Bee Keeping
Simple and Natural

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The Barefoot Beekeeper

INTRODUCTION

It seems to me that so-called 'modern' beekeeping, along with a toxic agricultural system, has resulted in the poor state of health we find bees in today.

This document is an outline of my current thinking, and an introduction to the notion of 'natural' or 'balanced' beekeeping, towards which I believe we must now make a move.

All opinions expressed herein are my own, and may not entirely coincide with other people's idea of what constitutes 'natural beekeeping'. I encourage you to make your own choices, and to think for yourself.

THE NATURE OF HONEYBEES

Before we can consider any form of 'bee keeping', we must make some attempt to understand the nature of the creature we will be dealing with.

The traditional approach to this subject invariably begins with pictures of individual bees. There are many books with diagrams and photographs of dissected honeybees, showing how their anatomy is arranged and how a dead bee looks under a microscope. I recommend you take a look through at least one of them so you have an idea how all the bits fit together and what they all do. Dade's *Anatomy and Dissection of the Honeybee* is one of the best.

However, as beekeepers – or potential beekeepers - and as observers of and participants in living nature - we are not so much interested in dead bees as in living ones. And as soon as we decide to look at living honeybees, we have to think, not in terms of individual bees, but in terms of the unit of survival: the colony.

In a very real and literal sense, honeybees can only exist as part of the large, extended family that is their colony. This family consists of a mother, who we call the Queen (although she is not a monarch or ruler in any sense), perhaps a dozen groups of half-sisters, who share a common mother but had different fathers (all deceased), and a band of brothers, who are genetically identical to their mother and had no father.

A rather confusing and somewhat unexpected picture, then, and one that we will begin to understand only by careful study of their life cycle and unique behaviour.

The primary motivation of all creatures is, of course, survival. The fact that the ancestry of the honeybee can be traced back in the fossil records at least 100 million years demonstrates that it is, most assuredly, a survivor and, therefore, an excellent adapter to changing conditions, both long- and short-term.

Natural History

Apis mellifera – the European honeybee - probably originated in Africa and certainly spread throughout Europe and Asia as far as the Siberian tundra, developing subspecies and local ecotypes in order best to take advantage of the wide range of climates and flora it encountered along the way. Recently, fossil evidence has been found that she may have had relatives in North America, which she was formerly supposed not to have colonized. One day, the mystery of why she failed to thrive there will be solved.

The natural history of the honeybee is intimately entwined with that of the flowering plants: you could say that they were made for each other, or at least that they grew up and evolved together; the one feeds the other and is rewarded by prompt and efficient pollination services. Many other insects are involved in pollination, of course, but none has the capacity to come through winter in such large numbers, and therefore be available to early-flowering plants and trees when needed. It is this capability that makes the honeybee so commercially valuable as a pollinator of our fruit crops.

How the honeybee evolved as a social creature and developed its remarkable ability to live co-operatively in huge groups remains a mystery. The observable fact is that they do so live, and this is what we are interested in: the actual behaviour of the honeybee super-organism - the *colony* as a collective, co-operative, highly successful, multi-component yet amazingly co-ordinated 'creature' that is entirely independent of man but now largely under our influence, playing a vital role in the production of some of our most valued foods, and exerting a degree of selection over many of the flowers that bloom in our gardens and what is left of our natural landscapes.

The Swarm

So let's start in our own European temperate zone, and look at the honeybee colony at first as a swarm – a whirling, roaring cloud of bees, emerging from a hive or a hollow tree – a sight seen by few people nowadays, living out of touch with the natural world in cities and suburbia, but remembered by all who have witnessed it. Despite its wild and anarchic appearance, which can cause panic in those unfamiliar with bee behaviour, a swarm is in fact purposeful and organized, and not in the least interested in causing a nuisance to humans or anything else: their one aim is to find a suitable place in which to set up home. They need a protective 'shell' around them - which may be a hollow tree, a cosy loft space or a conveniently placed beehive – some kind of cavity that will protect them from the weather and from predators. This is the 'naked swarm' – a division of the colony, analogous to the division of a cell – that will form the beginnings of a new bee family.

So what is this swarm, and why is this phenomenon almost unique to honeybees?

The swarm is the macro-reproductive mechanism of the honeybee; as compared with the mating of the queen and her laying of individual eggs, which is the micro-reproductive system.

