

Bees can tell time by temperature, research finds

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Bees are known to tell time by light and social cues. Now, postdoctoral scholar in biological sciences Manuel Giannoni-Guzmán and researchers from Brandeis University, University of Puerto Rico Rio Piedras,

University of Pittsburgh and East Tennessee State University have shown that the circadian clocks of bees can be altered by another surprising factor: temperature cycles inside the hive.

The researchers sought to better understand how [bees](#) lived in peripheral areas beyond where light enters the hive. They were surprised to find clear temperature fluctuations across the day throughout the hive, mimicking temperature oscillations caused by daylight.

To understand how important this temperature cycle was to a bee's activity, the researchers put bees in constant and [total darkness](#) while exposing them to the temperature cycles they observed within the colony. Six days later, the scientists shifted the temperature cycle back by six hours. "We saw that the bees shifted their activity with the temperature, meaning their daily routines were responsive to temperature," Giannoni-Guzmán said.

The discovery that bees can tell accurate time from temperature cycles inside the hive shows that on a cloudy day or when bees aren't going outdoors, they have other means to tell time accurately. This will affect the way that researchers understand, interpret and integrate what they know of bee behavior.

More broadly, as more [extreme weather events](#) occur around the world, bees will face challenges to maintaining the activities that keep them and the agriculture they support healthy and vibrant. If part of the southern U.S. is hit with an unexpected snowstorm, bees getting ready to forage might not realize they need to conserve energy and heat the hive. In the event of a 100-degree day, bees will have to expend a lot of energy keeping the colony cool. It is those considerations that will influence colony health or possible [colony](#) collapse, Giannoni-Guzmán said.

"We want to see how important this research is come winter in

Tennessee, when bees aren't leaving the [hive](#) as much," Giannoni-Guzmán said. "We will be interested to see how our findings apply to [temperate regions](#) where there is a greater degree of [temperature](#) variability across the year." This research will also reshape how researchers think about bees' circadian rhythms.

A preprint of article, "The Role of Colony Temperature in the Entrainment of Circadian Rhythms of Honey Bee Foragers," was posted on May 16. The article will be published in the journal *Annals of the Entomological Society of America*.

More information: Manuel A. Giannoni-Guzmán et al, The Role of Colony Temperature in the Entrainment of Circadian Rhythms of Honey Bee Foragers, *Annals of the Entomological Society of America* (2020). [DOI: 10.1101/2020.08.17.254722](https://doi.org/10.1101/2020.08.17.254722)

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