

# THE BAERS AND THE BEES



## MEET THE BAERS

**Boris Baer**, Professor of Entomology, and **Barbara Baer-Imhoof**, Research Specialist, founded the world-renowned **Center for Integrative Bee Research (CIBER)** to serve as a beekeeping think tank. The center, now based at the University of California, Riverside is one of the largest honey bee health networks in the country, enabling entomologists, engineers, economists, and professional beekeepers to collaborate on innovative solutions for colony collapse.

Bees pollinate more than 80 crops, with a global estimated annual value of \$220 billion. Over the past year, U.S. beekeepers reported losing roughly 45% of their hives, with similar losses reported worldwide. These losses have been happening on this scale for nearly 20 years — the magnitude of the problem is not small.

## POLLINATOR THREATS

Of all the threats to commercial beekeeping that CIBER participants must solve, arguably the most serious is the varroa mite. These mites mainly attack honey bee larvae and pupae, latching on to them and eating their fat bodies. The fat loss weakens the bees, and the mites transmit viruses and bacteria while eating.

As humans began to travel around with managed honey bees, this mite jumped from Asian to European-managed bees, whose immune systems were not prepared for it. The mites then spread around the world, reaching the U.S. in the 1980s. This year, after several unsuccessful tries, the mite established itself in honey bee colonies on one of the last formerly unaffected continents, Australia.

Another more recently established honey bee pest is the small hive beetle, whose larvae burrow and tunnel through combs, consuming broods, pollen, and honey. They also produce a repellent slime, so bees have a hard time removing them from their hives. Honey ferments in the damaged combs, and colonies collapse within weeks.

## IMPACTFUL RESEARCH

One way CIBER scientists are addressing these pests is through breeding and artificial insemination. There is a honey bee found only in Southern California that appears tolerant of mites as well as the region's extreme heat and drought. Genetically, they are the most diverse bees in the world, and unlike the Africanized bees that form part of their ancestry, some of these bees are manageable, not defensive.

Dubbed “survivor bees” for their ability to withstand environmental stresses, they carry mite loads up to five times smaller than other bees. It's not clear whether the survivors repel the mites, or the managed bees are more attractive mite targets. Breeding survivors with other bee populations holds promise for creating managed hives that thrive.

The CIBER team is identifying and isolating volatile substances produced by survivor bee larvae, which keep nearby mites away and warn worker bees about them. Identifying the survivor bee colonies capable of producing the most of these helpful chemicals, and using those colonies in a breeding program, will help mitigate the danger posed by the mites.



Boris and Barbara watch bees feed in a holder with apiary manager Owen Wagner (left) and lab assistant Brenda Garate-Galindo (center) in their lab.

## RESEARCH FOCUS



## IMPACTFUL RESEARCH (CONT.)

The team is also doing a similar thing with survivor bees' resistance to other infectious agents. They've isolated four different substances that kill an intestinal parasite called Nosema, which is a particular problem for hives used in almond pollination. Nosema gives the bees diarrhea and prevents them from keeping their hives clean.

