# Bumblebee See, Bumblebee Do

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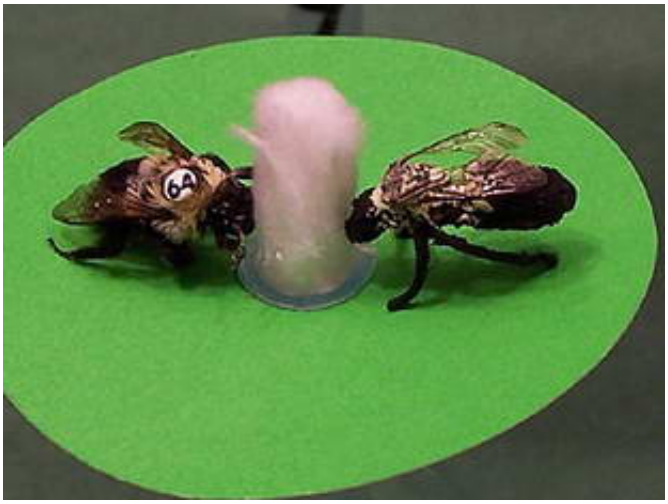


Just as travelers figure out which restaurant is good by the numbers of cars in the parking lot, bumblebees decide which flowers to visit by seeing which ones already have bee visitors. Bumblebees that watched other bees forage on green artificial flowers were twice as likely to choose the green flowers over orange flowers when it was their turn to forage, according to new research.

*A live Bombus impatiens bumblebee (left) feeds at a cotton wick soaked with sugar water that protrudes from an artificial flower. The bumblebee model on the right is positioned to simulate a feeding bee. Photo credit: Brad Worden.*

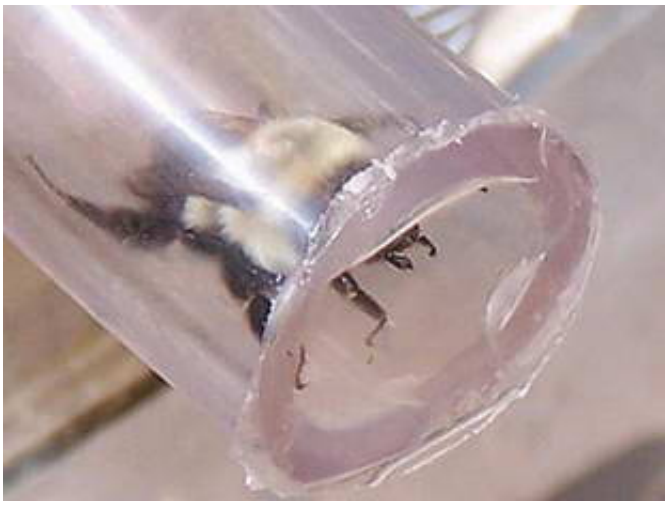
The finding is the first demonstration that insects can learn by just watching the behavior of other insects.

“Studying a variety of different animals -- everything from chimpanzees to bees -- that show some kind of social learning, will give us a better understanding of how social learning occurs," said behavioral ecologist Bradley D. Worden of The University of Arizona in Tucson. “One of the cool things we’re finding out from bees is that complex behavior and advanced forms of learning can come from small brains.”

Worden, a postdoctoral research associate in UA’s department of ecology and evolutionary biology, conducted his work on the brainy bees with Daniel R. Papaj, a UA professor of ecology and evolutionary biology. The team’s report has been released online and will be published in an upcoming issue of Biology Letters of the Royal Society. The National Science Foundation funded the research.

Charles Darwin was one inspiration for the study because he wrote about the possibility that honeybees were watching and learning from bumblebees, Worden said.

While observing bumblebees in the field, Worden, too, got the impression that bees were copying the behavior of other bees.



*A bumblebee inside a plexiglass tube watches through the porthole as other bees feed on artificial flowers. Photo credit: Brad Worden.*

“Honeybees and bumblebees are social creatures – they live in these colonies,” Worden said. “We know that they communicate with one another, at least in the nest, but nobody had really studied whether outside the nest they’re paying attention to what other individuals are doing.”

So Worden and Papaj designed experiments to test whether Darwin’s musings might be true.

They trained Bombus impatiens bumblebees to visit a particular color for food by using artificial flowers -- green or orange paper circles that were 7 cm (about three inches) in diameter. At some of the "flowers" the bees could feed at cotton wicks soaked in sugar water. Without training, bumblebees tended to prefer orange over green. The bees, who can easily see the difference between the two colors, learned to prefer the color that had the sugar water.

The trained bumblebees visited a feeding arena that had three green and

three orange circles. A small plexiglass tube with an observation port was positioned 25 cm (about 10 inches) away. Other bumblebees, one at a time, were allowed to press their faces against the port and watch from three to 12 trained bees feed for 10 minutes. At that distance, an observer bee could tell that there were bees on the flowers, but probably couldn't tell exactly what the bees were doing.

A separate set of observer bees served as controls: they got to watch the feeding arena for 10 minutes with no bees in it.

Then the lights were turned off and, behind the scenes, the feeding bees and their flowers were removed. A new set of three green and three orange artificial flowers was set up in the feeding arena, but the flowers had no food and the location of the particular colors was different from what the bumblebee had observed.

The observer bees were then allowed, one at a time, to visit the artificial flowers. Observers that had watched bumblebees feed on green were twice as likely to visit the green circles. To make sure that odor cues were not somehow influencing the observer bees, Worden made model bumblebees using life-size resin models of bumblebees painted in bee colors and with real bumblebee wings glued on. He then repeated the experiments with a new set of observer bumblebees watching the "behavior" of the models.

When it was their turn to forage, the watchers preferred the color that the model bees were "visiting."

While honeybees do a dance to communicate to hive mates the location of good flowers, bumblebees do not. Worden speculates that watching other bees in the field may be particularly important for bumblebees because they cannot find out from their hive mates exactly where the good flowers are located.

Papaj noted that Darwin's original proposition, that one species of bee may watch and learn from other species of bees, remains to be tested. He added that such "eavesdropping" would greatly expand a colony's sources of information about rewarding flowers.

Worden and Papaj plan to conduct more research to determine when bees copy others and when they learn on their own.

Source: University of Arizona in Tucson