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BEES IN AN IDEAL WORLD

THE DIRECTOR OF *More Than Honey*, Markus Imhoof, had a nickname for Fred Jaggi, who appeared in the documentary: Öhi. This was the name that Johanna Spyri's character Heidi, in the Swiss children's book of the same name, gave to her grandfather. Jaggi was, without a doubt, a natural for the part. You cannot look or speak more like a Bernese Oberlander than this man from Gadmental, in the canton of Bern. In the documentary *More Than Honey* he represents the esthetic, dramaturgic counterbalance to the industrialized, soulless bee world that the movie also features. Jaggi stands for down-to-earth, rural beekeeping with a manageable amount of colonies deep in the unspoiled Swiss countryside.

He worked primarily as a carpenter, and until a serious accident in his early twenties he was a passionate biker. This combination of work experience

and hobby had previously brought him into the movie world when he built a hidden ramp in a glacier for a motorbike chase in a James Bond movie. Today he indulges in two hobbies: making cupboards out of tree trunks worn smooth by the frosts of the mountain climate and bleached by UV light, and, of course, bees.

Bees weren't the love of his earlier years—as the child of a rural beekeeper, he avoided them because of their stings. However, his elderly father gave him a choice between joining him and giving them up, and as he says, he didn't want to be a softie. The neighboring beekeepers, as he remembers, "weren't actual beekeepers, they were farmer beekeepers. You looked around at what the others were doing and basically just got on with it as a sideline. Only occasionally did you grab a reference book."

In the 1980s and 1990s, the era of after-work beekeeping was over. By that time the *Varroa* mite was appearing even in secluded alpine valleys, and good honey yields in the mountains could only be achieved with concerted and virtually professional measures against bee diseases; "then there weren't many who carried on."

Jaggi was one of the few who did. The Bernese are known in Switzerland for their stubbornness but also for their devil-may-care attitude to life. The difficulties Jaggi faced brought these characteristics to the fore. And then, as if to comply with all the alpine stereotypes, he started poaching, but only occasionally, you understand, and not necessarily from conviction but rather from a quintessential Swiss stubbornness. There was the time with the badger he shot that he had to hide from the gamekeeper, or with the doe that hung in the smokehouse. Previously he had been refused a hunting permit, partly because of a disability. Not that that stopped him hunting, of course.

He refers lovingly to his bees as "my blacks" or "ur-bees," which fits in well with his fondness for all things primal. Totally different from the others that buzz around, his bees are superbly adapted—to the altitude, the climate, the six-month-long winters, and in particular, to the special diversity of flowers of the mountain meadows. The scientific name of his bees is *Apis mellifera mellifera*, or as beekeepers call them, *nigra*—the blacks.

But even if Jaggi doesn't like to hear it, his *nigra* are in no way originals.

Rather, in the form that they are found in Switzerland today, they are the results of the efforts of the Swiss breeder Ulrich Kramer, who in 1890 tried to "pure-breed" *nigra* in special reserves with the intention of maintaining the original form. Pure-breeding, however, meant strict inbreeding. Breeding trials on honeybees up until that time were almost always aimed at nurturing gathering abilities, gentleness, and swarming inaction. Bees were meant to bring home lots of honey, to allow intrusions into their hives without resistance, and to swarm—when the whole colony goes off in search of a new residency—as seldom as possible.

But as so often happens, the breeder's preoccupation with a few aspects meant that other, equally important attributes were also affected in unexpected ways. Selection through inbreeding has side effects. In the medium term, this breeding practice had an immense impact on the health of the bees, individually and collectively—similar to the practice of breeding cows as living milk tanks, where previously healthy cows, through the greed of breeders, have their immune system destroyed and can only remain on their chronically overloaded legs with the aid of chemicals.

