Honeybees waggle found to be disturbed by gravity

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Honeybee. Credit: Adam Siegel

(Phys.org) -- One of the really cool things about science is how the mundane can suddenly seem not just interesting, but truly fascinating. One great example of this is the bee hive, specifically the honeybee hive, where it appears that little of interest is going on when viewed as an outsider. But then, some people spend an enormous amount of time studying what goes on in such a hive, and then go on to explain it to others, and then just like that, the mundane, becomes exciting. One such researcher is Dr Margaret Couvillon, who along with her colleagues at the University of Sussex, have found, as they describe in their paper published in *Biology Letters*, that when forager bees return to the hive to report on their findings, by doing a little waggle dance, they tend to do a better job of it when prancing vertically versus horizontally.

To discover this little bit of information regarding honeybees, the team set up hives with glass walls that allowed for viewing inside the hive, and watched them for three years.

Researchers have known for quite some time that the little dance done by forager honeybees is the means by which information about food sources are conveyed to other worker bees, so that they can go out and find it themselves. They've also known that the way such information is conveyed is by waggling in a certain direction, which for the bees, is relative to the sun, which they always assume is straight ahead. Thus, to convey that food is 20° off the sun, the bees will dance at an angle 20° off straight up. And to make sure everyone gets the point, they will do the same dance over and over, like 70 to 100 times. Also, the length of the dance indicates how far away the food source is.

But, the research team found there's more to it than that. Sometimes, if the bees have to perform the dance horizontally, i.e. convey angles such as 90° or 270°, their accuracy doesn't appear to be all that great, thus, repeating it over and over tends to give the onlookers a better idea of what the forager is trying to convey. In essence, they average the demonstrated angles to come up with the true direction of the food source. How they do this, of course, is still a mystery.

The research team thinks that gravity is likely the reason behind why horizontal dances are less accurate, noting that most any creature would have a harder time pointing out directions when trying to dance sideways on a honeycomb. They also note that if the dance grows too sloppy, the onlookers will simply ignore the forager and move away.

More information: Working against gravity: horizontal honeybee waggle runs have greater angular scatter than vertical waggle runs,

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Abstract
The presence of noise in a communication system may be adaptive or may reflect unavoidable constraints. One communication system where these alternatives are debated is the honeybee (Apis mellifera) waggle dance. Successful foragers communicate resource locations to nest-mates by a dance comprising repeated units (waggle runs), which repetitively transmit the same distance and direction vector from the nest. Intra-dance waggle run variation occurs and has been hypothesized as a colony-level adaptation to direct recruits over an area rather than a single location. Alternatively, variation may simply be due to constraints on bees' abilities to orient waggle runs. Here, we ask whether the angle at which the bee dances on vertical comb influences waggle run variation. In particular, we determine whether horizontal dances, where gravity is not aligned with the waggle run orientation, are more variable in their directional component. We analysed 198 dances from foragers visiting natural resources and found support for our prediction. More horizontal dances have greater angular variation than dances performed close to vertical. However, there is no effect of waggle run angle on variation in the duration of waggle runs, which communicates distance. Our results weaken the hypothesis that variation is adaptive and provide novel support for the constraint hypothesis.