

NATURAL BEE HUSBANDRY



The International Journal for Bee-Centred Beekeeping

Issue 1 – October 2016



A Bee Loud Glade, Heidi Herrmann

Apicentric Beekeeping – Origins and Fundamentals, David Heaf

The Modern Top Bar Hive, Phil Chandler

Macedonia: Capturing Old Traditions by Gareth John

Should We All Go Native? Dorian Pritchard, Dip. Gen., PhD

Commercial Warré Beekeeping in Australia, Tim Malfroy



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Editorial

John Phipps, September, 2016

The Magazine

Natural Beekeeping, Sustainable Beekeeping, Bee-centred Beekeeping, Sensitive Beekeeping, Bee-friendly Beekeeping and Apicentric Beekeeping are just some of the names which have appeared over the last few years to describe a type of beekeeping which differs from conventional forms of honeybee management. These terms are in reality synonymous and on the whole refer to beekeepers who instead of using modern moveable frame hives (usually fitted with wax foundation) are keeping their colonies in top bar hives, Warré hives, log hives, tree hives, skeps and sun hives, for example. Fundamentally, this ever-expanding group of beekeepers wish to give the bees homes made of natural materials, to allow the bees to build their comb freely (with the appropriate amount of drone comb), to let the colonies develop in a natural way, restrict to the minimum (if indeed any) intervention into the hive, for instance to implement swarm control measures, to take from the hive only honey which is surplus to the colonies needs, and use no chemical or aggressive forms of varroa control. Indeed, it would be true to say, that many of these beekeepers have colonies only in their gardens in order to boost the number of bees in the environment for pollination purposes as well as having the sheer delight that it gives them to watch their activities.

It would be very wrong to state here that beekeepers who use conventional hives do not share the same aims as 'natural beekeepers'. The way that conventional hives are used – with careful management – can allow beekeepers to realise some of the same objectives, though the architecture and inner structure of the hives may not allow the bees to build a nest as nature intended.

Much thought was given to the title of this new journal, and contrary to comments from some eminent beekeepers, I decided to keep the archaic word 'husbandry'. 'Husbandry' means more than management. In the past it referred to the homestead, the keeping of livestock, the garden and the farmer's fields. Husbandry means care with responsibility, a sensitive

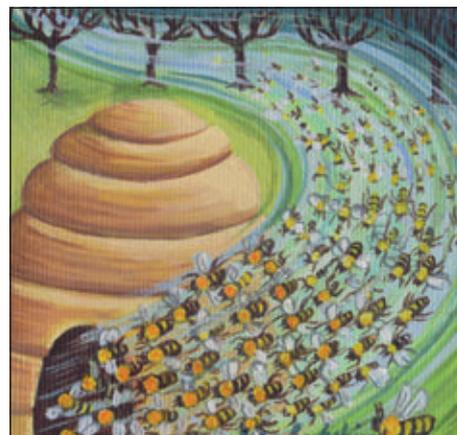
approach to man's relationship to the land, to the animals that he keeps and ultimately to his immediate environment.

Many forms of natural beekeeping in use today are based on old, traditional practices. For centuries, such hives produced enormous crops of honey and wax without the many problems that beset beekeeping today. Whilst modern beekeeping (i.e. post 1851 with the use of the moveable frame) has allowed the business of harvesting honey and the establishment and management of large apiaries easier, at the same time the constant manipulation of colonies and the exchanging of frames between hives has had a detrimental effect as regards colony health and the spread of disease from one apiary to another.

Almost all beekeeping journals are targeted at those who keep bees in conventional hives. However, naturally inclined beekeepers need as much help and guidance as others members of this huge international fraternity. It is the aim of this journal to explain the philosophy of bee-centred beekeeping, to allow readers to become aware of the options available to them, and to give advice on how this special relationship can be successfully achieved in their own apiaries. Once mastered, the apicentric beekeepers will find a new aesthetic dimension in their craft, and have the pleasure of working through the seasons in complete harmony with the bees which share their space.

The Logo

A long time ago I bought the painting illustrated here of the swarm entering a skep (top right). It is a powerful image, full of vitality, reflecting the enormous potential of the colonising bees. For most beekeepers, the sight of a swarm entering a hive of its own free will or being hived at dusk is one of the most wonderful happenings in beekeeping. This being the case I asked the artist, Lisa Berkshire, if we could adopt the image as our logo. Having given us permission to do so, she told me that the painting was completed just after she graduated from Norwich School of Art and that it 'was inspired by a project



I completed for a children's book which was based around seasonal proverbs, the one about bees being "Bees swarm before a near storm." I love to get movement into my work and this subject was perfect for that." Without any doubt, Lisa fully captured the energy of the swarm and it is an image that we are proud to use. There is more information on Lisa and her work on our journal's website and her gallery can be viewed at www.theillustratedworldof-lisaberksire.co.uk.

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Cover Design: Jonathan Burbidge

Cover Photo: A part of Heidi Herrmann's garden devoted to bees. By Heidi Herrmann.

Magazine Design: SiPat.co.uk

Printing: Custom Print Limited, Liverpool



A Bee Loud Glade

Heidi Herrmann – Trustee, Natural Beekeeping Trust

“The bees rise and fall in front of the entrance like a cloud of atoms, each of them shaped – right down to the hair on their tongues – by the overwhelming purpose of the hive. I feel that if I just stand there long enough, watching the bees land at the hive entrance, watching them dance in their minute shadows thrown by a warm sun overhead – then perhaps I’ll understand the purpose of life, too.”

Verlyn Klinkenborg

The bees with whom I enjoy kinship and who delight my existence, and the place where they live, can hardly be called ‘mine’. I learnt from a piebald horse in a story by Lev Tolstoy that there are things that should not be spoken of in proprietary terms. In the story, the horse called Strider said: “The words ‘my horse’ applied to me, a live horse, seemed to me as strange as to say ‘my land’, ‘my air’, or ‘my water’”. However, titles got chosen for the cover of this launch issue of “Natural Bee Husbandry” when it was just an ideal in the minds of two bee-loving people, John Phipps and Jeremy Burbidge. When we got the news, the bees and I, we were happy, we rejoiced and agreed that I would write a piece called ‘my bee-loud glade’. So much for the change of title.

It’s perfectly understandable that we all say “my bees”, even though it’s a bit misleading because in reality each hive is inhabited by a being for which the English language has no word and which in my

native tongue is called Bien, and each Bien has a distinct personality, just like people do, and they all belong to a world of goodness and grace and speak in a language that is common to all the bees of the world and to us is like code. We beekeepers spend a lot of time speculating about them and guessing their intentions. Some will even open the hives to take apart the wholeness like taking files out of a filing cabinet, and let’s face it, modern hives make that easy. We can’t bear not to know what they’re up

to in their hives. And yet we shouldn’t forget that they’re not “ours”, even though we can relate to them deeply.

I recall vividly how the bees in that paradise flower garden where everyone speaks in code, responded to my visitors’ glad tidings. It was midsummer. Natural bee husbandry! A magazine devoted to a growing movement that’s causing honey-driven beekeepers some alarm. That people should want more humane approaches to bees or even keep bees for the pleasure of their



Heidi with a straw skep.

Left: Part of Heidi's wonderful flower garden planted especially for bees. Decorated Einraumbeute hives in the background.

Right: Vera Oruc watching a swarm enter a Warré hive. Honeybees, filled with honey which they will use to make their new combs, are normally very gentle at this time. Watching a swarm entering a hive is one of the greatest pleasures in beekeeping.



company threatens assumptions that have become deeply embedded ever since the invention of the frame hive. But the sheer variety of forms in which efforts towards natural bee husbandry are manifest in the world, together with the clarity of purpose that is common to all, bodes well.

The bees all sent out their young on orientation flights when we arrived in the garden. There was an exuberant mood. John Phipps, who was a smallholder once, and a teacher and always a beekeeper, told the bees and me about his plan to launch into the world a quarterly publication directed at raising the profile of bee-centred husbandry. I fancy that the bees were delighted. --- When the young bees leave the hive for the very first time, they emerge en masse, hundreds from each hive, and they dance in circles, faces turned hive-wards, for ten minutes or so until they have learnt the exact position of their home in relation to the world outside, into which they will soon venture to work and where they will eventually die. It's blissful to be amongst them at such times. On every sunny day, there is a time for these beautiful dances, hovering on the threshold between inner and outer world, and they're a wonder to behold. Where I live these orientation flights happen after noon time, and then time invariably stands still while they last.

Imagine the inner hive, where all is ordered, purposeful, fragrant and utterly in the service of the colony's bid for

immortality, the perpetuation of the species - imagine the contrast between the inner sanctum of their world and the world outside. Imagine the bees meeting what we have made of it. Noxious fumes and toxic blossoms that will impair their nervous systems and threaten to render them powerless to deploy their supreme ability to keep the world in flower and fruit. We may well feel concern in our hearts as we watch them soar from their hives.

When they first emerge for their playful and utterly mesmerising orientation flights they circle the hive with perfect poise and the air resonates with the sound of thousands of softly whirring wings. Soon they will fly out to return with substances for the hive to transmute into healing substance. They are perfection embodied. No wonder that in the company of bees we can find ourselves lulled into phantastic oblivion and that we should seek it and feel at peace with the world in their benign presence.

