



The Origins
of the Documentary

MORE THAN
HONEY

By Marcus Imhoof

BEES HAVE NOURISHED my family for more than a hundred years. They were part of my grand father's cannery business, Imhoof & Casserini, in Zofingen, a village in northern Switzerland. The cherries, apricots, raspberries, and gherkins would not have flourished in his vast fruit and berry garden without bees. "One-third of everything that we as humans eat wouldn't exist without them," my grandfather used to say.

He was very fond of me because I was wilder than my cousins. And I loved him for his many animals—horses, dogs, birds, and even a roe deer. When he was on his deathbed, I would draw horses and he would whinny. But he was particularly fond of bees. He had

150 colonies. He built a proper house for them with a sculpted gable and a red tiled roof. When I lay in the grass of his garden I used to hear the buzzing of bees. What I didn't realize then was that I was watching the flowers having sex. "Plants," my grandfather explained, "are anchored to the ground. They can't stroll across the meadows and hug each other and they can't have children without help. What they need is a love messenger—a bee."

It was a familiar and natural setup, rich in tradition, a fruitful synthesis between nature and culture; my grandfather even designed the labels on the cans. But his concept was too romantic; the competition worked more effectively and had fruit delivered by rail. The business suffered, and eventually the estate had to be sold. All that remained for my grandfather were the bees. They still brought him nectar from his lost lands where the apples still grew. The age of the "economic miracle" had arrived; trees were felled on the sunny slopes above the town to make way for sprawling residences. My grandfather despised the residents because despite having all the trimmings of nouveau riche luxury, they dined in the kitchen. He found accommodation in the summer residence of rich relatives, the Villa Eden. The gilt V of "villa" on its gate had long since dropped off and had never been replaced. When we children dared to approach the small bee house in the overgrown garden and listened to the excited buzzing in the summer heat, we found it a magical place, fascinating but also scary. In the midst of all this stood an old man with a straw hat and no protection. The bees didn't harm him; it was as if they knew him.

But even in this idyllic setting, beekeeping relied on a few tricks. It used to annoy me that my grandfather fed the bees a cheap sugar solution as a substitute for honey, rather like giving cheap beads to Native Americans in exchange for gold.

Now, globally, bees are doing really badly; they seem to have reached the ends of their powers. Alarmed by these reports, I, as grandson of a beekeeper, set off on a trip around the world to seek a solution to the mystery. Even the subsequent generation has become involved with the destiny of bees. My daughter and her husband, Boris Baer, work at the University of Western Australia researching genetics and the immune system of bees in the hope of

breaking the vicious circle that is threatening to wipe bees out. The bees don't frighten my two small grandchildren, Andrin and Lucien, who often visit the bee labs looking like mini astronauts in their oversized bee suits. The younger one still takes his cuddly penguin with him beneath his armor—just for safety's sake. He particularly likes the smoker. Both of them often help with marking the newly hatched drones with different colors to signify particular birthdays. It's not that easy to make a tidy dot with a small paintbrush on the backs of drones. Andrin has found an imaginative solution to counter *Varroa destructors*, in his hand-drawn comic strips, the bees wear knights' armor and spikes protect the hives.

A narrative link exists in our family history from my grandfather, who was a beekeeper, via me to my grandchildren. I first got to know about bees as a child and now I talk about them with my grandchildren; they are the future. The movie is dedicated to all grandchildren. A member of the Club of Rome predicted that in twenty to thirty years' time, the young will start a revolution to reclaim the environment. I only hope that we can manage it quicker and in a peaceful fashion.

Initially, the extent to which the personal relationship should be visible in the movie wasn't clear: Can we show it or is it too intimate? In the end we decided yes, we could, because *More Than Honey* shouldn't be just a documentary. The personal relationship gave me more freedom to be subjective.

I never wanted to make documentaries, but in the 1960s, when I was starting out, you could forget making feature films because of the lack of sponsorship. This is why my first movie after graduating from film school was a documentary about the cavalry. It is loosely related to *More Than Honey* in that my grandfather was lucky enough to be assigned to the cavalry, the only chance for a 19-year-old to have something to do with horses. The movie was about whether horses liked being part of the military system as much as those who proudly rode them. The movie was banned but still won a number

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of prizes. Previously, while at film school, I had made a documentary about a prison that was banned because I had blanked out the faces of all the inmates while leaving the faces of the wardens and governor visible. They found that highly offensive and felt compromised. These conflicts strengthened my resolve to change to feature films. In the meantime, film sponsorship had recognized the value of fiction, so I remade the prison documentary as a movie (*Fluchtgefahr, Danger of Escape*, 1976), basing it on the diaries I had written while working incognito as a prison warden in preparation for the documentary. This wasn't so easy to ban, as it was "fiction."

