

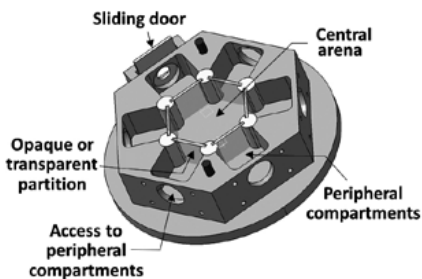
Do flies have their

• SABINE NÖBEL • INSECT TRADITIONS

The idea that culture is uniquely human has been swept away by recent discoveries about many animals, including whales, meerkats, orangutans, and birds. But until now, there has been little empirical evidence that social transmission and copying occur in less cognitively advanced species.

Sabine's lab experiments show that fruitflies (*Drosophila melanogaster*) perform mate-copying, in which females learn sexual preferences from watching others mate. Does this behavior constitute culture?

To answer this, Sabine and her co-researchers at TULIP required a transferable definition. *"The typical criterion of culture is generally that transferred traits must be socially acquired and spread to others repeatedly,"* they write. *"We propose a definition focusing on the properties of social learning."*



The experimental hexagon device is used to test flies for conformity and transmission chains. Females located in the peripheral compartments watch a demonstration in the central arena through a transparent partition.

The researchers set up five rules to test whether mating behavior was socially learned across age classes, memorized for sufficient time to be copied, trait-based, and conformist. Given these demanding criteria, Sabine's team was delighted to see their flies produce a five-star performance.

After watching others mate with green or pink males, female flies preferentially mated with males of the color preferred by the female they had observed. This social learning occurred

whether the observed flies were the same age or 11 days older (i.e. the age of parents). Color-based copying continued even when the pink and green males had another contrasting trait such as curly wings or white eyes.

"Our study shows one major way culture can affect evolution as it changes the selective social context of every individual"



The socially learned sexual preferences were highly durable. After watching five demonstrations spaced by resting intervals, the flies continued to display unusually high mate-copying 24 hours later. Considering the flies' short lifespan, this demonstrates long-term social memory. Using a new hexagon device to test six female observer flies at once, researchers also found that learned behaviors persisted for at least eight transmission steps.

To test for conformist bias, the proportion of demonstrator females in the hexagon was varied. Observer females demonstrated an exaggerated tendency to copy the majority, preferring whichever color was chosen more