When a colony reaches a certain size and is likely to out-grow its home - and the bees believe that there will be sufficient forage for them to establish a new colony and provide it with winter stores - the queen will be guided by her retinue to lay fertilized eggs into special cells that have been prepared purely for the purpose of raising new queens. Unlike the horizontal – or rather, slightly inclined – cells in which her eggs are normally deposited, she must now lay into a larger, vertically-hanging wax cell, generously provided with the highly nutritious and complex substance we call *royal jelly*. During the swarming season – early to mid-summer – six or more of these cells may be prepared and each provided with an egg. After three days, a larva will hatch from the egg and then feed eagerly and – because she is to be a mother - exclusively on royal jelly, topped up from glands in the heads of young workers who have themselves fed on 'bee bread', comprised of pollen alchemically fermented in nectar.

The queen larva gains weight rapidly and after five days in the open being fed exclusively on royal jelly, her cell is sealed by her attendants and she is left for a further seven days to undergo the metamorphosis from larva to pupa and then to emerging imago.

Royal jelly has the unique property – in sufficient quantity over an extended period – of turning what would otherwise be an infertile worker into a fully-functional, egg-laying queen. Worker larvae are only allowed to eat it for three days, when they are put on bee-bread rations for a further three days until they are sealed in their wax cells to be reborn after a 12-day transformation.

At around the time when the first queen cell is capped, the bees become restless and – if conditions are judged to be right - a collective decision is made to swarm.

The current laying queen, who has had her food rations reduced over the previous week to enable her to lose enough weight to fly properly, is hustled towards the entrance and, together with about half of the colony's mature bees, who have filled their stomachs with honey as insurance against an unknown fate, she flies out and joins the excited, circling throng, which may travel only a few yards from their home before settling on the limb of a nearby tree.

A great cluster gathers around the queen – perhaps ten, fifteen or even twenty thousand bees in a big swarm – forming a temporary, protective shell. At this stage, their queen is especially precious: if she should perish, swarming will have been in vain and they would have no choice but to return to their old hive. Here on the branch they will stay for a few hours or, if necessary, a few days, while scouts are sent out to look for a suitable new home. If it rains, or turns cold, they will cluster tightly together, heads pointing upwards and wings arranged like the scales on a reptile, so as to shed water and retain heat. When they are so clustered, it is possible very gently to stroke a hand over the backs and wings of the bees, as if they were a cat.

Scouts search the surrounding terrain for suitable homes. They will fly around, enter and measure the volume of promising cavities, assessing them for suitability in ways only bees understand, and report back to the suspended colony if they become excited by a particular location. They convey their degree of enthusiasm by means of a version of the 'waggle dance', performed on the surface of the swarm, sending vibrations throughout the cluster.

A number of scouts return with news of their finds, and a collective decision is reached – by some means that puts national governments and executive committees to shame - as to which scout has been successful in finding their ideal home. Once a decision has been made, the colony rises in a purposeful cloud and makes directly for their chosen residence, moving in without further delay.

At this point, the bees are in an excited, feverish state, and from this fever they produce heat. This is the first requirement for extruding wax from glands in their bodies in order to commence construction of their 'skeleton' – the beeswax comb – that will be both a nursery and a food store for the next several years, if they remain undisturbed. A swarm that has clustered on a branch for a day or two will almost always leave the beginnings of wax comb behind, such is their eagerness to begin building.

Establishing a New Home

Hanging from the roof of the cavity, they join legs to form chains, measuring up to construct their comb according to their own particular geometry. Tiny flakes of soft, malleable wax are kneaded together into precise, hexagonal tubes, offset at their bases and slightly inclined upwards towards their open ends, to enclose the greatest possible volume of space for the minimum amount of precious wax. The slight slope is calculated, it seems, so as to hold, by surface tension, the greatest volume

of nectar that can be contained in a cell that must, at other times, serve as a womb for developing larvae. It is this extraordinarily economical use of a material that is so costly in energy terms to manufacture, that has enabled the honeybee to thrive in such a variety of conditions and cavities for so long.

Once a single comb is well under way, another is started close by on each side, parallel to it, at exactly the right distance to allow builders and cell-packers to work comfortably back-to-back. Those delegated to house duties begin to fill cells nearest the top with nectar, and a little lower with pollen, brought in by foragers in readiness for feeding the nurse bees, who need to generate internally the special food for the young larvae that will begin to emerge in a few days. The first priority now is to build up a strong population of worker bees – infertile females – which will become the foraging force so vital to the growth of the new colony. So as soon as space is available, the queen is guided by her escorts to lay a fertilized egg in the empty cells near the centre of the new comb.