Actors are at the heart of my work. It is almost an erotic pleasure when directing to witness how ideas suddenly become three-dimensional and begin to come to life. An individual playing with reality was one of the topics covered by a movie script about a con man, and my mind had been occupied with thoughts about individualism for years. But in all these egocentric excesses, which well matched the times of the artificially inflated economy, I could find no way of bringing the hero down to earth without destroying him.

The bees' swarm intelligence was a real release for me. As a documentary director, I had to closely watch my leading actors, the bees (and the human protagonists too), only being able to give a few instructions. This made life difficult, but it was an exciting challenge to try something completely new. Close scrutiny, necessary for a documentary, had already been an important aspect of my feature films and I always researched them thoroughly. The dramaturgical experience gained from feature films was a great help for my first full-length documentary. A documentary is still about telling stories that form an entity when linked together. I pinned up cards displaying all the individual scenes in order to find possible sequences, and especially to experiment with turning points. Afterward I made a sketch a meter and a half (almost five feet) long, rather like a kind of musical score, so that I could see at a glance the continuity of the movie.

Work on *More Than Honey* took five years; one year for research and project development, one year to organize the finances, two years' filming on four continents, and one year for editing. Despite my family background in beekeeping,

I still had to familiarize myself with the work. I set off on a trip around the world to get to know everything I needed to know. Using a small video camera, I recorded conversations and kept a diary. Initially I made the film in my head. This was important for the planning as the filming was dependent on dates precisely scheduled by nature and spread across four continents. Particularly in spring, there were many potentially critical overlaps: apple trees begin to blossom in the Shanxi province around the middle of April, then the pollen has to be harvested, but at that time we should be in Arizona because the desert heat is still bearable then. To film the hand-pollination, we would need to be in the Liaoning province around the middle of May, but then we would risk missing the foulbrood inspections in the Bernese Oberland.

I began researching in Australia with my daughter and son-in-law. Through the renowned Centre for Integrative Bee Research (CIBER) I made contact with researchers and beekeepers from other parts of the world. My research trip turned into a relay race as I was passed from one beekeeper to the next. My grandfather and my bee researcher in the family opened doors throughout the world.

In the USA I started with the scientific beekeeper Randy Oliver in California, a practical person who has published various articles based on his work and research and with whom I did a kind of bee apprenticeship. I lived and worked with him for three weeks in Grass Valley in the foothills of the Sierra Nevada. When we set off in his old truck to move the hives we took his mother with us. We dropped her off en route at Lake Tahoe for two days at the casino. The liveried doormen raised their eyebrows as our buzzing truck drew up at the entrance. Randy put me in contact with many other beekeepers, queen bee breeders, bee brokers, and bee dealers—and also with John Miller.

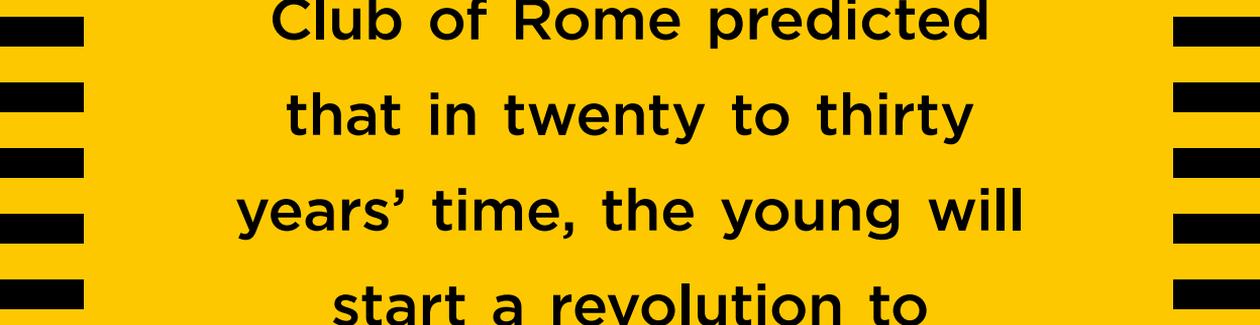
The first thing I saw on John Miller's honey farm was splitting, early in the morning and on an empty stomach. I could almost feel the brutality of this mechanical process; it was like being in a slaughterhouse, the floor covered in dead bees, huge swarms hanging on all the trees trying to escape, and clamor everywhere. If I hadn't had a net in front of my nose I would have been breathing in bees.

