John Kefuss:
Keeping Bees That Keep Themselves

by M.E.A. McNeil

John Kefuss began experimenting with the possibility of breeding resistant bees before it was known it could be done. He promotes his "Bond Method" of selection as both more healthy and economical than chemical treatment for both bees and their keepers. He now proposes a more gradual approach to weaning an apiary.

A winding dirt road thickly lined with blackberries and oak leads to a French apiary that has been sought out by researchers from around the world. The guest book in the ancient brick honey house reads like a Who's Who in the world of bee scientists, and they came to find John Kefuss, breeder of survivor stock.

Some, bumping up the brambly drive, 24 kilometers north of Toulouse, may well have wondered if they were going to a great deal of trouble to visit a huckster – the 007 Bond Method beekeeper. He is in fact some kind of reverse snake-oil salesman, peddling the rewards of giving up remedies with a side of good humored showmanship.

A kindly bear of a man, Kefuss warmly welcomed visitors one day last fall to his Rucher d'Oc (which means Apiary of the Oc, a region in the South of France). He sat down beneath an enormous oak tree to tell his story, surrounded by the pilgrims -- some Polish and American beekeepers. He dubbed one, Krzysztof Loc who breeds 12,000 queens a year, "The Henry Ford of Polish Queen Insemination." And then he was off into the story of the tree -- planted some 400 years ago to commemorate a visit of King Henry IV of France to the hunting grounds there. The story of the storyteller himself seemed remarkable, too.

Photo: Jerry Draper

John Kefuss, in the red shirt, leans against a 400 year old tree at his apiary, Rucher d'Oc, in Southern France. He is explaining his selection and breeding techniques for resistance to a group of Polish and American beekeepers.

Kefuss is an American who arrived some forty years ago to these lightly wooded rolling hills, which are native to his French wife, Josette. He came by his own circuitous route, a life journey that has somehow repeatedly landed him in the right place at the right time. Looking back from under his oak tree, he says, "Sometimes you have luck. You don't realize until later just how lucky you have been."

He started beekeeping at 11 years old. He worked his way through Ohio State University with a job at the bee lab of the legendary researcher Walter Rothenbuhler, who Kefuss calls "a kind and good person, a very good bee geneticist, a world class scientist." In the lab, Kefuss counted American foulbrood in bee cells. Kefuss saw that some strains of bees were killed by a couple of scales, and some strains tolerated a full comb filled with dried scales. Rothenbuhler told him, "John, you have to test against the actual disease."

When he finished his B.S. in entomology, with a minor in chemistry, he decided to join the Marines. Rothenbuhler, a World War II veteran, turned him instead to a job at the USDA lab in Logan, Utah. There he ran a study on photoperiods in bees under William P. Nye and, at 24, wrote the resulting paper that was published in the Journal of Apicultural Research. He remembers hitchhiking back to Ohio for a family visit with a quarter in his pocket.

Rothenbuhler was known as a systematic, careful researcher, and he admired those characteristics in the work of Frederick Ruttner in Frankfurt, Germany. He convinced his young protégée to enter a doctoral program under Ruttner. Not only did Kefuss speak no German, but he had been pronounced irredeemably language-challenged by his high school French teacher Mme Cory. Whether it says more about him or Mme Cory, he completed a PhD from the J.W. Goethe Universitat in zoology with work in biochemistry.

While he was a graduate student, Kefuss traveled to Apimondia in Maryland in 1967. He counts this story as the best of his good fortune: The first day of the congress he met a young French woman and had Ruttner translate for them both, including, on the last day, his proposal of marriage, which she accepted. "Like choosing queens, you have an idea what's a good queen," he said.

The newly titled Dr. Kefuss moved with his wife to her native Toulouse, where he established a commercial apiary. His education not withstanding, he insists he is not a scientist but a beekeeper (a fine line once you see what he is up to). "If you want to conduct an experiment, bring a scientist. I have the bees." And so it was that he supplied bees to Wolfgang Ritter in Germany and Jacques Ducos de Lahitte in France, who were testing chemical treatments used in hives. From 1983 through 1991, such treatments as Folbex, Apitol, Perizin, Amitraz, Apistan and Bayvarol were evaluated. "We did not work with the chemicals ourselves. But we saw the results." It was a turning point for Kefuss, who concluded that "Using chemicals is caveman beekeeping."

Photo: Jerry Draper

John Kefuss is an American beekeeper who lives with his French wife near Toulouse. At his commercial apiary there, as well as in Chile, he breeds resistant stock. He is glad to share his successful protocol to help beekeepers eliminate chemicals in their hives.

Now it is known that bees can be bred for resistant behavior, so it is hard to imagine that it was at most a guess and a hope only 17 years ago when Kefuss began to experiment with the idea. His respected doctoral mentor, Ruttner, opined that bees could not be bred against mites, saying, "Sheep can't be bred against wolves."

