

Vampire bats give a little help to their 'friends'

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The common vampire bat, *Desmodus rotundus*, is a highly social species. In this study, bats maintained "friendship" bonds when their colony was moved from captivity back into a tree with other wild bats. Credit: Sherri and Brock Fenton

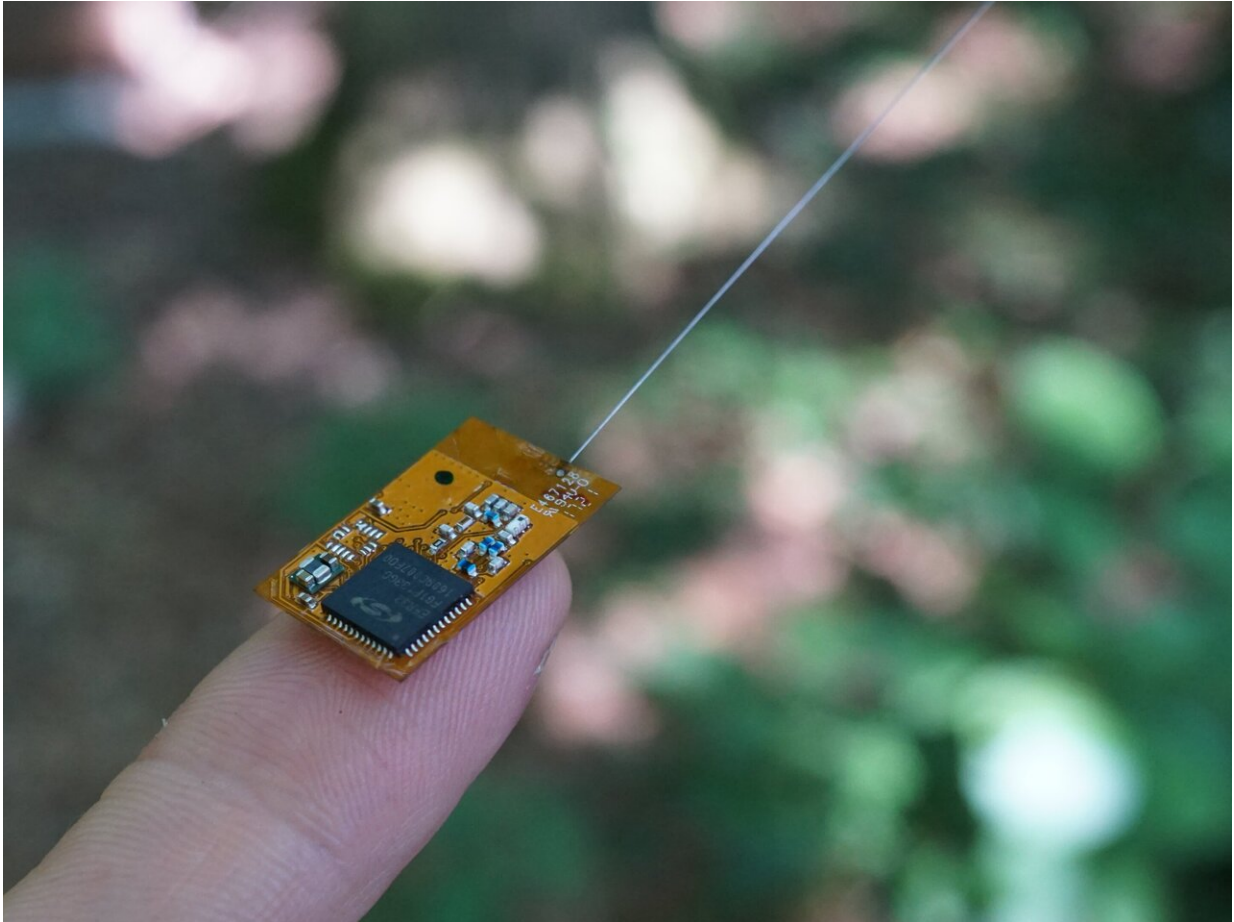
Vampire bats could be said to be sort of like people—not because of their blood-sucking ways, but because they help their neighbors in need even if it's of no obvious benefit to them.

In a new study, scientists documented vampire bats developing social bonds during captivity that they maintained once they returned to the wild—a sign that the relationships weren't borne only of convenience while they lived together in a cage.

The research, enabled by pioneering customized technology, offers a rare peek at wild vampire bats' friendship-like behaviors and new insights into how social structures form. Vampire bat cooperation is rare in that individuals pay a cost to help others: They regurgitate food, their ingested blood meals, to feed non-relatives.