We can be grateful to the bees for what they are, and for persisting in the face of adversity, forever showing us the gift of their grace. The unease I think we all feel comes from knowing that all needs to change. That the relentless proliferation of a mindless agriculture which does not deserve its name, turning ever larger swathes of the earth into deserts, cannot sustain life. All is not well, especially with the flowers, even the wild ones growing along fields of chemically-grown crops have been found to be lethal to the insects

they attract, and that is a profound sadness of our time. We may feel powerless to stop what feels like an inexorable onward march of forces directed against the living earth, but our collective unease can also help us to attain to a heightened awareness of our individual tasks in these troubled times.

As for me, I have long ceased to manage the bee colonies as I had been taught by well-meaning people. Learning the preferences of the bees in the place where I live, and growing in abundance the flowers they favour now seems a more fruitful occupation. Watching the bees as they leave and arrive at the hive, and thanking them for making all things better is also rewarding. I am exceedingly fortunate to be part of an emerging community of beekeepers who have chosen to defer to the bees for guidance on all beekeeping matters. Of all the ways touted these days to 'help the bees', beekeeping as commonly understood is not one of them. Most of today's beekeeping is grossly reliant on utilising the bees' legendary capacity for self-healing whilst imposing on them the rules developed by impoverished intellects. It has no future. We human beings dared to engineer the land and then the bees, and now the harvest is poor, and we look to the bees to help us, and teach us their code.

My decline as a beekeeper in the normal sense of the word was triggered by studying the life of the hive as described by scientists such as Mark Winston, Thomas D. Seeley

and Jurgen Tautz. But it was the bees themselves who ensured that everything I'd ever learnt in beekeeping books or from master beekeepers duly unravelled. Space does not permit me to tell you how, but I hope to be able to elaborate on the bees' superior pedagogy on a future occasion. Their method essentially consist of filling the human soul with wonder, and they can achieve astonishing results. Through the study of bees in the wild, especially Thomas D. Seeley's copious research,

we now have overwhelming evidence of the bees' capacities to order their lives, and excellent grounds

for re-thinking beekeeping; it follows that natural bee husbandry is a necessity of our time.

And now to the "The Lake Isle of Innisfree" by William Butler Yeats. I will desist from attributing every flower I have ever grown to this poem and the bees' unfathomable powers.

*"Nine bean rows will I have there,
A hive for the honeybee
And live alone in the bee-loud glade
And I shall have some peace there."*

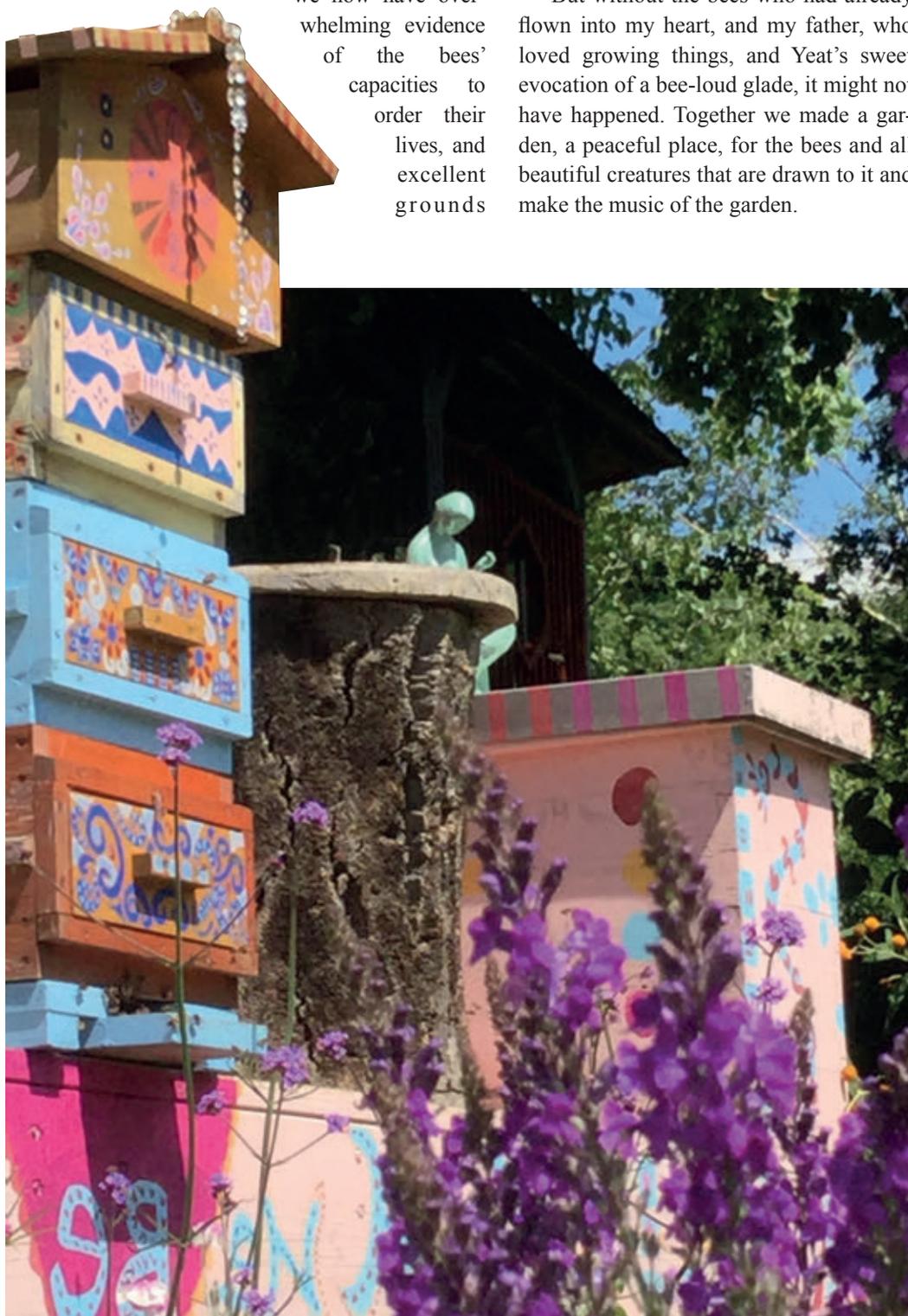
But without the bees who had already flown into my heart, and my father, who loved growing things, and Yeat's sweet evocation of a bee-loud glade, it might not have happened. Together we made a garden, a peaceful place, for the bees and all beautiful creatures that are drawn to it and make the music of the garden.

So many bees are needed to drown out the sounds of the mechanical civilisation whose effects we must suffer because we wanted it and have made it so. And millions of flowers and trees we must grow for the bees. "While I stand on the roadway, or on the pavements gray/I hear it in the deep heart's core" are the words which Yeats chose to end his beautiful poem. It was written in 1892, since when the 'pavements gray' have become the lifeless acres of a disconnected civilisation; in that short time the bees' resilience which evolved over millions of years has reached breaking-point. We feel it in 'the deep heart's core': the earth which has sustained us for so long now needs our warmest engagement. It falls to us to sustain it now.

People's growing inclination towards natural bee husbandry and conservation represent to me a vivid sign of hope in this bleakness, hope that profound change is possible as we grasp for ways to collectively renew our commitment to the bees and all of nature at this time of grave loss and mass extinction. Havens for bees are springing up all over the world, the ancient tree beekeeping practices of the Bakshir from the Urals are being revived to provide habitat for bees, and hives which mimic the bee's natural home in the cavity of an old tree are becoming a focus of beekeepers' ingenuity.

The garden here is a richness of poppies, dahlias, and cosmos right now in late summer. There are, too, sunflowers, lavender, thyme and marjoram, and many rows of beans for the bees. The purple inflorescences of *Verbena bonariensis* rise up here and there in the colourful tapestry, avidly sought out by the bees for their long lasting pollen and nectar, as are the wild roses, Penstemons and Michaelmas daisies. Echinacea's nectar just flows and flows, whereas other blooms are more fickle: they all have their rhythms and the bees' activities rise and fall in tune with them all. It's a garden to go to and feel at peace with the world, a place of thanksgiving, a bee-loud glade.

I thank Mr Yeats profoundly and many others, too, whose love for the bees and work for the world is a constant inspiration. I feel very confident that the new magazine "Natural Bee Husbandry" will make a lasting contribution to a new culture of beekeeping that is grounded in love and respect for the exquisite bees who give us so much.



Plants were chosen to give bees all year round forage.



Apicentric Beekeeping – Origins and Fundamentals

David Heaf – www.bee-friendly.co.uk

What is now widely referred to by the oxymoron ‘natural beekeeping’ comprises a confluence of several streams of beekeepers in various countries who have begun to place more emphasis on meeting the needs of the essential nature of the bee rather than treating it as a machine for producing honey. Over 100 years ago, Ferdinand Gerstung was among the first to call for respect for the integrity of the brood nest, coining the term *Der Bien* which he described as an organism – today we would say ‘superorganism’ – that exists through the harmonic, purposeful interaction of all of its parts or members, and by which each part presupposes the whole as the origin and bearer of its existence. In 1923 Rudolf Steiner drew attention to certain practices in beekeeping that violated the essential nature of the bee, drawing particular attention to artificial queen breeding, which he said would eventually undermine the health of honey bees.