The middle of each comb will soon be full of brood in all stages, and three weeks after the first egg is laid, new workers will begin to emerge from their cells and take over the nursing duties of their now elderly sisters, who may return to foraging duty for their few remaining days of life. Foraging is exhausting work and worker bees live for only a few weeks: those who flew with the swarm must ensure that the next generation is well established before they expire.

Meanwhile, back in the old colony from which our swarm flew, the first of the new queens has emerged, seven days after her cell was sealed. A decision has been made by the colony that she will take over from her mother, and consequently she has killed by stinging all her potential rival queens who were yet to emerge from their cells. Their bodies will be dragged out of the hive and disposed of by workers, and her sting will never be used again, unless required in mortal combat with a challenger to her throne.

The Mating Flight

Five or six days after emerging, in the warmth of a summer afternoon, the new queen flies from her family and travels to a place known only to bees, some two or three kilometres away, where she will mate with perhaps a dozen of the hundreds of drones gathered there. They have navigated to that spot by reading clues in the landscape that they cannot have learned from their fathers (for they have no fathers) or their sisters (for workers have no time to spare for such things). Tiny particles of magnetite in their bodies are likely to aid their navigation, and their congregation areas may, perhaps, be located over anomalies in the Earth's magnetic field.

Dodging swifts and swallows, the queen returns to her colony, soon to begin laying her eggs: fertilized eggs in the smaller cells, where her daughters will grow to form the workforce of the colony; unfertilized eggs in the larger cells near the bottom of the comb, where they will become fertile males, with the potential to carry her genetic code to another young virgin queen from a distant colony. Her sons are indeed her own, as they have no father, while her daughters, having many fathers between them, may show clear signs of their various paternal influences in their colouration; and thus groups of half-sisters can sometimes be recognized, even by our eyes.

She may take several mating flights until her spermatheca are full, and then she will not fly again until – perhaps the summer after next – she flies with a swarm.
At the peak of her laying capacity – for a few weeks next summer – she will lay as many as three thousand eggs each day, and may continue to be mother to the colony for a further three or four years. Sooner or later, though, she will become incapable of maintaining the needed rate of lay, and the colony will make the decision to replace her by swarming, as they did her mother, or – usually towards the end of the season - by supersedure.

Supersedure

Unlike swarming, which may require many queen cells to be constructed in order to maximize the potential of macro-reproduction, supersedure may only require a single cell, most often large and centrally placed in a specially-constructed recess or hole in a comb. This will be the best queen a colony is capable of making, and much care goes into ensuring that she is first class, as the colony is investing everything in her: she must carry them through the winter or they will all perish.

The swarmed colony, now established in a new home, is building up well. The old queen has resumed laying, and the season moves on. The summer solstice passes, and the bees take note of the shortening days. All their energy now goes into building up their stores to carry them through the winter: even though the summer foragers will never live to feel the cold weather, nor will they eat any of the stored honey, they know that they have to work themselves to death for the sake of the survival of the colony.

Here we see evidence of the true nature of bees: *they never behave as individuals with their own agendas, but always they labour selflessly for the greater good of their extended family*.

We see it again if they are disturbed by a predator – they will hurl themselves at their common foe, disembowelling themselves by leaving their stings behind in its flesh – with no thought for their individual selves, but only for the protection of their super-organism, the colony.

Nectar and pollen are gathered from selected sources and passed from forager to house bee, to be stored, carefully arranged, in cells best placed for their later use. At night, a gentle hum is heard coming from the colony, as ten thousand wings pass a current of warm air across the surface of the nectar-filled cells, evaporating excess water until it comprises less than one fifth of the volume of liquid, when it can be sealed up as honey without fear of fermentation blowing off the wax caps.

Bees born towards the end of the season have a more robust metabolism, as they must live through the tough winter months, when foraging may be impossible and honey stores must be eked out. When spring comes, they must be alert to it and be ready to bring in the early nectar and precious pollen, to prepare new bees for their working summer.