Miller had to leave early, and waited for me on a highway bridge with his pickup. He was making a call as I arrived and handed me a sandwich so that I had something to eat while he talked on the phone. Then we sat down in a café and the first thing he said was: “What we’re doing here really is cruelty to animals.”

So even at the onset he was tempting me onto thin ice with his openness, something that also comes across in the movie. He went on to explain that “I even want the bees to be stressed because then they are more likely to accept the new queen.”

His humorous openness and honesty fascinated me; he, with his industrialized conveyor belt beekeeping, is one of the reasons why bees are in such a predicament. But he is also able to analyze and to assess critically, although each time in a typically American fashion he always finds an optimistic solution or an excuse. As a leaving present he gave me a photograph of my grandfather that he had had framed and to which he had added an inscription: “A shared experience.” Through both our beekeeping grandfathers we had almost become friends, even when he asked me whether he had been cast in the role of Satan after having watched the trailer online. He is a Mormon and a marathon runner, and says that he only reads the *Wall Street Journal* and occasionally the *New York Times* to find out what the enemy is thinking. His son used to work for Apple but was lured into joining his business. Miller Honey Farms—California, Idaho, North Dakota is a dynasty. Miller has a brother in Idaho who is also a large-scale beekeeper, but they don’t talk to each other. There is even a book about Miller, *The Beekeeper’s Lament*. And there is a book about his whole family and his grandfather, who developed migratory beekeeping using the railways, *Sweet Journey: Biography of Nephi E. Miller, Father of Migratory Beekeeping*.

Nowadays they transport the bees across the continent in huge trucks and try to stop as little as possible. The entrance holes remain open throughout the journey with nylon nets spread over the cargo to prevent the bees from flying away. When, despite the airflow, it becomes too hot, they stop at a car wash and spray the load with cold water. The logbooks have to be adjusted,



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because legally it wouldn't be possible to travel the 2,700 kilometers (1,678 miles) in two days and a night with all the mandatory breaks.

During the journey we continued to film, changing from one truck to another and driving ahead in the escort car to film impressive landscapes, and at one stage even transferring to a helicopter. Our work was increasing the stress loads of the bees. When Miller rang us late at night to ask about progress he was furious: "You're endangering my bees and my drivers!" He doesn't love just money but also his bees. But he's driven by money, and his bees pay the price.

Prior to filming in the almond plantations, we had secretly hoped that we would be able to film one of the pesticide vehicles, but in the end it was difficult to keep them out of the frame. They were constantly audible, making it difficult to find any sort of peace for interviews and filming because they were simply always out and about. And then suddenly they would drive straight through our set. Miller becomes very angry when the bees are sprayed but here too he can find a way out: "They do what they have to do. It's a pact with the devil." The pollination industry, of course, also has its history, based on how humans selected bees in the first place. Initially we wanted to open the film with honey hunters in Nepal to show the oldest form of confrontation between humans and bees. The hunters abseil, with no protection at all, down cliff faces, poking at the dripping honeycombs until they drop. There are also Spanish cave paintings depicting this procedure. The bees naturally try to defend themselves, and in some cases the hunters get stung in their eyes and become blind.

Humans have learned to minimize such dangers. The first scene in the film, after the birth of the queen, now shows the insects domesticated by humans as farmed animals, an almost mythological act. Instead of an apple, though, Adam picks the bees that create the apple from a tree. The bees were actually the only creatures to have worked in Paradise.

The mountain valley in these clips is one of my favorite landscapes. During the Ice Age, there was a huge glacier here; Bronze Age people lived on its extremities, and you can still find traces of their dwellings on the alpine

meadows. Then someone with a ladder and a box wanders into the picture and proceeds to capture something. Trudging home with his booty, he places it in something resembling a doll's house and latches the little door.

That is the beginning of the cooperation between bees and humans—domestication in the sense of bringing something home. It was the start of a difficult year for Fred Jaggi. Eventually he was forced to gas all his beautiful, pure-bred black bees, the strain of bees that he had cared for since his grandfather's time, which is precisely the reason that they were especially susceptible to diseases—there had been no fresh blood for such a long time. After gassed bees are burned, the empty cases have to be disinfected. Originally we wanted to film this in a nuclear power plant where the Swiss bee institute Schweizerischen Bieneninstitut was holding disinfection trials with gamma rays, but we couldn't get permission to film. Normally disinfection is carried out in the ovens of the nearest bakery, but the bakery was so ugly, a metallic barrack-like building selling enormous amounts of frozen croissants from Poland to tourists from the nearby hotels, that I didn't feel like using it for this scene, particularly as the burning of the beehives was so emotional. The fire burned for three days in the pit that Jaggi had prepared.