"What's quite common in animal cooperation is doing something where we both benefit simultaneously: Let's live together, let's hunt together. I'm benefiting, you're benefiting," said the study's co-lead author Gerald Carter, assistant professor of evolution, ecology and organismal biology at The Ohio State University.

"Here, there's a kind of risk. If you have a cooperative trait that helps other individuals and costs you, natural selection should wipe that trait out unless the cooperative individual benefits somehow," he said. "With vampire bat food sharing, there must be a benefit. It must be that by helping others I'm also helping myself. We think the bats have long-term reciprocal relationships: You help me because I help you. But it's not yet clear how that works."



A proximity sensor used to tag *desmodus rotundus* bats. Credit: Simon Ripperger

Carter and his colleagues at the Smithsonian Tropical Research Institute (STRI), where he is a research associate, housed female vampire bats and their captive-born offspring in a closed laboratory colony for 22 months, creating conditions that prompted social bonding behaviors of food sharing and grooming. They returned the bats to their natural outdoor home roost, a hollow tree, equipped with sensors that recorded their proximity to each other every two seconds, and placed those same sensors on a control group of wild bats.

Over eight days, the researchers collected enough data from the sensors to show that relationships between the previously captive bats persisted when they returned to the wild. From an evolutionary standpoint, the study suggests that whether bats maintain a relationship can be attributed in part to their shared history.

"It's kind of analogous to being friends in high school. After you graduate, and you're released out of this structured environment, do you continue to stay in touch with those people, or do you lose touch with them? It depends on personality types and the kinds of experiences you shared. That's essentially what we were after with this study," Carter said.

The research is published in the journal *Current Biology*.

The novelty of this work results from a serendipitous meeting in Panama between bat biologists Carter and co-lead author Simon Ripperger, an STRI postdoctoral fellow and now a postdoctoral fellow in Carter's lab.

Carter was observing captive bats in a lab on the edge of a forest, and Ripperger was combing the landscape to locate as many wild bat roosts as he could find to test a new technology for tracking their social networks. In the past, he had relied on older methods such as radio-telemetry, sometimes running after them, tracking their flight path with an antenna in hand.

Ripperger had begun using new electronic sensors to track bat interactions in the wild. He worked for eight years with engineers and computer scientists at the Museum of Natural History in Berlin to develop tiny computers weighing less than a penny that could be attached—like a backpack—to each bat with glue. Adult vampire bats weigh between 1 and 1.5 ounces and their bodies are about 3½ inches in length.

"The major challenge was to miniaturize the sensors in a way that we can fit them on bats. And the other thing we wanted was information on association between bats," Ripperger said. "All the sensors in this network have to talk to each other regularly. Ours will run for a week or two and sample proximity every few seconds."

Carter has been observing captive vampire bats' helping behaviors for years, filming females regurgitate their blood meals to feed fasting bats kept in a separate cage.

"They do this for kin and non-kin. It's pretty rare outside of humans to have behaviors where I'm paying an obvious cost to help you and you're not related to me," Carter said.

In the wild, vampire bats often spend 22-23 hours of every day inside their roost—typically a cave or a hollow tree—leaving just briefly to take a blood meal from an animal. In this study, they traded a cow for a dish of blood, but otherwise did the same things in captivity that they would do in the wild.



A tagged vampire bat in a tree. Credit: Simon Ripperger

To measure and strengthen cooperative relationships among captive female bats in this study, the researchers repeatedly had some individuals go without food to induce social grooming and food sharing. Some, but not all, relationships became stronger over the 22 months the test bats were kept together.

The scientists returned 23 captive bats wearing sensors to their hollow tree and glued sensors to 27 wild female bats living in the same roost, and analyzed associations among all 50 bats for eight days. The data showed that test bats had closer bonds with each other than they did with control bats, and that their bonds to each other were stronger than wild

bats' connections to each other. The findings suggest that even with about 200 potential partners in the roost, the bats that had connected in the lab stuck together in the wild—a sign that they had formed social bonds.

Though vampire bats are very distantly related to primates, Carter said they have a lot of behaviors similar to group-living primates, suggesting that some bats and primates have independently evolved comparable traits to adapt to similar types of social environments.

"This is why vampire bats are an interesting model for cooperation, because you really get the sense they have to navigate cooperative relationships because there's a potential to be cheated—which is the whole crux of the evolution of cooperation," Carter said. "Vampire bats cooperate in some ways that are similar to how humans cooperate or other animals in complex individualized societies."

More information: Ripperger SP, Carter GG, Duda N, et al. Vampire bats that cooperate in the lab maintain their social networks in the wild. *Current Biology* (2019). [DOI: 10.1016/j.cub.2019.10.024](https://doi.org/10.1016/j.cub.2019.10.024)

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