Meanwhile, modern beekeeping was proceeding apace, yet older methods were continuing to be used especially those that favoured natural comb, for example skeps, top-bar hives, logs and clay hives of various formats. The vertical top-bar hive of Émile Warré comprising stacked boxes appeared shortly after World War I and by 1923 he favoured it over the version of his hive that uses frames. He admitted that his hive was not a revolution in beekeeping. Indeed, my own researches show that the same concept – stacked boxes and always extending below (*nadiring*) – emerged about 250 years ago. The horizontal (Kenyan/Tanzanian) top-bar hive, a trough hive, was developed in the 1960s and has become very popular with beekeepers choosing relatively natural methods. That hive concept can trace its roots to ancient Greece.

Above: David Heaf observing the activity of bees at the entrance to the Warré hive.

David, together with his wife, has translated into English from French “The People’s Hive of Abbé Warré” and is the author of “Natural Beekeeping with the Warré Hive” and “The Bee-friendly Beekeeper.”

Not until the 1980s, with the crisis precipitated by the arrival of *Varroa* in the West, do we see people starting to formally associate and work out what features beekeeping should have if it is to respect the essential nature of the bee. Forerunners in this are *Mellifera e.V.*, founded 1985, with their base and teaching apiary at *Fischermühle*, Germany, who elaborated what they called *wesensgemäß Bienenhaltung*, i.e. beekeeping that harmonises with the essential nature of the bee. We could call it bee-friendly or apicentric beekeeping. To complement

their approach they developed two hives. One is a trough or horizontal hive called the Einraumbeute (one-box hive) that is remarkably like Gerstung's hive. It has tall frames of Dadant size rotated through 90 degrees. The other is the Bienenkiste (bee box) largely intended for easy natural comb beekeeping for beginners. Key features of Mellifera's approach include natural comb, working with the swarm urge, no artificial queen breeding, and maintaining brood nest integrity.

One important feature of the *der Bien* that Gerstung drew attention to is roundness. He said that the *Urform*, the primal form for the colony, is the sphere. He supported this assertion with the examples of the shapes of the brood nest, queen's laying pattern, winter cluster, swarm, brood cell shape, mass orientation behaviour and pollen/honey shell or dome and pointed out that the sphere has greater thermal efficiency because of its minimum surface to volume ratio and for the same reason is easiest to defend against attack. The rounded shape has been given special emphasis in two recent hive designs. One is the *Weißenseifener-Hängekorb* of Günther Mancke (Germany), which has now spread to various parts of the world under the name 'Sun hive'. It comprises an egg-shaped two-part straw skep intersected horizontally with a board that supports nine arched semi-frames from which hang natural combs. The top of the hive is a depriving skep having a hole on which can be seated a shallow super. This hive concept has been taken to its ultimate extreme in the *Hobosphere* which comprises eleven completely round frames, and, instead of straw skep casings, the frames are enclosed by two internally hemispherical wooden blocks that together form the base and cover of the hive.

The relatively recent trend towards naturalness in beekeeping is far from being a romantic hankering after traditional, older methods. Rather is it not only a post-modern reaction to the modernism of industrialised apiculture but also it has found its evidence-based justification in existing knowledge of the life history of the honey bee including the most up to date findings of apiological science. Furthermore, although it is true that natural beekeeping has its greatest following among hobby beekeepers, it is not devoid of those who produce honey for sale. For example, one



Exterior of Einraumbeute Hive.

UK company imports 300 tonnes of honey annually from small producers in Africa who use mostly bark and log hives. In the so-called developed countries, commercial natural beekeepers largely use modified Warré hives, horizontal top-bar hives and frame hives, for example the Einraumbeute and even the Langstroth. But use of traditional skeps has dwindled greatly. The 600-skep apiary of Georg Klindworth (Germany), filmed in the 1970s, is no longer operative, but smaller scale Lüneburg skep operations producing honey for sale are still going. There are commercial beekeepers in the Australia, France and the USA using Warré hives with various modifications, the biggest operation I know of comprising 300 hives in the Rhône valley. Among horizontal top-bar hive and Einraumbeute honey producers are Sam Comfort in the USA, and Norbert Poeplau in Germany.

By taking my cue from writings on agricultural and environmental ethics in general, I have examined in a series of articles in *The Beekeepers Quarterly* and in my book *The Bee-friendly Beekeeper* several possible fundamental attitudes of beekeepers towards the living world, ranging

from the most anthropocentric to the most apicentric. Attitude categories range from dominator, to steward, to partner to participant. We can see a spectrum from the bee farmer, who must profit from his bees to survive, to the hobby natural beekeeper, perhaps using organic or biodynamic methods and just enjoying the direct experience of the life of his bees without requiring any further reward. No single one of the four fundamental attitudes or ethical stances is more justified than any other. For example, most of us accept that farmers can make their living from their animals. But what many find less acceptable is unfeeling treatment of bees, for example as shown in documentaries such as *Who Killed the Honey Bee*, behaviour which we could class as that of absolute despotism. And, for the sake of balance, we should mention the other end of the spectrum where we can find examples of a relationship to honey bees we could describe as *unio mystica* (mystical union), one or two examples of which are portrayed in the film *Queen of the Sun*, the focus being more one of communing with honey bees rather than exploiting them.

In the list below are most of the factors that the apicentric beekeeper may consider, though not necessarily adopt. First come characteristics of hives and their siting:

- wood and/or natural fibre with no metal or plastic
- shape suited to the shape of a swarm or cluster
- scope for vertical or horizontal colony growth
- volume and elevation above ground as found when bees are offered the choice
- entrance size, orientation and position as found when bees are offered the choice
- wall thickness as in hollow trees
- uninterrupted brood nest
- queen is in principle free to roam throughout; no excluder
- shaded from hot sun as in a tree trunk
- not in a wet dark dell
- forage accessible and sufficient for the colony density desired, including wintering
- no preservatives on the hive or stand; innocuous natural paints only have locality free of pesticide use.

The following list covers aspects of colony management for consideration:

- bee-centred management instead of maximising production of hive products for profit
- natural comb; no foundation
- colony reproduction by natural swarming
- no queen mutilation (marking, wing clipping)
- no artificial queen breeding, transplanting larvae, instrumental insemination
- locally adapted queens where possible
- comb fixed to top and walls of hive cavity; no Langstrothian ‘bee spaces’
- absolute minimum interference with the hive
- rarely opening the hive top, which lets the heat out
- no or minimal use of smoke
- no chemicals in the hive that the bees do not put there themselves, e.g. no varroa treatments
- no drone culling
- feeding only where essential and then primarily honey and/or real pollen
- consideration of impact on other pollinators.



Interior of Einraumbeute hive to show partly completed combs with pegs to help support them

It would be beyond the scope of this article to enlarge on all these aspects, so we will select a few of the more fundamental ones. Among apicentric beekeepers are various degrees of adherence to what is natural for the bees, probably the most apicentric being cutting a cavity in a living tree and baiting it with wild comb to attract a swarm to set up home in it (Zeidlerei). But regardless of one’s outlook on the living world in general and honey bees in particular, there is one factor that should unite all beekeepers and that is their concern for bee health. Even the bee farmer wants healthy bees, otherwise it could affect his bottom line. So I will focus the remainder of this article on a few of the reasons why natural beekeeping can help with bee health.

Clearly appropriate hive design, as regards its thermal performance in hot and cold conditions, will reduce physiological stress on the colony by minimising the allocation of resources, i.e. both honey (calories) and bees, to maintaining thermal homeostasis and ventilation. A vertically uninterrupted brood nest such as in trough hives, log hives or sun hives should help minimise cooler zones where the Varroa mite could have better breeding success, and at the very least promote the integrity of der Bien. Many research papers show adverse influence of non-optimal temperatures on young bee development, and increased susceptibility of colonies to pathogens.

Not overstocking with hives is also a relatively obvious benefit: colonies struggling to nourish themselves may be at greater risk of disease. Less obvious though is the risk of drifting between colonies causing pathogen or parasite spread. Ferals surviving in the wild, i.e. untreated for Varroa have been found to have a density around one colony per square kilometre. Finally, eschewing non-renewables or high embodied energy materials in hives accords with the ecological mindset of those drawn to natural beekeeping. Polystyrene hives are an anathema to them! We have to acknowledge though that the current version of the Einraumbeute has a stainless steel mesh floor. Hive roofs could be made from recycled aluminium, e.g. scrap caravan sides etc.

The comb, a vital organ of the nest, serves as skeleton, womb, larder, communication network, social immune system (through its propolis content), thermal insulator, and, as it matures, humidity buffer. We favour natural comb in order to give the bees almost complete freedom in determining its structure. Insecticides are present in commercial foundation, but the health impact of them is not yet known. The widespread belief among beekeepers that using foundation saves the bees a lot of work is undermined by the following two findings. One study found that natural comb free of honey etc. weighed 10.3 g/dm², foundation 9.3 g/dm², and comb built on foundation 16.7 g/dm². Foundation therefore saved only 2.9 g/dm² of wax. Due to unexpected circumstances, Warré discovered that colonies build natural comb on narrow starter strips as quickly as they draw comb on foundation. Colonies given only worker foundation produce only about 5% drone comb, whereas the average in natural nests is 17%. Could this big discrepancy disrupt colony routine while workers look for corners in which to build drone comb, or convert worker comb? And anything that impairs drone populations could impact polyandry and reduce the number of patrines in colonies. Several studies show that intracolony genetic diversity (polyandry) improves colony homeostasis, health and survival. And aside from their role in reproduction, drones produce 50% more heat per bee than workers, so the 1000 or so drones (5.6% of the total) found in wild colonies are not just a waste of space but instead contribute significantly to colony thermoregulation.