Nevertheless, Jaggi went for racial purity. (In Switzerland, it is more acceptable to use the term "racial purity" than it is in neighboring Germany.) Better they keep themselves to themselves, and here he is in the majority. "You see what happened when they crossed the European and the African bees—suddenly we had killer bees. If something like that happens here, then there will be fun. By then I'll no longer be keeping bees, I'll have met my Maker," says Jaggi, pointing to some spectacular white clouds above the Geisshorn, a mountain in the Bernese Alps. "This will no longer be my problem." Currently, he tackles the smaller problems himself. When he discovered that some of his bee offspring had gray abdominal rings, he concluded that his queen must have mated with *carnica* drones from the neighboring valley. He found the queen among a mass of workers on the comb and ended the "bastard" production by beheading the queen with his fingernail.

In the course of its relationship with humans, *Apis mellifera*, the honey-bearing bee, has split into twenty-five races in different geographical regions. As Jaggi anticipated, the races have adapted to diverse habitats, either alone or

through breeding. Numerous subspecies have become established in various European regions: the Spanish bees are termed *Apis mellifera iberica,* the west and central European ones (Jaggi's "blacks") *mellifera*, the Italians *ligustica*, the southeast European ones *carnica*, the Balkan ones *macedonia*, the Greek ones *cecropia*, the Cretan ones *adamii*, the Cypriot ones *cypria*, the Turkish ones *anatoliaca*, the Caucasian ones *caucasica,* and the Morrocan ones *intermissa*. They all bear the species name *Apis mellifera*.

Only three of them are of any significance to international bee breeders: *Apis mellifera mellifera*, *Apis mellifera carnica,* and *Apis mellifera ligustica.*

Apis mellifera mellifera, also known as the European dark bee or *nigra,* has no problems with damper climates and copes well with the cold, even during long winters—one of the reasons that Jaggi believes them to be good high-altitude bees. After winter they need a little bit longer to reach peak production, a drawback that has made them unpopular among beekeepers interested in performance. *Nigra* bees are also a bit smaller than other strains, but this is not reflected by reduced transport capacities.

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At the beginning of the twentieth century, there was even something of a *nigra* hype among beekeepers, but that died down relatively quickly. One of the leading figures in the Swiss bee world, Hans-Ulrich Thomas, suspected that changes in agricultural usage, for example, land clearance projects, had a favorable effect on the small black bees. *Nigra* particularly thrived at the harvest of buckwheat and the associated field flora (farmers call them weeds). Nowadays, both barely exist, if at all, so *nigra* are buzzing along on the sidelines. But maybe they won't stay there. The strain is low maintenance, which makes them an attractive prospect for many beekeepers today.

Apis mellifera ligustica, the second successful honeybee on our list, have attained worldwide popularity because compared to their direct competitors, they come out of hibernation quickly, achieve a high headcount, and

deliver good yields. Beekeepers prize their gentleness, their unwillingness to wield their sting to prevent the theft of their honey, as notoriously executed by humans. *Ligustica* have become established in all regions with a Mediterranean climate, but flag in areas with longer stretches of bad weather. Additionally, experts have discovered that *ligustica* get lost easily, and thus they are a bad selection for the milking of aphids in cluttered forests.

There remains only the third member of this group: *carnica*. They are the most popular strain among beekeepers and worldwide the most widely distributed bees. *Carnica* have inconspicuous gray rings and are slightly bigger than the *nigra*. They originate from the eastern Alps, the eastern Danube area, and the western Balkans, and they have prevailed against the local competition because in every respect, they attain top or nearly top grades for most of the desired qualities. *Carnica* queens hibernate with relatively few winter bees, the advantage being that not so many need to be fed. In spring, the *carnica* winter bees get into gear relatively quickly and can immediately work efficiently. If the regional plant cover or the climate changes, they are able to cope with the new situation much quicker and more effectively than other strains. Also, their lack of aggression has a considerable bearing on their success.

Jaggi inherited the *nigra* from his father, who in turn had inherited them from his father. As an avowed traditionalist, he obviously cannot suddenly consider bad something that until then had been considered good. No, it can't be bad just because others have turned away from them! You don't have to follow every fashion! But now that his "blacks" were being harried on all sides by *carnica*, he was worried about being driven into a corner by the interlopers.