Kefuss saw, though, that in a project by Ritter in Tunisia with farmers too poor to treat their hives, survivor bees resulted. Was it a local effect, or was it genetic? In 1993, at Rucher d'Oc, Kefuss crossed the black Tunisian bees, *A.m. intermissa,* with yellow Starline *A.m. mellifera*, and it seemed that the resistant characteristic was genetic. The aggressive progeny could be selected for gentleness as well. He went to Tunisia, looking for hygienic bees: "I was asked, What will you do if you find none? I said, I'll go to the mosque and pray." He did find resistant bees; both he (in Toulouse) and Ritter (in Freiburg) tested them from 1993 to 2004.

It was a heady time. In 1993, promising Urguayan stock was tested at Toulouse as well as at the Oberursel Bee Research Institute in Germany and the University of Warmia and Mazury in Olsztyn, Poland. At the same time, Kefuss began testing European stock by withdrawing all treatment. "By 1996 we knew we could select for Varroa resistance," he said. In 1999 he stopped all treatment of his hives in France. From 1999 to 2005, Ralph Buchler tested 13 lines of bees from different areas in Europe on the island of Unije in Croatia for resistance to Varroa without treatment. Kefuss' bees from Toulouse were the last to die out. "Ruttner told me that it turns out that sheep can be bred against wolves."

Was Kefuss first? It's not his kind of question. "I don't think about that. Danny Weaver was doing selection tests about the same time, '93. I learned queen rearing with the Weavers in Texas -- Father Binford and Uncle Stanford Weaver. What's important is that you can develop bees through selection."

What sub-family of bees is best? That's not his kind of question either. "I don't know if it is very relevant to list the different races we have worked with (Carniolans, Caucasians, Chinese Italians, K-Stars, from our old Starline lines, *intermissa*). What is important is that all races can be selected for better tolerance to Varroa. What we are trying to do is develop bees with as many different types of alleles as possible because there are many types of resistance."

Perhaps one reason Kefuss eschews being called a scientist is that he is more practical than analytical. "It's not important to know" just *why* a particular strain is surviving (although he is assiduous in recording *how*). "You flew here to Europe and didn't know the mechanics of the plane, but you got here."

The term "Bond Test" was first coined at a meeting of the German Bee Research Institutes at Bremen "to describe our principle of 'Live and let Die' for the testing we had been doing since 1993. You don't do any treatments and wait until the non-resistant lines die out through natural infestations." Kefuss subsequently intensified the process with the Bond Accelerated Test -- "Survive or Die Now" (BAT). "In the BAT test we give frames of brood with large quantities of Varroa (40 per 100 cells) to accelerate the elimination of non-resistant lines. That way instead of taking three to four years we can do the job in about six months. The Bond test is slow but you probably end up selecting for more different types of resistance. The BAT test is fast and probably will not take into account mechanisms of resistance that require a long period for the effects to be observed."

Either way, he has found that most beekeepers see the choice between treating or withdrawing treatment from their apiaries as a catch-22. Kefuss said, "It took me three years to decide to stop because I knew there was a good chance I would loose my shirt, or even more." To convince reluctant beekeepers, he now teaches a more gradual approach, which he calls The Soft Bond Method.

He now keeps his commercial apiaries without treatments and cites 15% loss – the same or less than beekeepers that treat. To answer the skepticism his results have produced, he has announced "The World Varroa Challenge," inviting beekeepers to Rucher d'Oc to count mites in his apiary, offering one euro cent for every mite found.

Photos: John Kefuss

Beekeepers who have taken Kefuss's "World Varroa Challenge" to find mites in his apiary have been beekeepers from (top left, clockwise) Wales, China, France and Morocco.

The assembled beekeepers that fall day followed Kefuss from beneath the old oak to a tour of his bee house, stacked with homemade boxes. He makes or adapts all his own equipment, including frames, queen cells made of German hair curlers, and ice cream boxes used for emerging queens. His hybrid Cloake boards, a blend of Brazilian and New Zealand methods, have a five frame nuc above; he explained that they produce heavier queens, and he finishes no more than 20 at a time.

Then he suited up the group and took off down a dusty side road, trailed by a carload of beekeepers, to an apiary of some 35 hives. There, the foreigners pulled and ogled frames, resorting to opening cells to earn some change – after all, it was high mite season. Amid the placid bees, they soon shed their suits and then their veils. At last, the group came up with a couple of sickly looking pupae and three Varroa mites. Kefuss was having fun. "It's cheaper to have visitors from time to time to try to find mites in my hives," he said with a twinkle. "Don't believe what I say. Look at it for yourself and you will believe your own eyes."

That evening, Kefuss' long time apiarist, Maria Bolt, appeared at the bee house. He clearly respects her skill, introducing her with the story of his lost line of bees, which she was able to replenish, improved, from her own apiary. She brought a feast of French food -- a great coil of saucisson, breads, roasted vegetables and wines. The party was joined by local beekeepers, toasting and talking bees in multiple languages around the table, laughing: "Hey, the mites will become an endangered species," "No kidding, he raises them in Petri dishes," "Ha, I even advertised for them in the French bee journal," "There's a better business -- mites." In a glow of bonhomie, everyone dispersed into the night, headed for Apimondia, the international bee conference, in Montpellier.