Winter Stores

As the queen's rate of egg laying slows to allow the population to adjust to its winter level, a collective decision is made that the drones – having had free passage since spring – are no longer required in the colony and are henceforth barred from entering. Those within the hive are hustled out by force, and any that resist are put to death by stinging. Drones are only rarely carried through the winter – they appear to have no useful function at this time of year and would only eat valuable food that is needed by the workers. If the bees decide on a late-season supersedure, they will delay the eviction of the drones until the new queen is successfully mated, in case there are none available from other colonies. Many of the drones will, in any case, have come from other colonies, as they have free passage during the summer months.

As the air temperature drops, the bees organize their food stores, ensuring they have plenty within easy reach - above and to the sides of them - and that there are no gaps that may become difficult to cross by the close-knit winter cluster, now only about one tenth of its midsummer size. As the days shorten, foraging has stopped and the bees' metabolism has slowed. The cluster tightens and feeding is reduced to a minimum, for fear of early spring starvation. Through the coldest part of winter, the queen stops laying, as there are enough bees to maintain survival heat within the cluster and more would be a drain on precious resources. All is quiet, until once more the days begin to lengthen and the air begins to warm, and the scent of the first spring flowers drifts into the hive.

In tropical zones, where there is no summer and no winter, there are other conditions that dictate bees' food-gathering and reproductive behaviour, almost always including a part of the year when bees cannot forage. In hot, dry climates, there is a period of drought, when trees shed their leaves in order to save moisture and other plants delay flowering until the rains arrive. In wet, tropical areas, the monsoon season will keep bees indoors for the duration.

Seasonal Cycle

So our colony undergoes expansion, division and contraction, according to the availability of food, which is closely linked to the seasons and the local climate. Its only concern is its own survival, and to that end, individual bees will sacrifice themselves without a moment's hesitation. The colony has – as it were - phantom 'limbs' that reach out into the surrounding fields and hedgerows to seek food in quantities that are individually tiny and bring it back inside its 'body', where it is processed, amassed and sealed in containers made from substances it creates for itself. When its body outgrows its 'shell', it divides in two and the 'naked' part seeks another shell. Such is the robust nature of its internal generative system that, should any harm come to a queen, a new one can quickly be made from any convenient, fertilized egg, by re-building its cell or moving it to a proper queen cell and feeding it copious amounts of royal jelly. Such an 'emergency queen' will tide the colony over for a while until it can make a perfect supersedure queen to ensure its continuance.

The colony survives all individuals - even the queen will be replaced sooner or later – and in that sense is potentially immortal. The huge variability contained in the genes of honeybees across their entire range comprises their insurance against disaster: within that gene pool is the potential to find a niche in which they can survive despite almost anything that may happen in the wider world.

Each colony – each 'collective creature' – develops its own variations of possible responses to intrusion. Anyone who has handled a number of hives will know that they all have particular 'personalities', from the most passive and co-operative to the most defensive and belligerent. Some will hardly respond at all to the gentle touch, while others may scamper all over the combs or fly into a violent rage at the slightest excuse. Some will keep themselves to themselves, while others will rob all nearby competitors of their stores and leave their victims to starve. Italian bees (*A. m. ligustica*) are inveterate and incurable robbers, while the native British bee has no such tendency.
Honeybees cannot be domesticated in the sense that cows or pigs or sheep are: they are essentially unchanged by man, despite many attempts to 'breed' them to our specifications. Their unique mating behaviour and reproductive cycle ensure that diversity and adaptability will continue to be the dominant themes in their evolution.

Such is the nature of the honeybee. We cannot apply human values to their behaviour, but rather we must seek to understand them on their own terms, in the context of the natural world we share with them.

HONEYBEES AND HUMANS: A MEETING OF SPECIES

Our first encounters with honeybees were long ago, most likely in Africa. Someone discovered – probably simultaneously - that these tree-dwelling insects produced a sweet, sticky substance unlike any other, and that they had stings in their tails.

When fire became portable, someone else discovered that smoke would cause bees to become more amenable to robbing.

Some time later, a more settled tribe found that they could house bees in baskets or pots, which saved them the trouble of climbing trees to get the honey, and the craft of beekeeping was born. Pots, baskets and logs continued in use for many centuries, and while proficient beekeepers would have understood a good deal of the behaviour of their charges, the inner secrets of the hive remained closed from observers until the end of the 18th century, when a blind Swiss by the name of François Huber found them out through the medium of his faithful – and sighted – servant, Burnens. Huber's *New Observations on the Natural History of Bees* remains a classic to this day.