We should not overlook the fact that the comb in most hives used in natural beekeeping is not totally natural. This is because it is not the bees but the beekeeper who usually determines the comb spacing, either with top-bars or frames fitted with comb guides. Only in skeps, logs, clay hives and tree hives is the comb architecture totally natural.

Steiner's warning about artificial queen breeding referred to the intimate relationship between colony and queen, a relationship threatened by mechanisation of the process. We see an increase in mechanisation in a series which progresses from queens raised in the natural process of swarming; to splits made where no swarming impulse has started; to modern queen breeding including grafting larvae etc; to artificial insemination; and ultimately to recombinant DNA technology, this last having been suggested as a way of creating queens capable of producing colonies with disease-resistance traits.

Most breeder's queens are raised from grafted larvae and these are all emergency queens. Beekeepers have long known that colonies often supersede emergency queens. The two types of queen may look the same but the bees can tell the difference. One obvious factor in the intimate relationship between queen and colony is queen substance, long known to be closely connected with colony health and organisation, controlling the behaviour of workers, for example reproduction, foraging, raising new queens and swarming. Queen substance, e.g. queen mandibular or retinue pheromone, has been found to comprise nine chemicals and there is evidence that it contains others as yet unidentified. As 170 odour receptors have been detected in honey bees, it is likely that the chemistry of the intimate relationship between queen and colony will turn out to be even more intricate, for example at the level of receptor chemistry and associated gene expression. The production of queen pheromone is exquisitely sensitive to factors associated with reproduction and mating. In comparing naturally mated queens with those that were artificially inseminated, it was found that the former exhibited the greatest ovary activation and the most distinct mandibular pheromone chemical profile.

In the light of these recent findings, we can justifiably ask the question: is the receptor-pheromone chemistry and the

resulting behavioural responses of workers something we can instantly 'switch on' by introducing a queen into a colony or does it take time for the various classes of worker to adjust their behaviours to the spectrum of pheromones available? If the latter, then the longer-term exposure of the colony to its very own developing and maturing queen may be essential for fully unfolding of the intimacy of the relationship.

Artificial queen breeding is one of the most damaging contributors to loss of genetic diversity of honey bees worldwide. In the USA most commercial hives have progeny from as few as 500 breeder queens. And there has been a tendency for beekeepers to favour a limited choice of subspecies, for example in Europe *A. m. carnica* or *ligustica* or *caucasica* out of the ten available there. As with all husbandry, genetic uniformity exposes the beekeeper to catastrophic losses when disease strikes.

Purchased queens are rarely from the same locality as the one in which they are used and are thus not locally adapted strains that give better colony survival. There was a great wisdom in the tradition of landraces in farming, i.e. breeds adapted to their locality. Recognition of the value of local adaptation partly motivates efforts to conserve the European black bee, *3u. A.m. mellifera*, in its original habitats. The race evolved to cope with the climate and forage of the region with-



Interior of Einraumbeute hive to show a completed naturally-built comb.

out needing the prop of imported sugar, and is rich in locally adapted sub-types. Respecting local adaptation means that the whole task of breeding falls on beekeepers, or at least on local co-operatives of beekeepers, e.g. the Bee Improvement and Bee Breeders' Association (BIBBA) works with local groups of beekeepers to conserve the indigenous bee.

Natural selection works on honey bees not only through survival of the fittest colonies, but also through worker selection of queens. In the natural swarm process, many queens are raised, but only one re-queens the parent colony after the old queen leaves. Queen reproductive traits are regulated by workers who control which queens survive to adulthood. Apart from rejecting grosser abnormalities, breeders use all the queens they produce. Commercial queens vary a lot in quality. Furthermore their transport round the world can expose them to temperatures that impair their performance through reduced sperm viability.

Recent research into queen quality, some of which is referred to in the previous paragraph, is all very well but it largely involves studies of selected performance criteria, and lacks the more holistic perspective of long term colony survival or even of the wellbeing of the honey bee population in a whole region. In a pan-European study called 'COLOSS' it has recently been shown that locally adapted queens improve colony survival.

The other array of complex behaviours that is short-circuited by breeding with disregard for swarming is the whole process of establishing new nest sites. This involves swarming; clustering; deciding on which new site to go to; navigating to it; occupying it and constructing a nest in it sufficiently provisioned to survive winter. One wonders how many generations of preventing this process from running its full course will it take to so weaken the bees genetically that they will no longer be fit enough to survive without human intervention. In one study it was found that about 80% of swarms do not make it through the first winter. This is a harsh selection process, which, if removed by too much care from the beekeeper, for example routine autumn feeding, simultaneously removes a stimulus to long term fitness in the bee population. How swarm-based beekeeping can be managed in various contexts is a subject we hope to see addressed in future articles in this journal.



The Modern Top Bar Hive

Phil Chandler

Phil Chandler with completed comb from a top bar hive.

The principle is simple: a weatherproof box with sticks across the top, to which bees attach their comb. My hives have low entrances, sloping sides and a pair of follower boards to enclose the colony. There are many variations on this theme and all have the essential guiding principles of being simple and inexpensive to build and ‘bee-friendly’.

There are no frames and in the simplest form, no queen excluders, no ekes, no supers, no foundation and there is no need for extractors, settling tanks, filters, de-capping knives... in fact no need for any other equipment or storage space, other than that provided within the hive itself. And if you have just spent an hour leafing through suppliers’ catalogues, wondering how you can possibly afford to keep bees, that will come as some relief!

Top bar beekeeping really is ‘beekeeping for everyone’, including people with disabilities, bad backs, or a reluctance to lift boxes: there is no heavy lifting once your hives are in place, as honey is harvested one comb at a time.

From the bees’ point of view, top bar hives offer shelter, the opportunity to build comb to their own design – without the constraints of man-made wax foundation – and minimal disturbance, thanks to a ‘leave well alone’ style of management.

From the beekeeper’s point of view, the conventional box-and-frame hive works reasonably well. It is a simple matter to lift individual frames out of the hive to see what the bees are doing and - if you are fit and have a strong back - it is relatively easy to remove the honey crop.

From the point of view of the bees, however, it has a number of disadvantages:

- The frames are rectangular, while bees naturally build comb in deep, catenary curves.
- Bees use vibration extensively in their transmission of information around the hive: the waggle dance being the most obvious manifestation. Frames dampen these vibrations and thus interfere with the bees ability to communicate.
- The use of pre-formed, worker-cell size foundation forces bees to build comb according to our requirements, not theirs. They prefer to adjust the size of their worker cells according to season and build drone cells according to how many males they choose to raise.



Part of Phil Chandler's apiary with several top bar hives.

Phil Chandler is the author of "The Barefoot Beekeeper", "Balanced Beekeeping I: Building a Top Bar Hive" and "Balanced Beekeeping II: Managing the Top Bar Hive".

- Bees like to build queen cells around the edges of their comb, which is difficult if foundation wax covers the full width and depth of the frame.
- They prefer to space their honey storage combs slightly wider apart than their brood frames, which is impossible if all frames are equally spaced.
- They prefer to live in cavities with plenty of space below their combs, while modern hives have only a small space – often as little as a single bee-space - between the bottoms of the frames and the floor.
- And the very feature that make this arrangement most suitable for beekeepers, the fact that frames are movable and removable, spells disaster for bees if their caretaker chooses – as too many do - to re-arrange their nest according to whim, careless or ignorant of the needs of the bees.

In fact, most 'modern' hives are also less than ideal for beekeepers:

- When the lid and inner cover are removed, the whole colony is exposed at once, causing a sudden temperature change and an instant, mass protest. The beekeeper tries to silence this revolt by applying liberal doses of smoke, which, as often as not, aggravates the bees rather than subduing them, often with painful and disruptive consequences.
- Frames are made to precise dimensions, which means that they must be purchased - at no small cost - from manufacturers equipped with precision machinery and are laboriously assembled with hammer

and pins. They are easily damaged by rough handling and are difficult to clean thoroughly.

- Foundation wax also has to be bought in - as precision mills cost a king's ransom - and fitted carefully into the frames with more pins and wire.
- The wax used for making foundation contains a random mix of all the lipophilic substances that previous beekeepers have chosen to apply, as it is bought in by the millers from whoever cares to sell it to them. This may include sources that are less than scrupulous about the chemicals and medications they use.
- Then, when it comes to harvest time, we have the problem of weight. A full super of honey can weigh between thirty and sixty pounds, depending on the type of hive and number of frames. Not surprisingly, hernias and chronic back pain are commonplace among commercial beekeepers and many people, especially women, are put off even hobby-scale beekeeping by this consideration alone.

The simplest form of beekeeping

Top bar beekeeping is about as simple as beekeeping can get, whilst maintaining provision for occasional inspections, comfortable over-wintering and non-destructive harvesting. Everything you need is in one box – the beehive – which you can make yourself.

