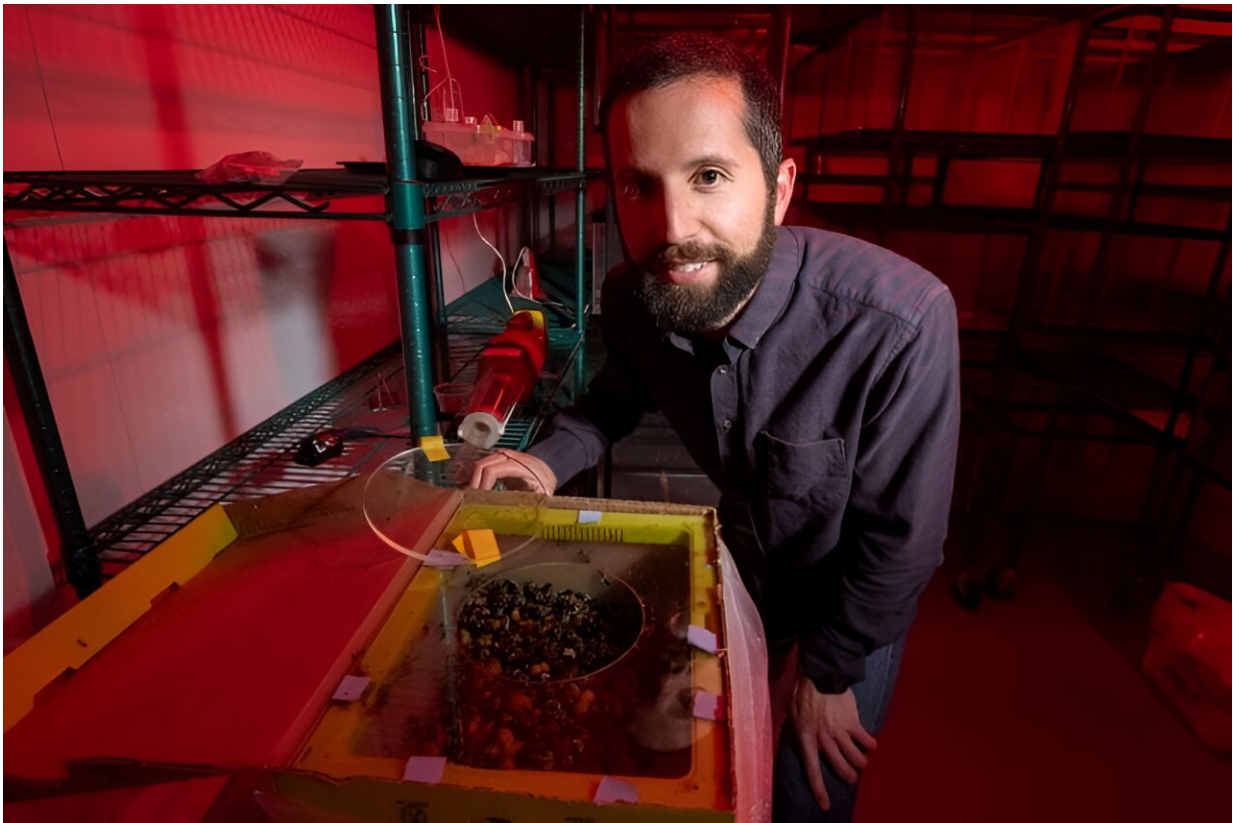


Researcher reveals the secret life of bumble bees

August 31 2023, by Roy Rivenburg



Tobin Hammer, assistant professor of ecology and evolutionary biology, leans over a colony of bumblebees inside a climate-controlled room at UCI. On the shelf by his right arm is a modified hand-held vacuum used to capture escapees. Credit: Steve Zylius / UCI

Bees that build microbreweries, ride a miniature merry-go-round and

possibly even wear diapers: In biologist Tobin Hammer's UCI lab, all sorts of unusual projects unfold.

Equipped with butterfly nets and retooled hand-held vacuums, Hammer and his team corral the insects, track their behavior and study their microbiomes—the bacteria and viruses inside the bees' guts.