Some 30 years later, Jan Dzierżon developed Huber's experimental hive further to create the first truly practical, movable-frame beehive, and shortly afterwards in 1852, Rev. Lorenzo Lorraine Langstroth patented his own version. Such was his talent for publicity and marketing that the 'Langstroth' became and remains the standard hive in the USA and the model upon which most other variants are based.

However, this type of hive is expensive to buy, very difficult for amateur woodworkers to build – due to the precise dimensions and many small parts needed for frames – requires constant maintenance, causes great disturbance to the lives of bees, and is heavy and cumbersome in use. Many women, especially, have been put off beekeeping by the weight-lifting needed to harvest honey from a framed hive, and hernias are commonplace among commercial beekeepers.

In Nepal, honey-hunting is still practised by men descending cliffs on ropes and using long poles to dislodge chunks of comb. Elsewhere, bees are still kept in skeps, baskets, pots, cavities in walls and other containers devised from local materials and – we can deduce from their longevity – more-or-less suitable both for bees and for their keepers. In Africa, the top bar hive was developed as an 'intermediate technology' solution, capable of being constructed using local skills and materials and being, in essence, a beekeeper-friendly hollow log, having the advantages of movable combs but without the need for standardized, machine-made parts.

Whatever the accommodation we offer them, our meetings with bees have always been a process of negotiation, albeit somewhat one-sided. We can protect ourselves from them, but they ultimately have no protection from us. The encroachment of chemical agriculture, deforestation and urbanization have reduced their natural habitat, while toxic cocktails of insecticides have poisoned their food flowers.

The honeybee has come to be seen as the 'canary in the coal mine' of our civilization and she is showing early warning signs of her imminent demise, to which we must pay urgent attention.

Our challenge now is to re-negotiate our relationship with bees: we must learn to protect and nurture them, rather than simply exploit them, and we need to learn to listen to what they need from us. The process of discovering how we can most effectively do that is the project that myself and others have set ourselves, and we hope that many more will join us and carry this work forward.

NATURAL BEEKEEPING: A NEW APPROACH

We have to acknowledge the difficulty inherent in the phrase 'natural beekeeping': as soon as you consider 'keeping' bees, you begin to stray from what is truly 'natural'. In nature, only bees keep bees.
So what do we mean by 'natural beekeeping', and what is 'unnatural' about conventional beekeeping?

To be considered 'natural', our beekeeping must take into account:

1. the *natural impulses* and behaviour of bees, including - foraging, swarming, storing food and defending their nest
2. how *hive design* affects bees
3. the suitability of *hive materials* used, including considerations of sustainability
4. the nature and frequency of our *interventions*
5. the *local impact* of a big increase in honeybee population on other species of pollinators
6. the balance between *honey harvesting* and the bees' own needs
7. the nature of any added inputs – *medications and feeding*

Natural impulses

A good deal has been written about swarming - mostly about how to prevent it. Conventional beekeepers spend a good deal of time and effort doing their best to thwart the bees' impulse to swarm. Experienced beekeepers will tell you that preventing swarming is very difficult and time-consuming and – as often as not - unsuccessful: natural beekeepers will tend to focus on ways to work with, rather than against the bees natural reproductive cycle.

Similarly, we have to make allowances for the fact that bees will – to a greater or lesser extent – collectively defend their home, their queen and their food stocks, and adjust our behaviour to cause them minimum stress.

Hive design

There are hundreds of hive designs, and more are added each year. Most of them use frames (for the convenience of the beekeeper) and wax foundation to suppress any temptation to build drone combs. To my thinking, both of these items get in the bees' way and cause more problems than they solve: frames create excellent hiding places for pests such as wax moth and small hive beetle, while foundation is simply old wax recycled along with traces of pesticides and all the chemicals other beekeepers have added to their hives – legally or otherwise – along with their largely unknown breakdown products.
Top bar hives – horizontal or vertical – or some form of log, pipe or basket/skep hive – are preferred by natural beekeepers, as they are designed primarily to suit the needs of the bees, rather than the beekeeper, while still making 'beekeeping' – as opposed to 'bee-having' – a practical possibility.

Hive materials

Plain, untreated wood is the most obvious first choice for hives, as being the closest to the bees' preferred habitat, the hollow tree.