Jaggi was very depressed and even unsure about whether to carry on. Then I gave him three colonies, all from Swiss strains. From all his experiences, however, he had become uncertain as to whether the thoroughbred ideal was really such a good idea and so he requested Carniolan queens. He has also switched to a broader gene pool and now has twenty-three healthy colonies, including a number of hybrids.

I discovered the Singer family, who breed Carniolan queens, online. They are very energetic and enterprising, and have an impressive online presence. When I first encountered them, Heidrun Singer was still married to an operetta singer from the Vienna Volksoper and was using her married name of Luftensteiner-Singer. In reality she is married to the *carnica* and the family brand is called Carnica-Singer. As she says, "I'm only here for the bees."

Heidrun Singer is the chairperson of the Austrian apiarists, has already been presented to the federal presidents, and has hives on the roofs of the

Vienna Staatsoper (the state opera), the Burgtheater, and the golden dome of the Vienna Secession.

Once a year she organizes a race between a mountain biker and a bee on a mountain near Mariazell. The bee is marked and starts at the same time as the mountain biker at the top of the mountain. The bee usually wins. At the mountaintop restaurant there is a stuffed bear that Singer's father shot in the former Yugoslavia.

I found it particularly appropriate that the breeding of queen bees was a business enterprise run by women: the elderly mother, Liane Singer; her daughter Heidrun; and, although now only occasionally as she is in school, Liane's younger daughter who is in charge of the royal jelly side of the business. One of Heidrun's brothers is a large-scale beekeeper and the other a pilot, which also seems appropriate. The patriarch of the family is 84-year-old Wolfgang Singer, who was honored for services to agriculture. In earlier days he

was the official bee inspector of the region and now often sits beneath a tree with his field glasses, checking that everything is being done correctly.

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We filmed Heidrun delivering the bees to the post office in the neighboring village to be sent on to customers. But as we tried to film their arrival at the central sorting station in Vienna, where they were to be forwarded to addresses around the world, we were informed that the post office didn't handle

living animals. We were able to prove the opposite by producing the original cases with stamped labels and were then allowed to film.

This demonstrates the absurdity of the bee smuggling story at the Swiss border: Bees can be sent and delivered throughout the world but if they are smuggled across borders they have to be destroyed in the name of disease limitation.

How could I portray a future without bees in the film? Film sequences cannot be filmed in the future, the camera only records the present. Together with director Ulrike Koch, who filmed *The Saltmen of Tibet* and supervised the

casting of extras in Bertolucci's *Little Buddha*, I traveled through four Chinese provinces in the quest for footage of hand-pollination of apple plantations. It was a memorable journey that deserved a movie of its own.

It was not particularly easy to get any precise information in China. Somehow the whole subject seemed to cause some discomfort, especially as foreigners were asking the questions. An official bee representative in Sichuan, who called himself Bee-king in his emails, gave us the best tips in the end.

Of all the people we met, we eventually focused on Zhang Zao from the northern province of Liaoning, because she was a human bee. As there are only five days of apple blossom in the north, there is not enough time to harvest the pollen, process it, and get it to the blossom, so she travels two thousand kilometers (1,243 miles) to the south where the apples blossom a month earlier. She gathers the pollen there and travels back north in time to pollinate the apple blossoms. Her story illustrates the immense efforts and costs that would arise were bees to vanish.

On the freeway to Liaoning we saw people sweeping the road with dustpans and brushes. China has a very different approach to manpower.

Toward the end of filming, Zhang Zao became more and more reticent. She wanted to know why I wanted so many details and why she should betray the trade secrets of the People's Republic of China. She stopped speaking to us and later refused to cooperate at all. Long negotiations deep into the night were unsuccessful. A generous sum to cover expenses swayed her resolve, but finally our offer became seen as further proof that something was not quite right and she demanded to see our official permit. We didn't have one. On the advice of our Chinese production partner we had entered China as tourists. "Tomorrow morning I will go to the authorities and make a report," was her response. This was very dangerous for all of us but especially for our Chinese crew who had made filming possible. The Chinese camera assistant hid the disk with our recordings in his underpants and we made a bolt for it.

But nature had other surprises for us—the "killer bees." Friends teased me at the beginning about whether I wasn't just a bit frightened at the prospect of "killer bees." I laughed at them. For me they were an invention of scriptwriters

to fuel the fears of invasion during the Cold War. At my first Apimondia international bee congress, in Montpellier, I learned that “killer bees” make honey. Professor Gonçalves from the Universidade de São Paulo—where Kerr inadvertently created “killer bees”—gave me the details.

