

Bumble bees learn from each other by observation and in-hive communication

Summary: Bumble bees surprise researchers with their apparent ability to teach their sister bees how to tackle a strange new flower resource – in some cases, without even leaving the hive.

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They may have tiny brains, but bumble bees are capable of some remarkable learning feats, according to a new study by CANPOLIN researchers.

PhD student Hamida Mirwan and Dr. Peter Kevan in the School of Environmental Sciences at the University of Guelph made the discovery while investigating the ability of bees to learn from each other – what scientists call social learning.

“Social learning in animals usually involves one individual observing and imitating another, although other kinds of communication can also be involved,” explains Mirwan.



Bumble bees feeding at artificial flowers used in social learning experiment at the University of Guelph

To examine social learning in the bumble bee *Bombus impatiens*, Mirwan built artificial flowers from plastic tubes and discs. The flowers were constructed in such a way that the bees had to walk on the underside of the disc to reach a small hole in the tube where they could access a sugar syrup reward. A group of bees then foraged on the artificial flowers for several days until they eventually became accustomed to feeding at them. Mirwan calls this group the “experienced” bees.

The next step was to see if other bees could learn from the experienced foragers. Mirwan confined a group of unexperienced or “naïve” bees in a mesh container near the artificial flowers and allowed them to observe experienced bees as they foraged. The next day, the naïve bees were allowed to forage on the artificial flowers. It took about 70 seconds for the bees to access the syrup. In contrast, control bees that had not observed other bees foraging on the fake flowers simply could not figure out how to access the syrup. (Control bees were allowed to try for up to 30 minutes, but most gave up before then).

In a second experiment, Mirwan allowed naïve bees to observe dead bees with their heads placed in the access holes. Unlike control bees, these bees were still able to figure out how to access the syrup, although it took, on average, about 15 minutes.

In a final test, Mirwan placed a group of experienced bees in a hive with their naïve sister bees. The naïve bees were not given any opportunity to observe other bees (dead or alive) foraging on the artificial flowers, but they were allowed to interact with their experienced nestmates in the hive. When the naïve bees were then allowed to forage on the artificial flowers, Mirwan and Kevan were surprised to see they were able to access the syrup in just 3.5 minutes. “They took longer than bees that had

observed other live bees in action, but they were much more adept at handling the flowers than bees that had just observed dead individuals,” notes Mirwan.

Behavioural science usually assumes that observation and imitation are at the heart of social learning, but social insects such as bees can also transmit information through touch, vibration and smell. “We can’t quite explain how bees that had never even seen an artificial flower were able to become adept so quickly at foraging on them, but clearly some type of in-hive communication took place,” says Kevan, “It suggests that social learning in bumble bees is even more complex than we first expected.”

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Mirwan, H.B. and P.G. Kevan. 2013. [Social Learning in Bumblebees \(*Bombus impatiens*\): Worker Bumblebees Learn to Manipulate and Forage at Artificial Flowers by Observation and Communication within the Colony.](https://doi.org/10.1155/2013/768108) Psyche DOI:10.1155/2013/768108

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