This intermixing of races is possible because of the special reproductive biology of bees. Virgin queens do not mate in the hives but leave the hive and fly in the vicinity of the site where other genes are available. The bearers of these genes are winged—the drones.

But one thing at a time. In a colony there are three kinds of bees: a queen, many male drones, and an even larger number of workers, which are female but are only able to reproduce under very special conditions and then only to a limited extent.

In the course of its five-year life, a mated queen lays millions of eggs in the brood comb which can become drones or workers. A queen that is ready to lay eggs recognizes by the size of the comb cell whether it is the brood chamber of a drone or a worker. Depending on the specifications, it fertilizes the egg using its already filled spermatheca, in which sperm can be stored for years, or it lays unfertilized eggs, the so-called drone brood. Drones develop in these unfertilized eggs with a genetic makeup that is identical to the queen's. If the queen fertilizes the egg it becomes a worker.

But how is a queen reproduced? Like the workers, it comes from a fertilized egg, but one that its mother laid in a very special, differently shaped, and slightly bigger cell. This "queen cell" is prepared by workers as soon as the necessity arises—that is, when the colony needs to swarm. Simultaneously, the old queen is put on a diet so that it loses weight and can fly again, something it has done only once before in its life, for its nuptial flight. Before the new queen hatches, the old queen swarms out with some of the bees to found a new colony, leaving the fully stocked hive to the younger generation and the queen-to-be. Ethnologists recognize similar divisions in social units of primitive peoples. If a tribe becomes too big for the land that is supposed to sustain them, the experienced old tribal chief will move on with half the tribe to seek new resources. A younger chief remains in the old homeland with enough to offer those that remain.

Bee breeders have used this natural principle of bees as a model for a targeted increase in their colonies by "splitting"—dividing a colony into two or more smaller colonies, each one having an implanted new queen or queen larva in a new hive. Splitting on an industrial scale, as practiced by operators like John Miller, is a procedure that causes a lot of stress to bees.

Whether artificially introduced by a beekeeper or reared by the bees themselves, a new growing queen in a hive begins as a normal female larva. The decisive factor in the development of the queen is the larva's diet. In the first larval stage, all bee larvae are fed royal jelly, a mixture secreted from nurse bees' hypopharyngeal glands. While the diet of future workers and drones is soon changed to almost exclusively pollen and honey, the larvae of the future

generations of queens receive lifelong supplies of royal jelly. Only in this way can the ovaries develop completely, and only in this way do the larvae become queens capable of reproduction.

When the bee larvae have reached a certain stage of maturity, the nurse bees seal the brood chambers so that the fascinating process of metamorphosis can take place in total isolation, as it does thousands of times each day in the spring and summer in every beehive: A worker, a drone, or a queen is created from a formless entity. The development times vary somewhat. With European bees, the workers hatch twenty-one days after the sealing of the brood cells, the drones after twenty-four days, and the queen after only sixteen days.

Soon after the queen's comb is exposed with the assistance of nurse bees and the new queen hatches, a cloud of sexually mature drones gathers at the nearest assembly point and they mate. This happens mid-flight, and is an intense process with up to twenty partners that pay with their lives for their first and only copulation. The drones' sexual organs are ripped off during coitus. The drones that return to the hive, alive but without having achieved anything, do not fare much better. They cannot feed themselves, which is why in fall they are driven away or killed by the workers which consider them to be unnecessary consumers.

The queen, on the other hand, with a stock of sperm for the fertilization of millions of eggs, has a long working life ahead of it. Between April and September, it will lay up to two thousand eggs a day, for up to five years.

Depending on the site and location of neighboring beekeepers, unwanted genes and thus unwanted attributes can be introduced during the nuptial flight as the male suitors are drones from very different backgrounds. Many beekeepers try to avoid this, and prefer fertilized and pure-bred queens to implant in their colonies, instead of taking risks on the natural marriage market. Hybridity is only one of the dangers that Jaggi is confronted with, and the smallest when measured against the others.

