Letters

Honeybee dance language: is it overrated?

Axel Brockmann and Moushumi Sen Sarma

Department of Entomology, Neuroscience Program, Institute for Genomic Biology, University of Illinois at Urbana–Champaign, 505 S. Goodwin Avenue, Urbana, IL 61801, USA

In a recent article in *TREE*, Grüter and Farina [1] point out that in honeybee dance language the communication of spatial (navigational) information is embedded in several additional informational components. As a consequence, followers of dances do not need to perceive or use the spatial information encoded in the dances to show adaptive foraging behavior. However, whether this is sufficient to argue that the spatial information is of inferior functional significance is questionable.

The authors try to show that the dance language is an inefficient communication system but fail to justify their metric of efficiency. To the best of our knowledge, there has not been a rigorous analysis to date of how to assess correctly the efficiency of the dance language or any other symbolic system that communicates spatial information. Citing Seeley [2], the authors calculate the total number of waggle runs danced by all dancers and compare this with the number of recruits that arrived at a feeder. However, a single waggle run is not a recruitment event because the potential followers need to be first alerted and guided to the dance. In addition, as the authors themselves later cite from another study [3], bees need to follow at least five–ten waggle runs to find the indicated food source successfully. Thus, calculation of dance language efficiency needs to take into account not only the number of successful recruits, but also the number of recruitment events and potential followers.

The concept of social and private information introduced by the authors [1] stresses the significance of behavioral plasticity in the responses of dance followers but errs in the assumption that public information is more reliable than is social information. This is not true for honeybees because of the unique character of social communication in their colonies and in eusocial insect societies in general. Foragers do not search for food for their personal needs but for those of the colony [4]. In eusocial systems, social signals and cues, such as dance signals, need to be reliable. There is ample evidence that dance information is continuously updated and reliable under natural conditions and tuned to the availability of floral resources and the needs of the colony [2,3,5,6]. The dancers provide all the information they have to address all possible followers, experienced or inexperienced. Dance information is better understood as a social reference system to which foragers adjust their behavior, rather than as a back-up system for private information.

The fact that followers can be selective about receiving specific signals does not negate the importance of any of the dance signals, which engage different sensory modalities. The relative importance of the different signals depends on the distribution of food sources. When the food is near or is uniformly distributed in the environment, spatial information is less important than are odors and other cues. However, there is evidence that spatial information encoded in the dance is important when food is difficult to find or patchy [7], particularly in the tropics and subtropics where eight out of the nine extant species of honeybees reside [8].

We speculate that communication and reception of abstract information is cognitively demanding and prone to failed transmission. Thus, the presence of other information might be a strategy to increase successful foraging by the dance follower. This additional information might in fact be ancestral and a precondition for the evolution of abstract information communication. This would explain why honeybees share olfactory communication and other back-up cues with other social bees.

In this context, we point out that the nest site selection hypothesis [9] favored by the authors [1] is not the only possible scenario for the evolution of the dance language. An equally probable hypothesis could be proposed that involves foraging behavior. From a mechanistic point of view, encoding of spatial (navigational) information in recruitment runs needs detection of the same or related compass cues used during flight navigation, for example, a free view of the sky (open nests) or a vertical comb, as used by honeybees [10]. Social bees with nest constructions that do not provide the possibility to use these navigational compass systems during recruitment runs were unable to evolve a dance language as communication.

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Corresponding author: Brockmann, A. (abrockma@illinois.edu).

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