Then I began to search online for people in the southern states of the USA who work with them. I found offers from so-called bee wranglers advertising pest controls with Hard Rock logos or bee-riding rodeo beekeepers. It seems the whole business of pest control is still the realm of “killer bee” B-movies.

Randy Oliver, my scientific beekeeper in Grass Valley, also had a friend in Arizona, Fred Terry. He was the ideal US antithesis to John Miller.

“Killer bees,” or more precisely Africanized honeybees, react very aggressively to black, which is why beekeepers should always choose white facemasks. The trouble was that I couldn’t film Terry’s face through the white veil, so I asked him to wear a black one. Quick movements, dark colors, and wool are the most provocative things of all. This proved to be the case with our microphones’ wind protectors; dark and fleecy, the bees laid into them as if they were bears.

Our first day of filming in Arizona was of the honey harvest. Terry drove his clapped-out old truck through a gate into a pasture and donned his protective gear, although there were no signs of bees. Using twigs and leaves, he then fired up his huge smoker, which was three times as big as the European ones and needed two hands to hold it. That was the job of Fred’s pretty girlfriend, Marie, who could have been Joan Baez’s sister. There followed the command “APF”—always pee first. You dread to think of the alternatives. Then they drove in their suits to the site of the beehives. On getting out of the truck you could already hear that something was different, the tone was much higher and more aggressive than normal flight sounds. When Fred opened the cases things really livened up.

Beekeepers wear long trousers and a long shirt under their suits as bees can sting through outer layers. Every sting relays olfactory information: “Watch out! Danger!” When a bee stings, all the other bees in the vicinity come to help out. I love my kid leather gloves, but here in the desert you wear clumsy, thick rubber gloves. For safety, you can also tape up the cuffs of gloves and the tops of boots.

We thought about cutting a hole for a lens in the cameraman's facemask, but this proved to be too much of an inconvenience and somewhat dangerous, so we decided against it. When the cameraman tried to look through the lens—it was impossible to view the monitor in the bright light—the viewfinder pressed the net to his nose and he promptly got five stings on the nose that became horribly swollen. We then tried to find a mask with an elongated nose, rather like a harlequin mask, so that the net no longer touched his nose. This was not an easy task in Tucson.

When we drove off after gathering the honey, we were followed by an angry cloud of bees for 1.5 kilometers (almost one mile), which is why it probably wasn't such a bad idea to have the beehives locked in an enclosure far away from civilization. And just when you take off your hood in front of a Mexican bar and are looking forward to a meal, a bee creeps out of a fold in your clothing and stings you. Fortunately, bees somehow seem to be in our family blood. My team was always somewhat jealous that when I was stung it didn't swell; they said that I had inherited resistance and that we should make a serum from my blood for people with allergies.

We would really have liked to film bears hunting honey but our budget wouldn't allow it. However, we at least wanted to film the upturned, empty hives after a bear raid—just the sort of scenes that you would imagine if you weren't a documentary maker. I secretly wanted the “killer bees,” which Fred Terry had retrieved from a roof and rehoused at the beginning of the scene, to return to the wild in the end, a kind of reversal of the opening of the film with Jaggi and the bees that he domesticated. Then, as if they had read the script, the bees simply vanished all on their own. Fred Terry was astonished.

All that remained for us was to film the cactus scene, where the bee swarm had settled before they moved on to a cliff face in a canyon and freedom. The bees played along brilliantly.

Working with bees as a director was new to me, but it fulfilled an old dream. Originally I wanted to take German studies and zoology at university, but this combination was not considered an option by the university as the main lectures for both subjects ran concurrently between eleven and twelve o'clock. And then my daughter, Barbara, took over this part of my life. Even

as a child she was always bringing creatures home, so it seemed logical that she would become either a vet or a biologist. While working on her doctoral thesis on intestinal parasites of bumblebees at the ETH Zurich, she met Boris Baer, who was writing his thesis on the genetic advantages of promiscuity in bumblebees. They have now both been researching bees for eight years at the University of Western Australia in Perth.

Recently the *Varroa* mite has infiltrated New Zealand with devastating results. Beekeepers didn't know how to deal with this plague and could only look on in despair as their colonies died. They only slowly recovered from the shock. In Australia, of course, everyone was anxious about what was in store for their bees. Can you prepare for something that doesn't yet exist?