Beginners are often told that top bar hives are not for them, with the implication that they need special knowledge or skills to operate successfully, or they are told that

“they won't work in this country”, invariably by people who have never used one themselves and may never even have seen one up close. The fact is that they can work very well in most climates, provided attention is given to insulation above the bars, to keep heat in or out, depending on season and latitude. If beginners learn on top bar hives, they acquire the habit of handling combs gently and with care, which, in my observation, is a skill many conventional beekeepers could usefully practice.

Top bar hives can produce plenty of honey, but most TBHers value sustainability and keeping healthy bees over setting records for honey crops. We aim to work with the natural impulses and habits of the bees, respecting the integrity of the brood chamber, leaving them ample honey stores over winter and generally arranging things in order to cause their bees as little stress and disturbance as possible.

I have used many different types of hive over the last fifteen years, as I love to experiment and explore different approaches, techniques and equipment, yet I keep returning to the horizontal top bar hive for its simplicity and ease of use. To be able to move one of the follower boards aside and watch as the bees continue about their business, apparently oblivious of my presence, is a unique feature of this hive and if it had no other advantages, that would be reason enough for me to continue to use them.

DIY plans for building a top bar hive are available from the author's website: www.biobees.com



Macedonia: Capturing Old Traditions

Gareth John – Trustee, Natural Beekeeping Trust

The Project

Pack your bags, we're off to Macedonia! Thus came the cry ahead of our first fact-finding trip of our Europe-wide Erasmus project. We had already met some of our project partners in Holland earlier in the year. It was called a scoping meeting. A few of us might have called it a fly-swallowing meeting, our mouths being held rather wide in wonderment at what was proposed. We would visit four countries

around Europe to compare old and modern beekeeping techniques, which we would document and describe. We would then use this information to draw up a protocol for sustainable commercial organic beekeeping in Turkey and Macedonia and present this both on a multi-lingual website and at an international conference.

The driving force behind the project comes from an organisation in Turkey, called Buğday ("Boodie"), which promotes organic

farming and food. Turkey is one of the world's major producers of honey. Many of the beekeepers involved still use traditional methods, but they are under increasing pressure to adopt a more intensive approach, similar to that used in other European countries. Buğday realised that this could so easily lead ultimately to the same collapse in honeybee health that has been seen elsewhere around the world. They were not prepared to stand by and just let this happen. Something had to be done. They canvassed support and input from Macedonia, Holland and the UK, worked hard to prepare a detailed proposal, and approached the Erasmus Fund to cover the not-inconsiderable costs. After some tense waiting, Erasmus said 'yes'.

The thinking behind the collaboration is smart. Turkey and Macedonia are just entering the phase of intensified beekeeping. Holland and the UK did this some time ago and some within those countries have started to come out the other side, re-discovering old ways and adapting them to the modern era in a manner that is sustainable in the long term. Apart from Buğday, the other project members are a group of Dutch beekeepers called Smart Beeing, the UK's Natural Beekeeping Trust and the organic producers' organisation Aronija ("Aronia") in Macedonia.

Macedonia

The Republic of Macedonia is a small country to the north of Greece. For historical reasons, and somewhat confusingly, the north of Greece itself is also called Macedonia but that Macedonia is very flat and



Above: Traditional Macedonian 'Trmka' skep. Old paper feed bags provide additional weather protection. Note the dark local bees, *Apis mellifera macedonica*.



A certified organic apiary in the Macedonian mountains.



heavily agricultural, whereas the Republic of Macedonia is very mountainous, with agriculture confined to the flat fertile valleys. Much of the agriculture is non-intensive and many farmers are registered as organic. But what really sets the country apart, from a beekeeping perspective, are the mountains. These are covered with deciduous flowering trees that produce copious amounts of thick, dark, rich-tasting honey. When we met our first Macedonian beekeepers we could hardly believe the yields of honey they reported. We have not seen yields like that in the UK since the mid 19th century! One was tempted to think that their bees must be heavily man-



Above: Trmkas are woven from willow and clematis vine, and covered in cow dung. This one is being held by Rachel Hanney, a skilled British skep maker.

Left: A hive cut into the mud of a cliff face. The front is closed with a piece of flat stone sealed with a mix of mud and manure, leaving a small entrance hole. Honey is harvested from the side combs.

aged and fed large amounts of sugar. How wrong we were. What we were to witness was a veritable bee paradise. Bees were everywhere, both managed colonies and wild ones. As we walked through apiaries our nostrils were filled with the delightful aromas of the plentiful and varied herbs we were crushing underfoot. If bees could not be healthy and productive with all this food and medicine on their doorstep they could not be healthy and productive anywhere.

Although box hives can be seen throughout the country, many beekeepers also keep a few traditional skeps or 'Trmka'. These are woven from willow

large amounts of space above the brood-nest. Swarming was allowed but happened in only around 10% of cases, enough to allow the replacement of queens without the need for any artificial queen rearing.

Perhaps the most unique apiary we saw was set in an old abandoned village. To reach it we had to walk for some seven kilometres, down a dirt track through hills that were rich in flowers with occasional cultivated fields dotted between the extensive meadows. The beekeeper assisted our passage by ferrying groups of us in a well-used white Lada jeep. This saved walking but frayed the nerves somewhat as he

mid 1980's. Such is the supply of swarms that he informed us he could, if he wished, have an almost unlimited number of colonies.

England

Later in the year it was the turn of the project group to visit the UK, specifically the South of England. Now that we knew the group rather better and were aware of their interests, we included visits to several small and medium-sized biodynamic farms. Seeing the health and vigour of the animals and crops at a farm such as Tablehurst, in Sussex, really brings home the



Matt Somerville's Freedom Hive mounted on a tripod. The hive is 12 sided, double walled and replicates a hollow tree.



Characteristic of all the bees we saw in Macedonia was their great docility and patience. Nobody was stung despite the incursions into the bees' domain and the many strangers around the hives.

and the stems of wild clematis, which is abundant everywhere, and are coated with cow dung. The bees seem to like them and they are inexpensive to make, if somewhat time-consuming.

Box hives are often of the Dadant-Blatt type. One successful commercial apiary, miles from any agriculture, had 60 or so in one location. These hives had no queen excluders and were managed by adding

drove as if on a racetrack. His hives are cavities hollowed from a nearby cliff face. They are populated exclusively by swarms from wild colonies that live in similar cliffs in the surrounding hills. Unlike some of the large scale commercial beekeepers we visited, this one saw little need to treat his colonies for varroa. He has been spending the summers in this former village, growing vegetables and keeping bees, since the

effectiveness of the biodynamic approach. I have never stood amongst such healthy tomatoes! A magical day was then spent with Heidi Herrmann's bees in their beautifully decorated hives of all descriptions. The weather was warm and the bees rewarded us richly by gracing the party with a demonstration of swarming.

We next visited a commercial apiary just south of London run by David Rudland,

a former bee inspector. He and his wife have built a successful beekeeping business over recent years. They do not depend on any one aspect of beekeeping but cover a wide spectrum, from honey production to pollination to wax supplies to teaching - all points of interest to the commercial beekeepers in our party. Although David is a conventional beekeeper, he also understands the approach of those who prefer a more natural route and is more than happy to talk and compare methodologies with others. He fully accepts that some of what he does is less than ideal for the bees. But he tries to understand any harm and minimise it as far as possible.

From David's apiary we moved to Matt Somerville, in Hampshire. Matt makes log hives and the 'Freedom Hive', named because it give the bees the freedom to do as they wish. The hive can be mounted on a tripod or lashed, without legs, high in a tree. Not only are these hives aesthetically pleasing but they mimic the size of cavity to which bees are attracted in the wild. Being double walled they are also very warm. Experience confirms that swarms do indeed find them very attractive, moving in of their own volition and subsequently thriving, rapidly building long natural combs.

The next day our visitors were taken to a high security prison, not because of any misdemeanours, but because they were keenly interested in the rehabilitative work being done there with bees, Sun Hives and organic gardening. Sadly there is not space to expand on that here, but details of the project are on the Natural Beekeeping Trust's website.

The visit to the UK concluded with a day at my own apiary of Warré hives and variants thereon. Like the rock hive beekeeper in Macedonia, I find no need to treat my bees for varroa and we spent some time discussing this. For much of the week the weather had been unsettled and the bees had been tetchy, quite unlike the bees in Macedonia. It was a pleasure and a relief, therefore, to be able to show our visitors that, as can be seen in the photograph, not all English bees are unwelcoming of visitors.



Gareth John and visitors.

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Should We All Go Native?

Dorian Pritchard, Dip. Gen., PhD

Dorian speaking at an apiary meeting at his home (Photo - Chris Wren).

Part One

All across Europe most honey bees now survive apparently only with human help and the noxious produce of the pharmaceutical industry! The recent COLOSS survey found that of 597 colonies of 5 subspecies and 16 genetic origins established in 20 professionally-run apiaries, only 94 (15.7%) managed to survive a mere 30 months without a chemical fix! (see Büchler, et al, 2014) Each location contained bees of local strains together with at least two others of foreign origins (see Meixner et al, 2010;

2014). The enemy that brought most of them low was Varroa destructor.

This is a truly shocking finding, to me perhaps more than most, because, despite varroa being all around me, I have not treated my bees with any anti-varroa chemical, or relevant biotechnical procedure, since 2002. During those 14 years, of a total of several hundred colonies, I have lost no more than 3 for which the cause could be considered to be varroa or its associated viruses. For many years I have hardly seen a mite in my hives, nor

a bee with signs of deformed wing virus. This year (2016) in my 30+ hives I've seen just one worker with shrivelled wings, and not a single varroa mite. No doubt there are some, but you'd have to look hard to find them.

