a honeybee worker has many adapted structures on its legs for removing and transferring pollen and other materials to and from its various body parts, there seem to be certain areas which it cannot reach to perform its own cleansing operations. In particular, the quite

hairy region immediately caudad of or behind the points of wing attachment and extending back to the constriction between the thorax and abdomen is inaccessible to any leg structures of the individual bee, and thus the bee must depend on its sisters for grooming assistance.

Perhaps we can best describe the activities of the act if we assign some descriptive names to them. Because they are all females, possibly some beauty parlor terms would be more appropriate, but we can think of no better names than "customer" and "barber," respectively, for the "asking dancing bee" and her cooperating sister servant. As we have stated, the dance of the customer at first seems to be not unlike that of a bee that is apparently simply creating heat. In the latter case the individual worker bees may shake their bodies rapidly from side to side without attracting the attention of other workers except that sufficient room is usually allowed to avoid body contact. But the dance of a bee requiring or desiring the services of a barber seems to become more vigorous and is soon accompanied by attempts of her own to cleanse the antennae with the antennae cleaners of the front legs, of combing the hairs of the compound eyes with the pollen combs of the front legs, brushing the more posterior top and sides of the abdomen with the hind legs, but most vigorous of all, brushing the sides of the thorax with the second pair of legs.

It is at this point that the individual bee is somewhat in the predicament of the human with an itching back, particularly when the spot in question is between the points of the shoulder blades. In watching the frantic efforts of the customer bee it soon becomes apparent that she is not so constructed or provided with special leg structures for grooming portions of her own back, that is, the dorsal surface of the thorax and the anterior portion of the abdomen immediately behind the petiole, the narrowed constriction by which the abdomen is joined to the propodeum of the thorax.

The intervals of time required by the invitation dancers seem to vary considerably. In some cases a barber or grooming bee accepts the invitation or job almost immediately, in other cases there seems to be no response at all. We have been unable to determine whether a barbers' strike is in progress in such cases or whether it is just "Wednesday afternoon." In one case, we observed a worker jumping over an intervening bee, somewhat in the manner of a guard bee challenging the entrance of an incoming field bee, in this case apparently distracted by the dancing bee, but the grooming job was not accepted.

At certain times no invitation dances or grooming acts are observable, under which conditions we suspect that other activities and duties are of more immediate importance, as recently when fresh pollen was being brought in and there were numerous pollen dances in progress with the attendant excitement. On the other hand, on one occasion when there was no field activity or brood rearing, as many as a dozen grooming acts were in progress on one side of an individual frame of the observation hive.

If a near-by worker accepts the in-

vitation to grooming, she usually starts to work on the hairs near the constriction between the abdomen and thorax, spends comparatively little time on this region, and then moves forward to the region on the thorax behind the attachment of the wings where the hairs are the most concentrated, spending as long as six and one quarter minutes in one grooming act. The actual work seems to consist of combing the hairs by pulling them through the mandibles, although it is possible that portions of some hairs may be actually broken off in the process. Only the mandibles or chewing mouthparts are involved, the lapping mouthparts remaining folded beneath the head. At intervals during the grooming act, the barber backs up slightly and proceeds to clean her own mandibles, using her front legs in the process.

As soon as the grooming act is started, the customer bee ceases its dancing and thereafter gives complete cooperation by remaining motionless, even tilting the wings at a slight angle. In one instance two barbers were observed working on one customer. When one of the barbers backed up slightly to clean its mandibles, there was a slight confusion in positions and the second barber proceeded to groom the first barber. In this instance, there was no indication of any invitation having been extended. Many instances have been observed of two grooming acts in close contact with each other.

Further study may reveal more details and shed further light on the significance of these acts, but the observations to date indicate another way in which bees communicate with each other and manifest the cooperative spirit for which they have long been noted and praised for human exemplification.