Even in the healthy air and up on the high meadows that have never been and never will be polluted by agrotoxins, bee diseases are rampant. And

they can affect anyone, even experienced beekeepers like Fred Jaggi. One day he stood in front of burning frames and hives that he himself had lit. A bee inspector named Elisabeth Schild had discovered foulbrood; at least five of his ten colonies displayed the fatal symptoms. Schild didn't have to explain much. Dead, dark-colored pupae could be seen in the cells and there was an acidic smell. Some nectar forager or other had introduced the deadly bacteria and the nurse bees had spread *Melissococcus plutonius* throughout the hive while cleaning, like a cleaner in a hospital taking a bucketful of germs from one ward to another. In Switzerland, the rule is that when more than half the colonies are affected, all the colonies have to be destroyed to stop the disease from spreading.

For a number of years now beekeepers have differentiated between European and American foulbrood. The European version (EFB), the one that afflicted Jaggi's colonies, is bad; the American foulbrood (AFB) is worse. The name American foulbrood is misleading, as the areas affected are not restricted to the North American continent. The name is simply derived from the chance fact that it was first properly recognized and described in the USA. The disease can be recognized by sunken, capped breeding cells. Typically, well-developed larvae are affected; they change to a sticky slime that is a bit cobwebby when poked with a toothpick. Infested colonies quickly become weak, and members of stronger colonies soon plunder the weakened ones. There is no easier way to procure honey than to steal it—even for bees. However, the raiders carry home not only the bounty but also the plague, like the plundering hordes of the Thirty Years' War.

Officially, within the European Union (EU), AFB cannot be countered with antibiotics. If people persist in doing so, the chances of keeping the virus away from growing broods are minimal. Endospores, inactive and long-lasting forms of the pathogenic bacteria, can survive for decades in the brood comb cells—even as completely dried-up masses on the wooden frames and supports. What is more, endospores travel around the world in honey jars. World trade, to a certain extent, feeds AFB bacteria. At least it is not dangerous to humans—or so the experts tell us.

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Unlike AFB, European foulbrood only affects broods that are younger than forty-eight hours. The dead larvae don't become slimy but, as Jaggi experienced, turn into yellowy-brown shriveled objects, and there is an acrid smell. The EFB pathogen dies at 78°C (172°F) which prompts beekeepers who have been affected by infestations, especially in Switzerland, to decontaminate their inventories by baking them at 80°C (176°F) in large ovens. The colonies are beyond rescuing. In the meantime, they have learned other defensive techniques like washing the complete beehive, including the frames, with 5 percent hot caustic soda, followed by a 6 percent hot soda solution, and finally wiping it down with 70 percent alcohol. However, considering the effort required and the fact that there is no guarantee of success, bee experts and agricultural advisors recommend throwing the whole inventory into the nearest incineration plant. Those who live off the beaten track, like Jaggi, are allowed to burn them on their own land in an 80-centimeter (just over 31-inch) deep hole. Prior to this, the bees are gassed in their hives and the business site is declared a restricted area.

"So there you stand, the burning honey is sizzling, and the dead bees crackling in the flames. It was the same for the farmers who were hit by foot-and-mouth disease and had to get rid of their animals. I've gassed ten colonies and destroyed over three hundred frames. That's three thousand francs [around US$3,000] up in smoke. There was fire in the hole for three days. It was hell," Jaggi remembers. Nevertheless, he didn't give up. After the ban had expired, he fetched three new colonies of bees from Brienz on Lake Thun, an area without foulbrood.

You don't want to experience something like that twice. Despite a successful restart, the question remains: "What did I do wrong? Did I do anything wrong at all?" The official line was that a strong colony with enough "specialists" taking care of hygiene, cleaning bees, was pretty safe. Did some of Jaggi's colonies come out of hibernation weakened? Had he possibly used too much formic acid against the *Varroa* mites and thus indirectly weakened the growing larvae? Jaggi complained that foulbrood research was going nowhere. The scourge strikes, everyone ducks, counts and burns the dead, and hopes that the next time they are spared.