I think a strong clue to the health of my bees lies in the finding of the COLOSS scientists that at every test location it was the local strain of bee that fought its corner with greatest success (Büchler, et al, 2014). Indeed, colonies with local queens survived on average 83 (+/-23) days



The author's Northumberland strain of *Apis mellifera mellifera*.

($p < 0.001$) longer than those with non-local queens. I have selected and bred from local bees for nearly 40 years now, with a view to strengthening representation of the local variant of the North European Dark Bee, *Apis mellifera mellifera* L. in my area of Northumberland. In the survey it was not necessarily the *mellifera* subspecies that was most successful, but only so where *A. m. m.* was native to that locality. The important point is that independent survival of honey bees everywhere against this new pathogen turned out to be highest in stocks that were already naturally selected to dwell at that specific location.

To biologists this should cause little surprise, as we are brought up in the Darwinian mind. This teaches that all species are the outcome of repeated rounds of genetic selection by a host of environmental factors and traditional pathogens, which must perforce act locally. Wherever they are, local wild species whose ancestors have survived there for thousands of generations without human supervision must, of necessity, be well adapted to the environmental factors that define the home locations of those ancestors. These adaptations are specified by the genes inherited through generation after generation of well adapted survivors. True, environments change, but adaptability has also been selected, like

our ability to tan or go pale depending on the intensity of ambient sunlight, both skin shades having survival value in the appropriate regime. So changes in agricultural practices and environmental fluctuations, like global warming and cooling, are also accommodated within the native bees' behavioural and physiological repertoire, provided those changes are not too profound in kind, too major in degree, or too extended in time. Imported honey bees similarly well adapted to climatically very different locales are already under adaptive stress in their new homes, so their chances of success when other things go wrong can be expected to be relatively slim.

A term sometimes used in this connection is "antagonistic pleiotropy" (Fry, 1993). Pleiotropy refers to a gene which controls more than one aspect of phenotype. Coupled with "antagonistic" it implies opposite effects on fitness in different habitats, so that no single genotype is universally superior (Büchler, et al, 2014). Bienefeld and Pirchner (1991) considered most colony traits to be expressed in both workers and queens, although often with opposite selective value.

In relation to the COLOSS finding, the most likely parameters of success or failure were thought to include aspects of colony development, behaviour and dis-

ease susceptibility (Meixner, et al, 2014; Hatzina et al, 2014; Uzunov et al, 2014).

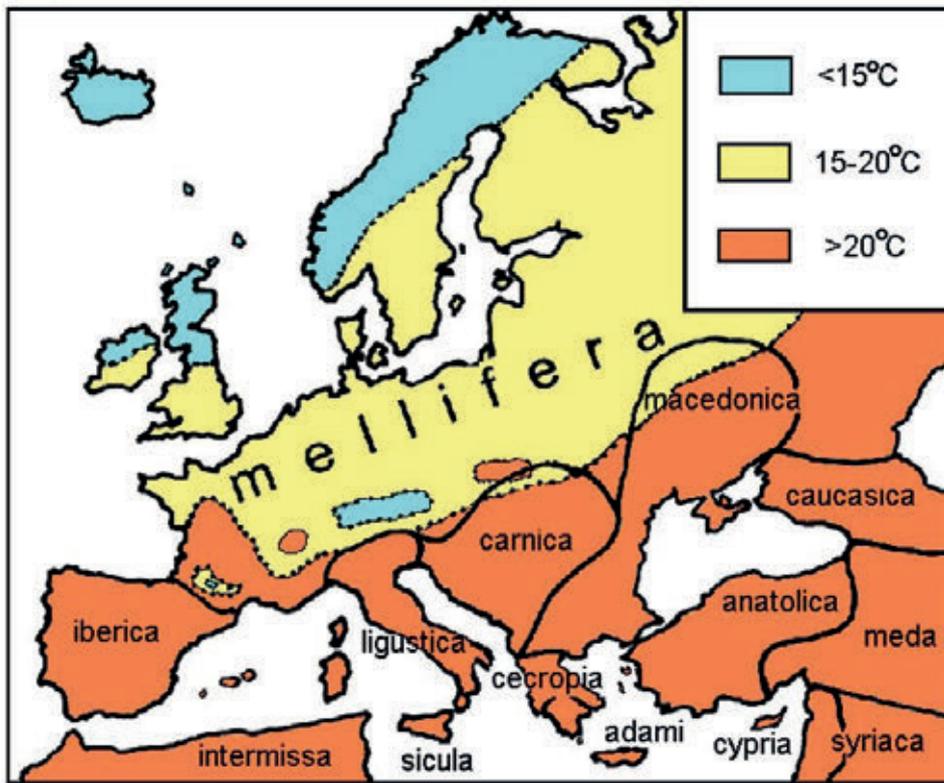
The state of mature adaptation to one, albeit somewhat variable, climatic environment, is at the core of the resilience of native stocks. Underlying this is a balanced genome which has been held in isolation for thousands of generations and within which re-assortment of the genes takes place without creation of physiological disharmony. When foreign genomes are spliced in, that harmony is disrupted and chaos can, and frequently does, ensue.

So, in the case of honey bees, what are the inherited features of say, the North European Dark Bee that on its home ground in Northern Europe give it a selective advantage over the other races? Comparative attributes of the European native honey bees are reviewed by Ruttner (1988).

Coping with the cold. One of the most important, indeed death-dealing, hazards of the North is low environmental temperatures, and northern native bees have several defences they use against them. First, their large size helps conserve body heat when outside the nest. This is because the surface area of a rounded body is proportional to the square of its radius, while its volume is a function of its radius cubed. Heat loss is proportional to surface area, while heat retention depends on body volume. The ratio of loss to gain is therefore smaller for large bodies than small ones and large individuals find it easier to keep warm in cold environments.

Although dark bodies radiate heat more than light coloured ones, they also absorb heat better and on balance the Northern bee's dark coloration aids in absorbing warmth from the sun. Cooper (1986) suggested that this for the Northern bee is most important in aiding drones to fly in cool air for mating. He suggests this gives them a competitive advantage of around 5-10% over drones of lighter colours. So drone-laying queens are less likely in native apiaries than in those of exotic bees.

Unsurprisingly, Northern natives can fly at lower temperatures than their Mediterranean cousins for both foraging and mating, but unlike those cousins, they do not risk chilling by emergence at dawn to collect dew, as rain water is rarely in short supply in the north. Northern bees are also less likely than their hot country cousins to be tempted out by the bright light reflected from snow, when no bee can survive that exposure for long.



Natural home ranges of subspecies of *Apis mellifera* (Ruttner, 1988) in relation to July average peak temperatures. The *A. m. mellifera* subspecies was originally confined to the region north of the Alps and Carpathian mountains and south of latitude 60°N, where average temperatures rarely exceed 20°C, but can go below 15°. All other honey bee subspecies are naturally adapted to July temperatures in excess of 20°C.

The geographical distribution of the native *A. mellifera* subspecies in Europe coincides remarkably well with summer temperatures, but not at all to those of winter, implying that the most important selection of honey bees by environmental factors operates in relation to summer temperatures (The northern limit corresponds roughly to those of hazel (*Corylus avellana*) and the hedgehog (*Erinaceus europaeus*)).

A. m. mellifera foragers have abdominal over hairs some 40% longer than those of Italian bees (*A. m. ligustica*) and those hairs are also branched. Both features help heat retention, as well as enabling heavy pollen collection.

The wing vein patterns of honey bees are one of their most reliable indicators of race and that of *A. m. m.* is believed to be associated with wing muscle strength, ability to carry heavy loads and staying power.

Winter clustering and cool air clustering. Italian bees do not show the tight winter clusters of Northern bees and can die in colonies of moderate weight despite an abundance of food around them, when Northern bees in much smaller colonies survive with vigour, by virtue of the tightness of their clusters. There are in fact geographical clines in winter clustering efficiency among *A. m. m.* bees from South to North, from lowlands to hills and from coastal areas inland, that relate to survival rates in harsh conditions (Cooper, 1986).

I find that when native stocks are set up for overwintering with an empty shallow box beneath the brood to allow the cluster to hang naturally, stores are used from the outside frames first, leaving honey close to the central brood in readiness for the spring increase.

Another native brood nest feature of winter survival value is convex, white honey cappings enclosing a pocket of air. This is an attractive feature for sales of comb honey, but also it prevents capped honey from “weeping” and fermenting on the comb surface in the winter hive, which can lead to dysentery. This character is associated with “cool-air clustering” on combs when inspected in cool air, which is a great asset in comb production as it enables bees to maintain high body temperature for wax production.

Colony age profiles and “winter bees”. Most of the “cost” of producing the work force is expended during each bee’s early individual development. The Northern bee counters this by decreasing the number of its offspring, while increasing their longevity. This life extension is applied predominantly to the foraging stage, increasing the foraging force as a proportion of the colony as a whole.

Ability to withstand bad weather is a very important attribute during spring and summer when Northern natives accumulate enough pollen to last 2-3 weeks, whereas Italians and most other non-native types will store sufficient for only 3-6 days. *A. m. m.* also stores its pollen among and below the brood, where it is immediately available for tenders of the brood nest, while non-natives store it less accessibly to the sides and above the brood.

