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Building a better bee

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Every morning at about nine, Ron Hoskins slips into his white beekeepers outfit, pulls trays out from beneath 17 of his 50 buzzing apiaries in a conservation park in Swindon, England, and painstakingly sorts through the contents with a magnifying glass. He goes home at five, and he's often up until 2 a.m. examining his finds under a microscope. "It keeps me going," says the 79-year-old retired heating engineer. Hoskins, who has a "beekeepers do it better" sign in his office, took up apiculture during the Second World War when he was evacuated to a country school. He's done it ever since. His current research started when worldwide bee populations began to collapse in the mid-'90s; since then numbers have fallen by up to 60 per cent in some countries. With a full third of our diet derived from insect-pollinated plants, the decline in bee populations could be devastating to global food security. But, after more than a decade of careful breeding, Hoskins thinks he's got the answer.

He's hopeful because of what's lying in the bottom of his trays: dead varroa mites, tiny parasites that latch onto the necks of bees, feeding on their blood and transmitting diseases in the process. The mites usually destroy any hive they infect and, since they started to spread from Asia in the 1960s, have arguably become the biggest threat to bee populations around the globe. "It's quite scary," says Chris Deaves, an executive with the British Beekeepers Association (BBKA). But Hoskins has managed to naturally make 17 of his 50 colonies mite-resistant, an achievement scientists such as Leonard Foster, a biologist at the University of British Columbia, are calling a major breakthrough. "If the bees are

able to deal with varroa mites to a level where they need no human intervention," Foster says, "they have the potential to reverse the decline in numbers."

Beekeepers have been fighting mites with chemicals, but that harms hives and is often ineffective, especially since varroa are beginning to develop a resistance to pesticides. Hoskins discontinued their use around the time he noticed dead mites starting to pile up underneath some of his hives. He soon realized that those colonies were full of bees with a very advantageous ability: they could tell when varroa were infecting other workers, and they seemed to be helping their neighbours by killing off the mites.

Hoskins monitored the colonies and selectively bred them to spread the genetic advantage. Then, a few years later, he noticed white bits of bee larva on the piles in his trays. At first he thought the hives were infected with a new disease, but the colonies had actually developed an even stronger resistance: instead of just removing varroa from adults, the bees were also destroying larvae once they became infected with mite eggs, making it much harder for the mites to breed. "If we can interrupt that life cycle," he says, "we've really done major damage. We were elated."

Other beekeepers are working to the same end. Rob Currie, an entomologist with the University of Manitoba, has been selectively breeding bees for eight years, and created a strain that can also remove the mites from other adults, while Marla Spivak, an apiculture professor at the University of Minnesota, has just been awarded a $500,000 MacArthur grant for creating her own strain of mite-resistant bee. Researchers with the U.S. Department of Agriculture have made a similar breakthrough, as have German scientists. And bees that keep hives clean by constantly removing corpses—making it more difficult for disease to spread—are being bred at Sussex University in the U.K.

But Currie notes genetic advantages come with a trade-off. "They're putting energy into grooming," he explains, which can lead to a drop in honey production, making the insects less effective pollinators. "If it can't produce honey it doesn't have much usefulness."

Also, because mating is very difficult to control in bees, both Foster and Deaves say there's no guarantee the new traits will be passed on to the general population. Beekeepers in Germany have already tried and failed. But Deaves believes Hoskins has a different method that could work. "His approach is to try and do a small area well, as opposed to spreading it over a large area thinly," he says.

The BBKA has given Hoskins $9,800 to create a batch of small, reusable nucleus hives, which will be sent to other beekeepers to establish new, stronger colonies. Once those colonies take root, the hives will be sent back, starting the routine over. It's a slow process, but Hoskins hopes his work will someday restart the British population of feral bees—now almost non-existent—and eventually help end varroa's stranglehold on bee numbers worldwide. "It will take years," he says, "but this is the turnaround."

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