Crossbreeding domesticated bees with wild honeybees to strengthen the gene pool, as practiced by Boris Baer and Barbara's team, is almost like taking a step back in time to the experiments Professor Kerr made in Brazil that got out of hand and resulted in "killer bees." To preclude this risk, the Australian test bees were brought to an uninhabited island. Should Frankenbees result from these experiments, no one would be endangered, as the mainland is too far for them to reach.

Unfortunately, all the laboratory equipment for analyzing the bees' DNA, which cost millions, was less photogenic than the trials in the field but was, of course, fundamental to the experiment as a whole. The studies were so interesting that the University of Copenhagen even sent human sperm to the Australian team to undergo the same sort of analysis as the drones.

As I visited the lonely island of the test bees for the first time during my research, one and a half years prior to filming, it dawned on me that here an almost utopian Noah's Ark was coming into being; it was a spot where the last healthy bees survive, whereas everywhere else in the world they are struggling. The situation was even more eerie because the island is a restricted military zone with underground chambers for submarines, all of which was out of bounds for cameras, of course.

The initial research journey resulted in many ideas and encounters with additional protagonists who were dear to me, especially in the industrial

sector; there was a bee agent in the USA and a beekeeper in Australia who dealt in package bees—bees posted in cardboard tubes and destroyed after pollination to save costs. These people, however, were not too keen on being filmed. And then there were the greenhouses in which we did film; viewers just can't imagine how strawberries grow there and that they have to be pollinated there. It was, in a way, a repeat of the Miller story; the protagonist was not completely convinced about the problems of his greenhouse beekeeping methods. This was why we decided to cut it from the film and keep it for the extras section on the DVD. There was the idea of following an almond from the plantation to its resting place in the finished product of a cookie—all this madness for a couple of cookies. And we discussed the extent to which the world economy should play a more concrete role, but I believe that it was right to omit all of that. The topics and concepts are lurking behind everything you see. Then again, expanding to include the pesticide industry and the political struggles and disputes would have made the whole thing more journalistic. Eventually we dispensed with these thoughts; the movie should trigger these discussions and not portray them. You can witness the effects of pesticides close up in the film, so there is no need to name the agrochemical companies that have rejected any form of contact with me for five years. Their refusal is more effective than an admission of guilt.

The human protagonists should all stand for themselves and be taken seriously, but they also document a specific stance on bees. The differences between the central characters were important both to tell the story and to encourage debate. But the central question was: Who are the protagonists and who are the antagonists of the movie? Are bees or humans in the starring role? Gradually, the bees became the stars, and the movie begins and ends with bees.

But I couldn't ask the bees questions, I could only observe them and imagine what they felt and thought. Do they even think at all? The bee researcher Professor Randolph Menzel was an invaluable contact in that respect. He knows bees inside out and is fascinated by the fact that these creatures with their minuscule brains can actually make decisions, something he can prove scientifically.



Our discussions, both at the institute at the Freie Universität, Berlin, and on the grass at his trial site at Klein Lüben, often revolved around the role of the individual in a swarm and the question of the extent to which we as humans are allowed to try to “think” like bees. This question bothers him as a scientist who has to objectively analyze solid facts more than it does me as a film director who is free to let emotions influence matters. His answer was explicit: As humans, the only instruments that we have at our disposal to research the bees’ brains are our own brains, but we have to be very conscious of this when we are trying to “think” as bees.

So, how do you escape accusations of having anthropocentric views, known by the rather disparaging term of “pathetic fallacy”? By saying that bees are simply robots and giving them only the reflexes of stimulus and response, the mechanical reactions to external influences? There is even the extreme,

scientific-materialist approach that declares that you cannot love the subject of your research because emotions tend to distort objectivity. Luckily, Menzel has a completely different opinion and says very clearly that he loves bees, even to the point of exclaiming that “the colony as a whole also has feelings!”

It is undisputed that we humans have feelings and empathy, and as Aristotle knew, empathy is one of the basic requirements of dramatic theory. There is no such thing as an objective film; even a documentary is an expression of a personal position. As soon as I place the camera somewhere I am making a personal statement.

When I started at film school there were no videos to practice on; from our first year we had to film with a 35 MM blimp camera weighing seventy kilograms (154 pounds). “Think carefully about where you place it,” laughed the teacher. That was an experience with far-reaching effects, finding a particular position, first mentally and then literally, and I learned to let the camera do the moving.