Straw is also an excellent choice, especially where grasses are more freely available than timber, while pottery/clay hives are common and suitable in some countries.

Sustainability should always be a consideration, including the energy content of a hive: framed

hives, for example, have to be made using power-hungry machinery due to the close tolerances in their design, while top bar and other simple hives can largely be made using hand tools.

Interventions

Natural beekeepers only open hives when there is a good reason to do so, and tend not to carry out 'routine inspections' just because so many days have passed, unless they suspect a problem following observations at the entrance. We use other senses, such as smell and hearing, to help diagnose the health of the colony. We consider that the atmosphere of the hive is important both for the retention of heat and the bees' own control of potential disease and pest problems. Unnecessary interference in the highly organized lives of bees causes them stress, which may well make them more susceptible to disease.

Local impact

There has long been a tendency for beekeepers to assume that their bees can only add to the quality of the local ecology, forgetting that swamping an area with hundreds of thousands or even millions of honeybees may be potentially deleterious to the local bumblebee or mason bee population, for example. The natural beekeeper will consider such environmental factors when planning where to place hives, and in what numbers.
Likewise, all beekeepers should be aware of the potential impact of the proximity of hives on other people and animals such as horses, which are notoriously sensitive to bee stings.

Honey harvesting

Of course, most people keep bees for their honey, and commercial beekeepers manage their bees to maximize honey yields. Natural beekeepers may prefer to keep bees for their own sake, or take only the honey they judge the bees can spare, ensuring that bees have enough to carry them through the winter or dearth period.

Medications and feeding

The abuse of medications is almost certainly a causal factor in the recent crisis in bee health, particularly in the USA. Both amateur and commercial beekeepers have for years been advised by their so-called professional bodies that it is essential to apply prophylactic antibiotics, anti-tracheal mite and – most notoriously – anti-Varroa treatments on a regular basis, despite the growing evidence that they were accelerating the evolution of treatment-resistant bacteria and parasites by so doing.

Adding any foreign substance to a hive causes the bees extra work by diverting some of their energy towards dealing with the intrusion. The natural beekeeper prefers not to use any medications, and if any treatment proves necessary, will opt for herbal, homeopathic or bio-mechanical remedies with the minimum disruptive effect.

Likewise, the natural beekeeper regards feeding sugar as a last resort rather than a routine procedure, preferring to leave bees to overwinter on their own honey and harvesting the surplus in the spring, when it is no longer needed.

So we are engaged in a constant process of working towards the ultimately unattainable notion of completely 'natural' beekeeping, while acknowledging that the bees will go their own way regardless of our wishes. Our relationship with them is that of facilitator or minder rather than 'keeper'. We could say that the role of the natural beekeeper is to enable our bees to attain the fullest possible expression of their bee-ness while in our care.

Sustainability

Our overall goal in natural beekeeping is to achieve a state of sustainability: balancing inputs and outputs such that our activities enhance rather than damage the health of our bees, other species and the planet.

To be truly sustainable, a system must be as close to carbon-neutral as it can be, requiring no synthetic inputs and having no detrimental impact on the natural environment. So if we are to continue to have a relationship with honeybees, we have to consider what impact current beekeeping practices have and how our 'natural' approach seeks to improve on this state of affairs.

A typical commercial beekeeping operation is a real energy hog. Lumber – which may or may not come from sustainable sources – is sliced and milled by powered machinery prior to assembly into hive boxes, which are transported by road, sea or rail to be further distributed by road to their apiary sites. Regular visits by beekeepers require oil-derived fuel, and more is needed to fire the boilers to heat the considerable quantities of water needed for sterilizing woodwork and washing down de-cappers, extractors, tanks and floors. More power is needed to retrieve the crop, to extract it and to mix and distribute the sugar syrup needed for the bees' survival following the removal of their stores. Honey must then be filtered, bottled and distributed to wholesalers and thence to retail outlets. Meanwhile, beeswax is recovered by means of steam or boiling water, cleaned and filtered and sent off to be re-melted and turned into sheets of foundation, which are then sold back to the beekeepers for insertion into frames for next season.