On a morning late in June, clear and warm despite the altitude, Jaggi watches his black bees, the new ones from Brienz. They fly to the alpine roses like red garlands festooning the slopes. Jaggi listens to the buzzing sounds. Even after all these years he still cannot get enough of observing them flying from blossom to blossom.

The watery liquid secreted by flowers, or more precisely from special glands in the calyxes, is initially just a raw material. Nectar is as much honey as flour is cake. But nectar is a highly remarkable substance with a very special composition. Apart from its own minerals, it contains various kinds of sugar including fructose, glucose, and sucrose. Depending on the type of flower, the sugar concentrations can be anywhere from 25 percent to 75 percent.

The plants use two tricks to help consumers like bees and bumblebees find the coveted foodstuff; during the blooming period they lure the insects with fragrances, which are also a component of nectar, and with attractive colors. Without these two stimuli, nature's approximately 130-million-year-old practice of giving insects a key role in the sexuality of plants would not work. Insects, and above all bees, cannot reach the energy-rich juices of the blossom without brushing their hairy abdomens against the pollen on the stamen, the male reproductive organs of plants. The pollen dusts the small flying objects so that on the next visit to the same kind of blossom, the stigma, the female reproductive organ, is brushed. The result is pollination, without which apple blossom wouldn't produce apples and raspberry blossom wouldn't produce raspberries.

Wind pollination is an alternative to the interaction of plants and insects for which the flowers need neither brilliant colors nor pleasant scents to attract attention. It is, however, much less efficient as it relies on the mass production of pollen because only a fraction of the pollen that is spread throughout the landscape lands on a matching flower. In contrast, insect pollination is a process of utmost precision and is pretty much independent of weather conditions. Only nonstop rain or a cold snap at an inopportune moment could temporarily bring the ingenious system to a standstill.

Pollen is by no means tiresome ballast for bees but rather an important foodstuff. Nectar alone is not enough to sustain the brood and colony

throughout the winter. Pollen contains fat, proteins, and minerals as well as vitamins. Without fattening up with this diet the bee larvae cannot develop their organs and glands. The worker bees use pollen to build up their strength for the hard work ahead of them. Pollen is also very important for the rearing of drones. Only well-fed drones are strong enough to win the battle for mating with the queen.

Before flying back to the hive after foraging and pollinating, they systematically brush the pollen off parts of their bodies and then redistribute it. It is important for pollination that this activity happens after the bees have already offloaded some of the pollen onto the female stigma. During the cleaning activities, the bees brush pollen that has settled on their large, finely haired compound eyes and frontal thorax toward the abdomen with a special little brush on their forelegs. The middle legs then take on the task of passing the pollen toward the specially adapted hind legs. A highly functional arrangement of special hairs, pollen combs, and pollen presses work together until the bulk of the pollen has been compacted into pollen pellets and attached to pollen baskets on the tibia of the hind legs. A full pollen basket can weigh up to eight milligrams and a twin pack (that is, a basket on each side) sixteen milligrams (each of which is a tiny fraction of an ounce). The antenna cleaner is an especially ingenious part of the bees' cleaning and transport features: semicircular notches in the forelegs through which the worker bee's antenna is drawn in order to remove pollen and debris.

To extract the nectar fluids, the bees are equipped with a proboscis, or rather they have one when they need one. They adjust their mandibles and labial palps (roughly corresponding to our lips), making the hairy tongue into a tube at the end of which is a sort of spoon, giving their tongue the form of a nozzle. It then moves back and forth, functioning rather like a suction pump, so that the fluids are lapped up and are fed, via a fairly long esophagus, into the honey crop. The common term "honey stomach" is misleading as nothing is digested here, only stored. The nectar can then be unloaded back at the hive. A pyloric valve separates the honey crop from the actual digestive tract in the abdomen, where only small amounts arrive to be used as fuel for the flight.

On top of this—and enormously important for the survival of the colony—the bees can use this valve to shift certain pathogens and toxins from the honey crop to the ends of their own bodies.