In my movies I accuse people of overcontrolling and of intervening in a manipulative fashion—and in order to formulate this I have to practice it myself. That is part of the issue in the first place. We are all involved in making the world what it is, there is no single culprit that we can all point at—we are all responsible. It wasn’t easy to formulate this without being too rosy or too smug. When I say that the bees were the protagonists, I accept potential accusations of anthropocentrism, but I didn’t want to make a cold, scientific movie. We were making a movie for the public, a cinema movie; it needed an identifiable subject so that I could tell my story. Letting my bees talk would have been going too far, but I did allow myself to playfully ask, in the “killer bees” scene, whether the bees were finally fighting back. I am pleased about their rebellion, that they are no longer making life easy for us. But how do I persuade my viewers of this? How can I get them to love bees too? Die Biene Maja (better known in English-speaking countries as Maya the Bee) has a good reputation for sure, but many people are still afraid of insects. As they are leading characters in our movie, we have to film them not just as a blurred mass but as individuals. They needed to be given a face.

Their world is usually hidden to the human eye. The macro scenes had to precisely blend with the documentary scenes; the viewer should be able to observe exactly what happens to the bees throughout all the various strands of the storyline, as the bees experience it. This is action from the perspective of bees. For instance, when the bees are traveling across the USA in huge trucks, we should be able to see and experience what it is like in those shaking cases, where new bees are hatched during the journey, and to see the parasites that clamber about on their heads. But we should also be able to see the queen in its narrow transport cage being placed in a yellow envelope and then stamped at the post office.

With a team of specialists, we constructed a macro studio in the “Alten Brotfabrik” on the outskirts of Vienna, where we could accommodate our own fifteen colonies of various strains on the large overgrown grounds of the Brotfabrik. During our two-month stay there, we only filmed macro scenes. In addition, the macro team visited various other areas in Austria and also Arizona—we couldn’t film the “killer bees” in Vienna with a polystyrene cactus, we needed a real desert and real Africanized bees.

For the “human” part of the film I needed a “hunter” who could quickly react to the protagonists while linking the people with the landscapes and the bees. Enter Jörg Jeshel. For the macro clips, we needed a cameraman with a totally different character, a “gatherer,” someone with patience and who would take pleasure in immersing himself in the world of bees, a place of creativity and constant activity. This was carried out by Attila Boa and a much larger team than Jeshel needed. Filming for the human aspects of the film required five people; for the macro slots, numerous people were needed at various times to film one single bee—the cameraman, two camera assistants, a script supervisor, a lighting technician, a technician for tracking shots, drone pilots to operate the mini helicopters with remote controls, carpenters for the props, a recording director, the bee carer, and me. We needed as great a variety of high-speed cameras and endoscopic lenses as they do in operating rooms.

In the process, a huge number of technical problems had to be solved that sometimes also raised fundamental questions. From the very beginning it was

clear that we couldn't film the bees at their usual speeds. We experimented for a long time to find the speed that was most appropriate. In the tests we discovered that the bees at 70 frames per second (FPS) move roughly as quickly as humans. Viewers shouldn't have the feeling that everything is happening in slow motion. It should be taken for granted that you can observe the bees naturally and that at 70 FPS you can see exactly what they are doing. If you film at 24 FPS, the small bee's flurry of movements—the tongue, the feelers, and the wings—all become impossible to appreciate in detail.

All flying bees were filmed at 300 FPS as it seemed to us that the wing movements have a more natural appearance with a certain amount of blurriness; the effect is more poetic than clearly defined wing movements. Bee wings move at a rate of 250 beats per second. For us, 24 FPS results in smoothly flowing images, but this occurs for bees only at 280 FPS because every single compound eye registers a different image, the next compound eye again a different one and so on. Only at 280 FPS do bees experience a smooth flow of motion. I discovered all this later, after our experiments with the wings. So, our 300 FPS was also the speed that bees see as flowing movement and no longer as a stroboscopic effect.

For the macro filming in particular, I was dependent on the experts. Our "bee whisperer," Peter Hopfgartner, was one of those experts and was also called upon for filming in the USA. He is a beekeeper himself, is on his second course of studies in philosophy, and knows the language of bees, that is, he knows what they are about to do but cannot give them orders. This is why we filmed in April/May: there is plenty going on in the bee world at that time.

We had a long list of topics that we wanted to cover: nectar deliveries at the hive, depositing and storage of pollen, the waggle dance, the building of the honeycomb, the birth of the queen, and so on. Our bee whisperer inspected the various colonies to find out where what we needed was actually happening. In the meantime, we had prepared everything in the studio—an empty fabricated honeycomb, lights, cameras, and all the technical requisites. Then Peter Hopfgartner brought in the frame and we could only hope that it would still be happening, or would happen again so that we could get our shot. In

both instances we didn't have much time as the bright spotlights created an environment that was markedly different from the dark hive and our technology proved a major distraction to the animals. First of all we looked at the honeycomb with our bare eyes, because when looking through the macro optic you miss a lot of what is happening in the margins. Then we decided which action we would concentrate on. Once this had been decided, I followed everything on the big monitor and could tell the cameraman what was interesting me the most. At the same time, I let the script supervisor know what should be noted down and by which time code (FPS), and then made my own notes for the cutting room.