In early autumn young *A. m. m.* nurse bees consume large quantities of oily pollens, which they convert to body fat and store for over-winter survival. Since the brood nest is at that time contracting and they lack the necessity to secrete so much brood food, their development gets arrested at a juvenile stage. This allows them to produce brood food again when the brood nest expands in early spring. By contrast, Mediterranean bees need to raise new cohorts of young bees throughout the winter in order to ensure brood food secretors for the spring larvae. This is an expensive exercise in terms of depletion of stores and also makes the colony vulnerable to the cold conditions outside.

The internal fat stores of “winter bees” also mean that Northern natives need consume less food in winter and so can survive on minimal brood nest stores. They also produce enzymes that relieve gas build-up in the intestines of overwintering bees, which means they have less need to leave the hive to relieve themselves.

The characteristics of native bees will be further considered in the next issue of NBH. Editor.

BIBBA (Bee Improvement and Bee Breeders Association) - www.bibba.com and SICAMM (Society International for the Conservation of *Apis melliferae melliferae*) www.sicamm.org are the two most important organisations for the conservation of local bees, for more information log on to their websites.



Commercial Warré Beekeeping in Australia

Tim Malfroy

Tim with top bar comb from the first
honey flow in his Warré Apiary, Central
Tablelands, NSW 2010.

In recent years beekeepers have faced tremendous challenges, often experiencing heavy colony losses as a result. These problems are reported by beekeepers, documented widely in the mainstream media and investigated by the scientific community, yet the way in which we keep honeybees is rarely offered as a contributor. In this article I detail my experience with natural beekeeping and the Warré hive and explain why I feel this style of beekeeping is a viable alternative to conventional apiculture, is commercially feasible in some environments and may be a candidate for a healthier way of keeping bees.

Why Natural Beekeeping?

I have had the pleasure of being surrounded by bees my entire life. My father is a well-known professional migratory beekeeper, honey producer (managing 800 organic Langstroth hives) and queen bee breeder with over forty years of professional experience. Despite helping my father for many years, I felt completely unqualified as a beekeeper when he gave me two colonies of bees in 2005.

Part of the reason for this lack of confi-

dence was due to my having witnessed an incredible time of tumult within the local beekeeping industry just prior to receiving the hives. Honey prices were at a record low, American Foulbrood was rampant and Small Hive Beetle had decimated most professional and amateur beekeeping operations in the region where I grew up.

In addition, I was reading stories from overseas about colony collapse disorder, Varroa mite and the impact of systemic pesticides and industrial farming on the bees and the beekeeper's way of life. Young and old were leaving the industry in droves. It was a difficult time to imagine a future in beekeeping.

I was confused as to why bees were struggling when they had thrived naturally for millions of years without the aid of humans. While it was obvious that in many regions of the world humans had created a toxic and barren environment for bees, I thought perhaps it was how we were keeping bees that caused, or at least exacerbated some of the other problems that existed.

I started researching different methods of keeping bees and gradually realised that

the biological 'needs' of the Bee and the 'wants' of the beekeeper were drifting apart. In fact, much of what I had considered to be fairly natural in terms of beekeeping was actually quite unnatural for the bees. Perhaps this rift was due to developments in apiculture since the industrial revolution. Expensive equipment and machinery that increased efficiency and yield often replaced the close interaction between bee and beekeeper. In addition, the cost of this machinery made entering the industry potentially prohibitive to young people.

The rift was also obvious in backyard beekeeping with most beekeepers adopting the methods that large-scale beekeepers used; plastic hives and foundation, regular re-queening, sugar feeding, etc. I could understand industrial beekeepers using these methods to increase efficiency and yield but was baffled that beekeepers with one or two hives would adopt this method (the peak of this anthropocentric approach is typified by the recent 'Flow frame' invention).

Therefore, my goal was to find a style of beekeeping that was simple, cost effective, bee-friendly and suitable for small-scale

beekeeping. I started experimenting with foundationless beekeeping in my Langstroth hives and continued my research, focusing on traditional styles of hives and apiculture that pre-dated the industrial era Langstroth system that dominates Australian apiculture.

Through this research, a whole new world opened up to me. I had found a style of beekeeping that made sense and seemed easier for the beekeeper and healthier for the bees. I continued expanding my beekeeping library, incorporating texts like Eva Crane's *World History of Beekeeping* and *Honey Hunting* and various bee biology books. Those by Thomas Seeley and Jurgen Tautz, whose eloquent descriptions of swarm intelligence and the superorganism concept, harmonised beautifully with the practical aspects of natural beekeeping.

I was attracted to the idea of a commercial beekeeping operation whose philosophy was centered on the understanding of the colony as a superorganism*, respected the natural functioning of the colony, used bee friendly hives, sourced strong local bees and adopted apicentric management.

Why the Warré hive and method?

I was reading a copy of the *Australasian Beekeeper* in 2008 and stumbled upon an article about the Warré hive, written by David Heaf, a beekeeper from Wales. The beehive design, unique management style and philosophy outlined in the article and in Warré's book, "*Beekeeping for All*", described a practical, holistic approach that was also environmentally sustainable and bee friendly.

I immediately started building some hives and in 2009, traveled with my wife to Apimondia in Montpelier, France in the hope of meeting some Warré beekeepers. Fortunately, Nicola Bradbear from Bees for Development organised a session on Warré and top-bar beekeeping during which I liaised with Warré and natural beekeepers from around the world.

On my return, I began preparing my own Warré apiary. I populated the first Warré hive with a large 'shook swarm' and on a late summer honeyflow of Red Stringybark (*Eucalyptus macrorhyncha*) the bees filled an astounding four boxes of comb in a matter of weeks, then wintered beautifully and have continued to thrive ever since. The colony not only built a prodigious amount of comb that season, they also behaved differently, were



Deep hanging comb in a 3-sided frame, Central Tablelands, NSW 2011

far less defensive and had a different aroma, I assume as a result of their being allowed to build virgin comb for the first time. This led me to believe that comb building is an important metabolic process of 'renewal' for the individual bee and the superorganism.

The following season, I conducted further practical trials to test the Warré hive. Seeley and Morse documented the form and structure of a bee nest as it occurs in nature in their paper.** To replicate this nest structure, I shook-swarmed a colony into a two-box Warré hive to mimic the natural size of a bee nest (308 x 308

x 480mm) and left the bees alone for a few months to build their own comb. The result was a classic configuration of a generalised bee nest: oval-shaped brood sitting beneath a wreath of bee bread and thermal dome of honey, cells for 'heater' bees and 'peripheral galleries' on the edges of the comb.

These initial trials indicated that adopting the Warré hive and method supported the superorganism and could pave the way towards building a commercial beekeeping operation that respected the natural functioning of the colony.



Tim checking the progress of the colony by tilting the top box.



Tilt-checking the colony in a Warré hive.



Limekilns Apiary.



A good swarm.

On reflection, some of the positive outcomes of the Warré hive and method were clear to me almost immediately while others took years for me to fully appreciate. I've listed just a few of these below.

Hive design

- The internal box dimension mimics a tree hollow, resulting in the broodnest being located snugly beneath the thermal dome of honey. This means there are no 'dead spaces' as is often the case with Langstroth hives and the colony winters very well (consuming less than half the honey stores compared to my Langstroth hives).
- The cover cloth encourages bees to make propolis and allows the beekeeper to open the hive gently without disturbing the bees.
- The moisture-absorbing, insulating quilt helps the colony stay warm and dry.

Management

- The in-built comb renewal, due to nading, helps with disease control and simplifies management.
- The Nading technique means that the colony can be expanded easily and quickly in spring with minimal effect on the bees.
- Colonies may be inspected using the 'tilt' method, which is both efficient and bee-friendly (limiting the need to do frame by frame inspections).
- The oldest comb is taken during harvest

and not returned to the hive, thereby reducing buildup of disease pathogens and any chemical residues in the comb.

Cost Efficient

- There is a reduction in bee losses (this is the primary expense for commercial beekeepers as it decreases overall yield while increasing labour and other costs).
- The boxes can be built from locally-sourced timber, which reduces the overall cost and carbon footprint of hives. There is only one size box to build.
- Less time is required to manage the hive overall, particularly in spring.
- No storage of 'stickies' is necessary as the entire comb is pressed or strained.

Natural Comb

- Natural comb allows the colony to develop at its own rate. The size of the colony is dictated by the nectar and pollen wealth of the region and strength of the colony, giving a true reflection of the season to the beekeeper.
- Natural comb means colonies are 'drone-right' which is very important for successful mating of queens in local DCA's and for genetic diversity in the bee population.
- Honeycomb can be sold 'as is', without any need for further processing.
- Allowing bees to build their own comb inhibits unnecessary swarming.

Minimal Intervention

– Honeybee colonies are creatures of solitude and benefit from being left alone most of the time***. The opening of hives to inspect colonies is gentle, swift and undertaken during warm, sunny weather. Interestingly, the Warré hive is the only hive I know of that allows beekeepers to check colonies from beneath the cluster and also from above, by removing individual combs.

Our Warré Beekeeping operation in Australia

1. Location.

To be a successful beekeeper you must have a deep knowledge of the local flora and understand how bees respond to the plant species of the area.