If Kefuss found himself often at the right place at the right time in his life, his talk at Apimondia might be added to that list as timely. Like no other presentation at the congress, the lecture hall was crammed to overflowing with people who wanted to hear how to get off chemicals without losing the store. They were, he told them, in for a big surprise.

Kefuss' message, simply put was: Most beekeepers have not assessed the cost of chemical treatments, which have to be repeated every year, in contrast to a breeding protocol. An analysis of the risks and benefits of selection will show that it is not economic to treat. In addition to the up-front cost of gas, labor and chemicals is the cumulative resistance created in pathogens and pests requiring increasingly stronger treatments, the contamination of honey and beeswax, and the negative effect of chemicals on colony fitness.

"Think like a lazy man," he said. The Bond test is "a test that runs all by itself" – the process of natural selection. He illustrated the point with a gag slide of himself and Bolt snoozing in front of the bee house.

Photo: K. Spitzel

"The Bond Test keeps you very busy doing nothing" says John Kefuss, illustrating the point that the best selection is done by nature. In this gag shot, Kefuss and assistant Maria Bolt take an illustrative break in front of one of the centuries-old apiary buildings.

Mites? Good, he says. They are valuable selection tools, not to be eliminated but kept at a level that does not hinder the bees. "If your dog has fleas and I bust into your house, he's not going to worry about his fleas" -- a Kefussian explanation.

Colony loss? A gift. In 2001– 2002, 2/3 of his hives died out in the selection process. "I would have been happy with 10% survival." But most commercial beekeepers, he concedes, could hardly celebrate heavy loss. What's more, selection costs time with skilled labor, and beekeepers have little leisure to work out a plan. Simply put, the Bond and the BAT test involve too much risk. To answer the need for a cross-over program that is simple and cheap, with fewer risks, he presented the Soft Bond Test. It is a way to do the time-intensive testing on a limited number of hives.

As a variable example, he set out a procedure for the selection of up to 20 breeder queens from an apiary of 500: 1) From the initial group of hives, select the 100 best producing colonies. 2) On those, perform 24-hour hygienic tests. (Kefuss carries squares of worker brood cells already frozen to insert immediately as he cuts, saving a trip. 3) Of those, select the most hygienic 40 for Varroa count. Tabulate all adult, daughters and immature Varroa in the cells to give a present and future evaluation. 4) Spread this breeding material by rearing daughters and requeening in all bee yards to produce selected drones. 5) Leave the best 20 of the selected hives without treatment – the Bond test – to produce breeder queens.

Kefuss is sympathetic to the main reason most beekeepers do not follow his path and has come up with "The Soft Bond Method" to reduce the intimidating risk of crossing into a non-chemical protocol.

Graphic courtesy John Kefuss

He calculates the time investment for selecting a breeder queen for disease resistance for this size example: 7.25 hours per queen (50 hours for hygienic testing plus 95 hours for the mite count, which comes to 145 hours divided by 20 queens). In addition, he notes the time per queen to select for, in this case, pollen collection: 3.73 hours. His total is 10.98 hours invested in each breeder queen.

He suggests that beekeepers: graft from the Bond Test queens with the lowest number of Varroa; monitor Varroa levels in colonies not in the Bond Test and stop chemical treatment when infestation is below 5% (the fleas-on-the-dog situation).

This Soft Bond approach has the advantages of limited loss, natural mating, better resistance to brood disease, and a time investment rewarded with less work and money spent on treatments.

Kefuss produces 3,000 mated queens a year in France, which he sells worldwide. His breeder queens sell for 650€ each. His apiary in Chile, Pacific Queens with partner Francisco Rey, has 4,000 hives for pollination, queen rearing and honey production. With opposite seasons, they can provide 6,000 queens to France in February and March. "In 1994 we had European foulbrood, chalkbrood and mean bees. We started to select for hygienic behavior, and in about two years time these problems were eliminated. We've been running the Bond test there for over 10 years."

Time brings change. Kefuss has turned over honey production in the French apiaries to his son Cyril, remarking "It's easier to lift a queen than a deep super of honey." And he deeply misses the camaraderie of his neighbor down the road Steve Tabor, the bee expert who died last year.

But Kefuss is moving into the future. He is in a cooperative project with Danny Weaver, who is doing DNA analysis to identify survivor stock. And he is training beekeepers from around the world in his Bond protocols, spreading the word that bees do not need to be kept with chemicals. Notably, a researcher from China returned home to train 400 beekeepers with a goal of producing chemical-free honey. It is hoped that Kefuss and Bolt will speak and teach two-day workshops in the U.S. in 2010-11: "It would be mainly practical manipulations with a little bit of theory. People would get their hands dirty and be involved."

He considers this work to bear "a certain moral responsibility to future beekeepers to show that it is not only possible but cheaper to keep bees without chemicals." He invites beekeepers to his Varroa Challenge at Rucher d'Oc, where they are welcome to sleep on the hay.

"This is what we do. I hope you take it and improve on it, and we can copy what you do."

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