The goal is to improve the health of not only wild bees, but also humans, whose microbiomes are somewhat similar, says Hammer, an assistant professor of ecology and [evolutionary biology](#).

Unlike honey bees, which have been extensively researched, [bumble bees](#) and [solitary bees](#) are largely a mystery. "We know very little about most bees," says Hammer, who notes that roughly 70% of the world's 20,000 species live underground and very few make honey.

One type brews a beer-scented liquid from fermented pollen and agave nectar. But the species is elusive, partly because it forages in the dark, usually around dawn. "I spent two months in Costa Rica looking for that bee and never found one," Hammer says. But when several nests turned up near an Arizona ghost town, he and a cadre of scientists swooped in to round up captives and examine their subterranean habitats. In April, they published [a paper](#) on the "bee breweries."

Hammer didn't set out to be an insect scholar.

Growing up near Redding, California, he wanted to study lions in the wild. But in grad school, Hammer got into bugs, hosting "Moth Mania" exhibits in Colorado and displaying hissing cockroaches and metallic green sweat bees at a Texas rodeo. He also analyzed caterpillar innards and co-authored a study showing that feeding antibiotics to cows doubled their output of methane.

At UCI, Hammer explores bumble bee biology with sophisticated DNA sequencing equipment and various odd contraptions. A tiny carousel in which the insects are tethered to a rotating central column is used to measure flight speed and distance. Another device tracks social interactions via QR codes attached to each bee's back.

A tank of carbon dioxide is used to knock out the critters before setting up experiments or transferring them to a climate-controlled chamber that formerly housed snakes. Red lights illuminate the room because the color hampers bumble bee vision, making stings and escapes less likely.

The fuzzy, yellow-and-black creatures come to UCI from companies that raise bugs for farmers, and they're great icebreakers.

"If I tell anyone I work with bees, they're always excited," Hammer says. Sometimes too excited. His office is loaded with bee-themed magnets, mugs, stickers and other gifts. "The biggest problem, though, is all the puns" that people hurl his way, he says.

Hammer's research is full of curious footnotes. As an undergrad at UC San Diego, he trained honey bees to stick out their tongues for a study that revealed they could distinguish between hot and cold foods. Later, as a postdoc at the University of Texas in Austin, he learned that the honey produced by campus bees tasted like Dr. Pepper and bubble gum because the swarms often raided trash cans for nourishment.

Perhaps his quirkiest project, announced last year, is trying to design a bumble bee diaper. If successful, it would enable his team to sample gut microbiomes without having to kill any bees. When Hammer briefly mentioned the idea during a presentation to UCI scientists, "the diaper was all they wanted to talk about afterward," he says.

For now, however, the proposal is mostly fanciful. Even if a prototype is

developed, how would researchers attach it to a bee's bottom? "That's the million-dollar question," Hammer acknowledges. "We need someone who's good at arts and crafts."

A bee laxative may also be essential. "It's really hard to get them to poop," he says. "We've tried feeding them different concentrations of sucrose," but no magic formula has emerged.

As offbeat as such research may sound, there's a serious purpose behind it. Wild bees are imperiled, Hammer says, and some efforts to help are having the opposite effect.

"Everyone wants to 'save the bees,' but that usually means honey bees, which aren't in danger of going extinct," he explains. Moreover, honey [bees](#) compete for food with their outnumbered cousins and can also spread diseases to them, Hammer says.

To protect wild [pollinators](#), he suggests planting more flowers, using fewer pesticides and creating nesting habitats in yards—patches of diggable dirt and homemade or store-bought "bee hotels," the insect equivalent of birdhouses.

Meanwhile, back in the lab, Hammer and his team are working on everything from glow-in-the-dark gut bacteria (for easier microbiome studies) to bumble bee probiotics (for improved insect health). The latter might even boost resistance to pathogens.

There's just one hang-up, Hammer says: "How do you make a bee take a probiotic?"

Provided by University of California, Irvine

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