When the bees return to the hive they have no time to rest; they immediately begin to offload their supplies. This is hard physical work. The returning forager regurgitates the contents of the honey crop, passing it on to a home-based worker which in turn passes the nectar on to another colleague. This relayed transport means that by the time the nectar reaches the comb for storage, it is more concentrated, more fermented, and thicker. The returning foragers stow away the pollen themselves without bothering the intermediate workers.

The diet of the worker and drone broods, after their initial diet of royal jelly, is enriched by food from the pollen, nectar, and honeycombs after their fourth day of life. Any nectar that the nurse bees don't immediately consume is made suitable for storage by the other hive bees by sealing it in the combs. Once sealed, the nectar becomes honey as we know it.

Fred Jaggi's honey is not just any old honey. "Up here the bees don't have the option of going for sprayed crops. No artificial fertilizers near or far. My honey is organic, more than organic—absolutely pure! The alpine roses are extremely good. When they flower and there's good flying weather for ten days then our harvest is assured. Alpine roses produce this wonderful, almost crystal clear, very runny honey. Anyone who tries it stays a customer. I don't need to bother advertising."

Those who wish to relieve the bees of their laboriously gathered goods have to invest a bit of effort themselves. The box-shaped dwellings of the bees have to be opened and the frames with the honeycombs removed—and the colony does not give up its honey without resistance. But Jaggi has figured out something that calms them down slightly. "The evening before harvesting, I gather some valerian roots, chop them finely, and place some of them near the entrance holes. The returning bees carry the scent into the hive and it spreads through the colony. The bees are not drugged then but when I collect the honey they are docile." Well, others would say less wild. "I have to put

up with ten, maybe fifteen stings per day from my bees without grumbling. It's like being scratched when picking blackberries. But there are also things that force me to stop immediately, for example, nearby helicopters; the bees become aggressive and there's nothing you can do about it."

That they don't react too aggressively to the removal of the honeycombs can be put down to the century-old practice of selective breeding by breeders who valued gentleness. But even these colonies are not boundlessly peace-loving, which is why beekeepers use defensive fumes puffed out of smokers, as well as protective clothing, from gloves to hats with netting to full suits.

While for numerous beekeepers the honey yields are the focus, all too often at the expense of the bees, beekeepers working with the anthroposophical Demeter Association have shown that profitable harvesting and a belief in the welfare of the bees do not have to be contradictions. Their self-imposed principles of bee breeding, which also take the natural habits of the insects into consideration, differ, in some respects fundamentally, from those of traditional beekeepers. Their core philosophy in a nutshell is: Let the bees do what they like doing as often as possible and refrain from doing what they don't like as often as possible.

Before mobile units with moveable frames were introduced in the nineteenth century, the bees kept themselves to themselves in their tree trunks, their clay tubes, or beehives until the moment when someone other than themselves came after their honey. The beekeepers had to break open the hives and thus destroy them in order to gather the harvest. Only since the advent of the box system, which permitted the removal of individual frames, have beekeepers been able to follow procedures within the beehive—and to interfere with them. Conventional beekeepers have the bee colonies live in "prefabs" made of industrially produced wax with defined cell sizes for worker broods and honey cells in which to implant the honey. The architecture of the hive is predetermined. Demeter bees, by contrast, can construct their combs much as their collective sense chooses. When frames are inserted, they function as units into which the bees can incorporate their own natural combs.

The principle of beekeeping according to the nature of bees, which Demeter

beekeepers follow, allows the bees more opportunities for development and variation. A queen is not imposed on them, they are allowed to swarm and choose a natural form of reproduction. The colony decides when to split and form a new colony. Demeter beekeepers are strictly forbidden from clipping the wings of queens, a practice that facilitates the capture of a swarm, as the disabled queen falls to the ground in front of the hive and the swarm remains there with it. And like humans building eco-friendly homes, the residents of the hives should only come into contact with untreated woods, not with synthetic materials like polystyrene. The highly dangerous *Varroa* mites are solely combated by non-synthetic measures like lactic acid or oxalic acid.