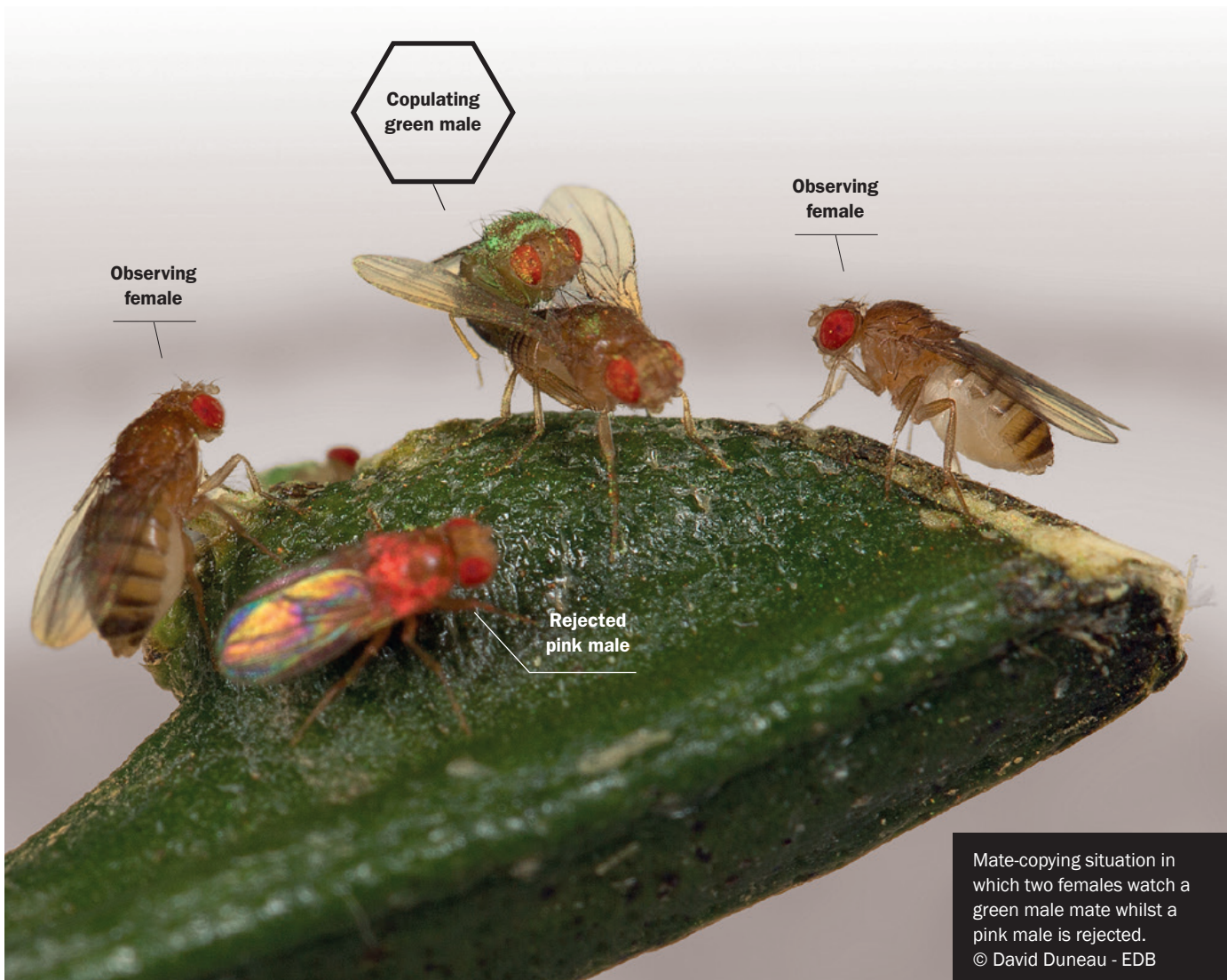
often. This evidence supports existing theory, Sabine explains: *"As soon as even the slightest detectable mating preference emerges within a population, conformist females are favored, as they transmit the most attractive trait to their male descendants while potentially culturally transmitting the preference to their daughters and/or to younger females."*

This snowball effect, in which females must quickly respond to peer pressure and grasp the local tradition before mating, provides an evolutionary explanation for mate-copying. *"More generally, our study shows one major way culture can affect evolution as it changes the selective social context of every individual."*

LORD OF THE FLIES

With a number of papers published on the fruitfly's cognitive mechanisms, Sabine shares an interest with illustrious predecessors. Eight Nobel prizes have been awarded for research using *Drosophila*, which reflects its advantages as a fast-breeding, easy-to-handle lab species. Sabine believes this humble fly has plenty more to offer: *"With its mini yet highly structured brain (100,000 cells) it is one of the most favorable model species to dissect the neuronal processes of learning."*

r own culture?



As the test population had only six observer females in each generation, the odds were relatively high that 50% or more of the trained flies would make a copying “error” by chance. Even in such a small population, local traditions were established. When the scientists built a dynamic model to simulate the large populations common in nature, the probability of copying errors dropped rapidly.

As conformist learning reinforces any initial preference, the model suggests that

cultural traditions in natural populations can last for thousands of generations.

*“Our lab experiments can be seen as a proof that *D. melanogaster* has all the cognitive capacities and dispositions to transmit female mating preferences culturally across generations in ways that can elicit potentially long-lasting traditions. This suggests that the taxonomical range of culture may be much broader than ever before envisioned.”* ■

FIND OUT MORE

Sabine and her colleagues have also demonstrated that *Drosophila* require serotonin and dopamine for mate copying. In research on mosquitofish, she shows that mate-copying depends on female boldness and optimal male size differences. One of Sabine’s key collaborators, CNRS research director Etienne Danchin, will be a plenary speaker at the European Human Behavior and Evolution Association Conference in Toulouse (April 23-26).

See www.iast.fr/people/sabine-noebel