## BREEDING BETTER BEES

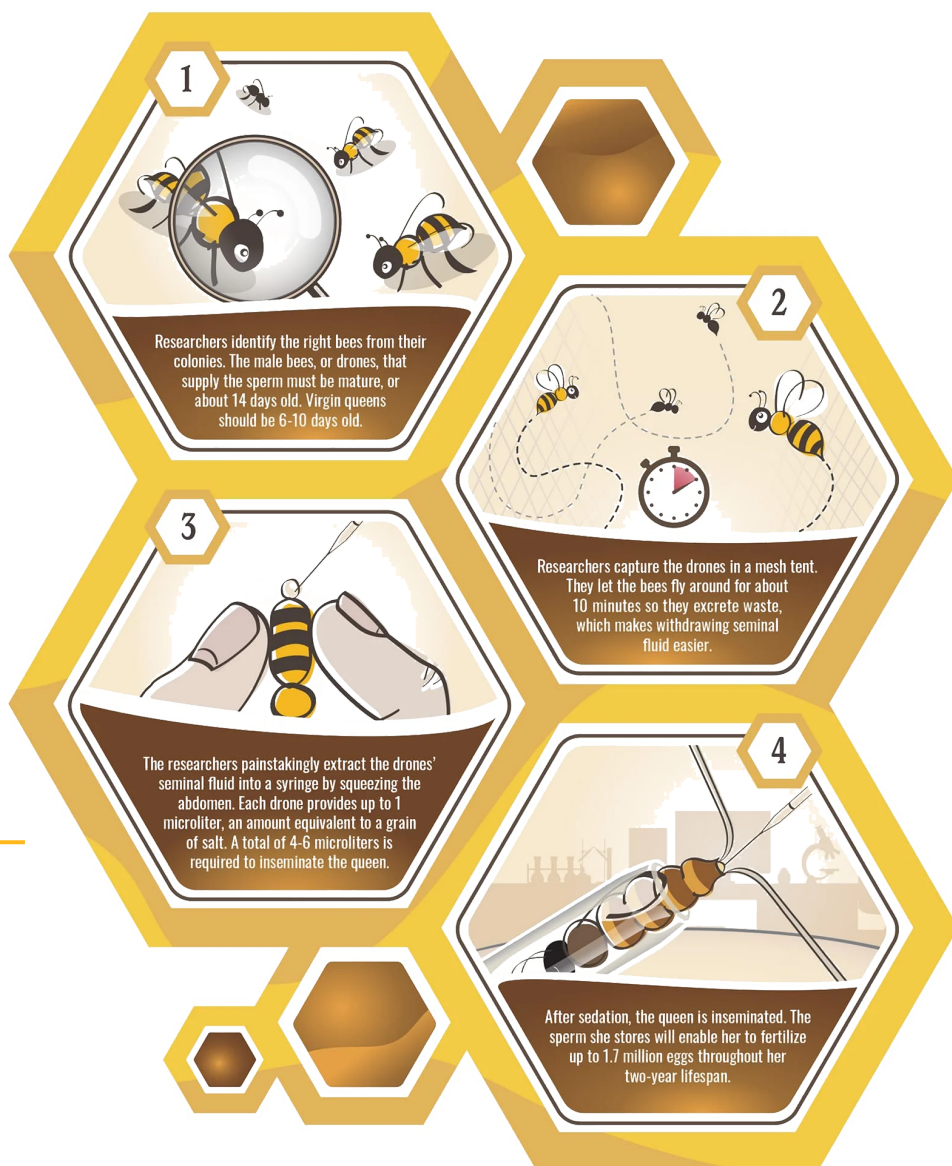
The Baers are at the forefront of an innovation that involves artificially inseminating queen bees with male sperm in a laboratory setting. It leads one to wonder why bees would need help propagating. How long has the phrase "the birds and the bees" been drilled into us, after all? There are several reasons.

Researchers at CIBER are working to create a strain of honey bees that can withstand the Southern California heat. They also want to create bees that are resistant to the Varroa mite and more than 80 other parasites. Finally, they are on a quest to create less aggressive bees, diluting the highly defensive strains that began infiltrating the Southwest U.S. a generation ago.

Take a look at the process (illustration by Rick Donato).

## FUTURE BEES FUND

We need your help to safeguard the future for bees, their pollination services and our food security. The Future Bees Fund relies on donations from the public to finance our work in research, beekeeping and outreach activities. Learn more at <https://ciber.ucr.edu/future-bees>.



## RESEARCH VIDEO LIBRARY

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Boris Baer, Professor of Entomology, and Barbara Baer-Imhoof, Research Specialist at the Center for Integrative Bee Research (CIBER), and the married entomologists fighting to save honey bees - and our future.

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