In essence, the principle is: Eat healthily. Even Demeter beekeepers cannot guarantee that the surroundings where the bees fly are unsprayed—their foraging radius is more than three kilometers (around two miles). Preferred sites are, however, those bordering on areas that are organically farmed. Demeter bees are also usually allowed to keep more of their honey than are colonies of conventional beekeepers; 10 percent of their own honey must remain for their winter stocks. Behind all this is the conviction that their own product strengthens the animals more than sugar water and the industrially produced bee foods that are usually fed to bees as substitutes for their own plundered stocks. According to the Demeter beekeeper Günter Friedmann from Küpfendorf-Steinheim, southeast of Schwäbisch Gmünd, Germany, this form of beekeeping is so successful that more and more bee breeders are prepared to change to this approach. "We have an influx, and this wouldn't be the case if we were just being bee-friendly, but couldn't show profits."

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In 1923, Rudolph Steiner, the founder of anthroposophy and so a mentor for the Demeter beekeepers, stated that in eighty to a hundred years—that is, today—beekeeping would be confronted with a great crisis, especially as the bees were being denied their natural reproduction by the implantation of an

artificially bred queen. "Certain forces which have hitherto been *organic* in the hive will be mechanized…" According to Steiner, "we have to be aware that by working mechanically we destroy what nature has elaborated in such a wonderful way."[1] The words of the esoteric Steiner are not based on knowledge about "inbreeding depression" or "genetic impoverishment," instead they sound more like a general warning not to violate nature and its creatures.

In comparison to the drive for maximum efficiency in beekeeping and breeding, as is mostly practiced nowadays, the veneration shown to bees by long-gone cultures over millennia now appears rather strange.

Bees were working animals of special significance for humans from the earliest of times. A bone carving dating from around 4000 BC was discovered in Bilche Zolote in Ukraine. It shows a stylized bee goddess on a bull's head, an early link between cows and bees that was to be found centuries later on ancient Greek gems and coins, and centuries later again on wooden carvings in the Middle Ages. The Swiss bee researcher Matthias Lehnherr interprets this striking combination as a kind of plea for prosperity. "Cows, bees and beehives symbolize the Promised Land, the land of milk and honey."[2]

In ancient Egypt, beekeeping and even migratory beekeeping was known around 3000 BC. There are portrayals of honey raiders, and of beehives being sailed up the Nile, presumably following the blossom. As honey was for many millennia the only source of a sweetener for humans, it might also explain why the Egyptians held the small working creatures in such esteem. They were valued so highly that they were accredited with the highest possible origins. According to ancient Egyptian myths, bees were created from the tears of the sun god, Ra. In ancient Greece, bees represented divinity, vitality, and wisdom. The freshly born Zeus and Dionysus were nourished with honey. Dionysus, a god better known for excessive wine consumption, was even supposed to have taught humans the rudiments of beekeeping.

And even in the Bible and in the allegories of the Church fathers the bee has a special status. Flying heavenward, they symbolize Mary, Queen of Heaven, who conceived the Savior as a virgin, rather like the bees that are born "from wax," apparently asexually. The thought of swarms of drones having group

sex with a rather unchaste queen somewhat tarnishes the traditional story of Mary's virginity. Bees represent reincarnation. Just like Jesus, who remained shrouded in mystery for three days after his death on the cross, the bees are invisible for the winter months only to rise again fresh as ever in spring. In the Middle Ages, bees symbolized the two sides of the son of God: sweet as honey and mild is the mercy of the Lord; painful as a bee's sting is the verdict of the Judge of the World at the day of reckoning.

The association with holiness remains in particular with wax, an integral part of many liturgical acts, from the thin intercession candles to the stately light columns at Easter. Even today candles are an indispensable part of ritual acts for a variety of religions. Of course, today most of them are produced industrially and are made of stearin.

The cultic veneration of bees survives to this day in popular sayings. As they say in Switzerland, "Curse and swear where a beehive stands, the bees'll sting you on your hands."