Migratory beekeepers in the USA truck hives by the thousands clear across the country for the almond pollination in California, then northeast to Maine for the blueberry crop. In the UK this type of activity is nowadays largely restricted to taking hives up to the moors in August for the heather. Although a certain amount of migratory fruit pollination work is still carried out, it is much less done than it used to be, since – thanks to globalization - imported honey became cheaper than home-grown and undermined our local market, making honey production in the UK a decidedly marginal proposition.

Due to what might be called the Langstroth hegemony, this whole scenario is also enacted in miniature by amateur beekeepers, who are taught largely to mimic the activities of their commercial brethren. They may only have a few hives at the bottom of their gardens, but in most cases they have not considered any alternative to the expensive, energy-hungry equipment available from the glossy catalogues of the beekeeper's suppliers.

We know that bees need nothing much more than a dry, ventilated cavity in which to build their nest. Instead, 'modern' beekeepers insist on supplying them with a box full of wooden frames, in which are mounted sheets of wax, helpfully imprinted with worker-sized hexagonal cell bases. A newly-hived swarm of bees must be surprised indeed to find so much done for them: ready-made comb bases hung in neat rows, with spaces all around them for access – what a boon for a busy colony!

But what may at first sight appear to be a great convenience, also has some significant drawbacks. All these imprinted cells are the same size, yet anyone who has observed natural comb knows that cell sizes vary considerably, and not just between workers and drones: worker cells themselves vary in diameter according to rules only bees are aware of. All those dead-straight frames may look neat, but bees don't build dead-straight comb – they like a gentle curve here and there. And if you watch bees building natural comb in an unrestricted space, they hang in chains, legs linked, as if laying out the dimensions of the comb in space as they work above their own heads – something they cannot do on man-made foundation.

So a good deal of so-called 'modern' beekeeping – in fact, virtually unchanged since the mid-19th century – is unsustainable from our point of view. In terms of honey yield, it is clearly an improvement on logs and skeps, but in terms of bee health and energy efficiency, it is a disaster.

The work of the progressive, balanced beekeeper is to find ways of interacting with bees that are truly supportive and sustainable, both for the bees themselves and for the planet.

PRINCIPLES OF NATURAL BEEKEEPING

In *The Barefoot Beekeeper*, I proposed the following three, simple principles for the 'natural' or 'balanced' beekeeper to consider:

1. *Interference in the natural lives of the bees is kept to a minimum.*

2. *Nothing is put into the hive that is known to be, or likely to be harmful either to the bees, to us or to the wider environment and nothing is taken out that the bees cannot afford to lose.*

3. *The bees know what they are doing: our job is to listen to them and provide the optimum conditions for their well-being, both inside and outside the hive.*

These three simple principles seem to me to form a solid foundation for our thinking about how we approach bees and beekeeping. As soon as we step beyond those basic principles and attempt further to define the parameters, we find ourselves in danger of beginning to create a 'book of rules'. And it doesn't take much looking around the world today to see how divisive and destructive other 'books of rules' have been.

'Natural', 'balanced' or 'sustainable' beekeeping – whatever name we give it – is a *process*, not a single destination. We have to remain flexible and always be on the lookout for ways to improve our techniques, so everything in this book is offered in this spirit: indications of what seems to work, always with the possibility that there are even better ways yet to be discovered, or – more likely – re-discovered, as there is really nothing new in beekeeping.

HOW TO BUILD YOUR OWN TOP BAR HIVE

Top bar hives are much easier to build than conventional hives, and if you use recycled timber and catch your own swarm, you can even start beekeeping virtually for free!

Illustrated building instructions can be downloaded from the author's site at www.biobees.com
For a detailed account of the theory of top bar hive design, together with detailed building instructions, I recommend *Balanced Beekeeping I: Building a Top Bar Hive.*

FURTHER READING

If you are interested in finding out more about 'natural beekeeping', visit the author's web site at www.biobees.com

The author's podcast can be found on iTunes and at http://biobees.libsyn.com

The Natural Beekeeping Network is an informal, worldwide network of beekeepers who are developing more natural beekeeping methods. Their web site is – www.naturalbeekeeping.org

Friends of the Bees is a UK-based charity that aims to promote natural beekeeping alongside conservation of all bee species. Their web site is – www.friendsofthebees.org

Books by Phil Chandler

The Barefoot Beekeeper

Balanced Beekeeping I: Building a Top Bar Hive

Balanced Beekeeping II: Managing a Top Bar Hive

Learning From Bees: a philosophy of natural beekeeping