All this requires an endless amount of material. It takes a lot of time to find the right bee with only the tiny detail seen in the endoscope or one of the other macro lenses. If you only switch on the camera after you find the right section, you are too late. We could manipulate some things a little, but only to a very limited extent. Sometimes totally unexpected things happened while we were filming, and we had to act quickly to accommodate the changes. On some days, we managed only a few seconds of usable film; on others, the bees were kind to us. We worked for a whole week for the mating scene, which lasts all of thirty-six seconds. In the end, we had 105 hours of macro material, twenty-five minutes of which appear in the final cut.

Heat generation was a particular problem. High-speed cameras need much more light; the more frames per second that have to be exposed, the brighter the lighting has to be, and the brighter the lighting, the hotter the lamps. This, of course, was a challenge because we were working with wax and we had the bees' welfare to consider. Sometimes we filmed outside using mirrors, as the sun was brighter than our spotlights and we could use the wind to cool down the equipment.

Considering the effort required, it wasn't surprising that in the end we needed another year to make use of the brief window of April/May to get the necessary recordings of the bees in all their diversity on film. Filming a bee gathering pollen, something that we thought was going to be the easiest thing

in the world, turned out to be very challenging. When we wanted shots of a certain blossom we had to let the cameras run and then either wait and wait and wait—often in vain—until a bee eventually arrived, or try to encourage the bee onto the blossom—also mostly to no avail as their flower-fidelity was programmed for other blossom types. If you took a bee from the hive entrance and placed it on a blossom, first the flight and landing on the blossom would be missing, and second, most of the bees flew straight back to the hive as they were guard bees and had nothing to do with foraging, or it was a nurse bee that also didn't feel like collecting pollen because it already had another job. It would be like employing a dressmaker in a bakery.

Getting the entire richness of this division of labor on film was a Sisyphean task but also a fascinating experience. Take, for instance, the nuptial flight with the camera flying at the same height as the queen, or the workers releasing the queen-to-be from its brood cell with the camera circling the event capturing the presence of the queen's colony. This should give the viewer the impression of being on the scene, and almost of being required to lend a hand. We had to predict exactly when the queen would hatch, otherwise we would never have had all the cameras and technology in place for the birth.

For the aerial shots we used mini helicopters, motorized drones with small cameras. Many advisors told me that this was far too complex and that instead we should create a 3D bee that could do everything and didn't actually sting, but there was no way I was going to agree to that. All the bees that you see in the film are real. We worked a lot with smells so that we could communicate with them and persuade them in their own language, but the most effective trick was patience.

We could certainly plan a lot, but with a shooting period of almost one hundred shooting days over two years not everything was practicable and we had to be ready for anything and everything. The editing phase was crucial to creating a ninety-minute story from 250 hours of material. Most of the changes to the screenplay happened during editing. The fresh eyes of our film editor, Anne Fabini, were important as she had never seen the real thing, only

the recorded images from which the story had to be told. Anne Fabini originally wanted to be a midwife and deliver babies; instead she became a crucial player in the delivery of the movie.

In the movie there were some things that we didn't want to state directly, we wanted the viewers to have the opportunity to draw their own conclusions from all that they had seen. But in order to play the game, all the cards have to be on the table. Thinking ahead about the amount of information and the playing options for the viewers was our challenge.

The statement that humankind cannot survive without bees may well have only been attributed to Einstein, but another comment that does come from him fascinated me more and more given my preoccupation with bees: "We cannot solve our problems with the same level of thinking that created them." This is why I am trying to optimistically prove that the quote attributed to Einstein is wrong and that we are more likely to die and the bees to survive. But *More Than Honey* is not a catastrophe movie. After studying the case history, we look at the efforts to find a cure, the prospects of finding one, and the unexpected solutions that nature could provide.

Over the thousands of years of the relationship between humankind and the bees there have been increasing numbers of conflicts between civilization and nature. This raises fundamental questions: Is humankind a part of nature? Or do we just want stand above it and subdue it? Could there not be some form of fruitful symbiosis between all parties—the bees, the beekeepers, the plants, the farmers, the dealers, and the eaters—a kind of Allstar Jazz Orchestra with various soloists appreciating one another in order to play music together? A utopian model of swarm intelligence.

Markus Imhoof, Berlin, September 2012