I manage over 20 permanent apiary sites and almost 300 hives. Half of these apiaries are situated close to home in the Central Tablelands (230km west of Sydney) with one large apiary on our property. Our other apiaries are located in the Blue Mountains (70 - 100km west of Sydney), the furthest being 150km away. I rarely move hives to new locations, so each apiary site is carefully selected to provide for the needs of the Bee all year round.

The diverse flora of the area is hugely important for the health of my bee colonies. Each bio-region contains dozens of eco-regions, particularly in the Blue Mountains where the flora changes dramatically with altitude and topography (the area rises from sea level to over 1000m altitude in 37km). Situating permanent apiaries within a few different regions gives me more flexibility as a commercial beekeeper as unique varieties of honey may be harvested from each region at different times of the year and it is uncommon for both regions to have unsatisfactory weather conditions for honey production at the same time.

2. Climate.

The climate in Australia is highly variable and often harsh; temperature extremes across our apiaries range from 48°C in the height of summer to -10°C in winter and often fluctuate by 25 degrees or more in a single day. Rainfall is also highly variable in both regions, ranging from 600mm/year in the Central Tablelands to 1500mm/year in the upper Blue Mountains.

We are fortunate to be located in an area with a diverse climate, encompassing sub-tropical and cool temperate zones.



Comb in three-sided frame partially completed.



Detail from completed brood comb.

Coupled with the diverse flora of the area, each season is wildly different and presents both problems and opportunities in regards to bee management.

3. Flora and Honey sources.

The Greater Blue Mountains World Heritage Area incorporates over 1,000,000 hectares of wilderness (a forest larger in size than the island of Crete). The area received world heritage status for its diversity of Eucalypts and refugia of ancient plant communities.

The Eucalypt diversity ranges from the tall open forests of the mountains

and deep valleys to open woodlands and mallee shrublands. These forests together with non-Eucalypt ecosystems including rainforests, heaths and wetlands protect a significant proportion of Australia's total biodiversity (<http://www.bmwhi.org.au/wp/about-us/world-heritage/>). The floral diversity is staggering; there are more than 1500 plant species in the Blue Mountains and in excess of 3000 in the Sydney Basin to the east of the mountains, many of which are highly melliferous.

Honey yields are variable in the Blue Mountains, however surplus honey can be

harvested almost every season. Last year over 100kg of honeycomb was harvested from some of my Warré colonies, a staggering amount of honey considering the bees had to build their comb and swarming was allowed. In the Central Tablelands, dramatic honeyflows are provided by two of the local Eucalypt species, in particular Yellow Box (*Euc. melliodora*) and Red Stringybark (*Euc. macrorhyncha*). Other Eucalypts, Wattles (*Acacia sp.*) and various shrubs and ground flora provide supporting nectar and pollen. Yields are highly variable, as Yellow Box only flowers once every 2-4 years and Red Stringybark once every 4-8 years.

Fortunately, there is no industrialised agriculture practised within bee flight range of any of our apiaries in either region. All honey is produced from woodland or wilderness areas and is, therefore, very pure.

Both regions do have their difficulties, with extreme weather events, particularly heat waves, floods, drought and bush fires, a constant concern. In 2013 I lost a large percentage of my hives in a bushfire that raged through 55,000 hectares of wilderness in just three days.

Locating apiaries in these 'wild' environments has been a conscious decision and has a number of immediate benefits; the bees have access to a wide diversity of high quality natural food (nectar and pollen), colonies are allowed to swarm and take on the genetic resilience of the wild bees of the area, colonies will never come into contact with agricultural chemicals or urban pollutants and the honey is very pure and unique so can be sold at a higher price.

4. Populating hives.

Due to the large expanse of wild areas and abundant forage and habitat (tree hollows) for honeybees, we have been able to increase our colony numbers with naturally occurring swarms.

These swarms are either captured in specially located 'bait hives' or caught as we see them in the apiary. We have also populated many hives using the 'shook swarm' method, sourcing bees from a Langstroth apiary where the beekeeper rarely harvests honey and allows the colonies to swarm regularly.

Bait hives are my preferred method as they have the highest success rate and require little work. The power of natural

swarms is a wonder of nature and is the foundation on which this whole style of beekeeping rests. Tapping into this great source of natural energy has been the most surprising and enlightening part of my beekeeping journey. The experience of watching a swarm enter a bait hive and fill it with new combs in a matter of days can't be replicated in conventional apiculture.

Some years I collect dozens of swarms, other years there are fewer. Despite this, the benefits of catching swarms for the Warré beekeeper are many; they are usually from strong healthy colonies, are disease free, primed to build an enormous amount of fresh comb, are locally adapted and you don't have to pay for them.

Warré Hive modifications for Australia

Partly due to its simplicity, the Warré hive can be modified slightly to accommodate local timber sizes and beekeeping conditions. Some of the things we have changed include:

1. Internal box dimensions: 308 x 308 x 240mm - these are slightly different to Warré's design due to the standard timber sizes in Australia. I use 22mm thick timber, which has been dressed down from 28mm green planks of salvaged macrocarpa cypress.

2. Frame design: beekeeping legislation in Australia requires removable comb. The 3-sided 'open' frames work beautifully and the comb surface area mimics that of Warré's original design.

3. Base: a custom designed bee-friendly base has been developed for areas with high populations of Small Hive Beetle.

4. Entrance Aperture: I use a full width entrance and entrance reducers for smaller colonies and for during the winter months.

5. Additional box size: I use half depth boxes (120mm) quite a lot for producing honeycomb frames during large honeyflows and also for my small 'breeder' colonies ('bee-friendly' supering also prevents honey binding of the broodnest during these intense times of nectar abundance).

6. Quilt: I use a simple calico bag filled with wood shavings for the quilt contents.

In addition, we have extreme weather events and have made modifications for heat waves. The top of the hive is painted white to reflect heat. During heatwaves I place two pieces of 10mm thick timber

across the top of the quilt box to allow hot air to leak out instead of getting trapped. I also pin hessian to the hive to prevent direct sun hitting the hive walls.

Wild Honey and Honeycomb

Small wooden frames, each holding almost 1kg wild honeycomb, are harvested and sold direct to restaurants, cafes and private customers, eliminating the need for any honey processing. It's the highest quality honey sold at the highest price, with no additional work other than harvesting from the hives.

Honeycombs are 100% ripe when harvested. Combs are also selected for cut-comb sections (I cut 200g square sections with a custom-built stainless steel comb cutter) and the rest is scraped into buckets. The comb is shredded with a custom-built stainless steel 'Moulimiel' and the shredded comb is tipped into 4 units of a 3-tier straining system. The shredder is particularly useful for processing the 'post-brood' honeycomb that is harvested from Warré hives. 90% of the honey strains naturally overnight and I'm able to tap off 120 kg of beautiful clean honey the next morning. The remaining wax is pressed for the last of the honey. The wax is then melted, filtered and poured into moulds for 1kg beeswax blocks.

The benefit of this system is that it is efficient, cost effective and yields a higher quality product compared to extracting.

Our entire business has been built on the natural organic qualities of our honey and our sustainable approach to apiculture. For over 10 years I have been attending farmers' markets, giving talks at food industry events and networking with well known chefs in Sydney to raise awareness about the importance of bees and to promote our natural honey and sustainable beekeeping methods.

Fortunately, there is a push these days to not only encourage organic, biodynamic and permaculture food production, but also to connect 'ethical' food producers to chefs and consumers. Being located close to Sydney, producing a high quality natural food in a well-known 'wild' landscape, using Warré hives and bee-friendly methods and working incredibly hard, not only with the bees but also on promoting the fruits of our labour to receptive customers, are some of the factors contributing to our success.

Conclusion

The Warré hive in combination with our customised Warré method has proven itself in a variety of different climates and conditions in Australia and supports not only the bees, but the beekeeper as well. As a result of adopting this bee friendly method, I currently produce tonnes of honey and honeycomb each season and have managed to set up a successful commercial beekeeping operation.

I also teach my customised Warré method for Australian conditions to approximately one hundred and fifty students a year and it is incredibly satisfying to see this style of bee-

keeping practised successfully by women and men, young and old alike. There are now hundreds of new natural beekeepers in Australia, producing their own honey and spreading the word about the importance of bees and the natural world they (and we) rely on.

While I hope that this article provides some inspiration to aspiring professional natural beekeepers, it is worth keeping in mind that the joy of beekeeping, even for most commercial beekeepers, has nothing to do with remuneration. As Warré himself pointed out, "I pity those who keep bees only to earn money. They deprive themselves of a very sweet enjoyment".

*Buzz about Bees :Biology of A Super-organismby Jurgen Tautz and The Super Organism: The Beauty, Strangeness of Insect Societies by Bert Holldobler and E.O. Wilson. "The Nest of the Honeybee".

** The Nest of the Honeybee, by Seeley and Morse.

***My approach to minimal intervention beekeepinghas been influenced by the concept of Nestduftwärmebindung, the principle of the importance of 'Nest Scent and Heat' as outlined in by Johann Thur in his book Beekeeping: Natural, Simple and Successful, a wonderful common sense text that mirrors much of what is written in Beekeeping for All by Abbé Warré.



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Books recommended for Apicentric Beekeepers

The Life of the Bee, M. Maeterlinck
The World of the Honeybee, Colin G Butler
The Buzz about Bees, Jürgen Tautz
The Hive: The Story of the Honeybee and Us, Bee Wilson
The Biology of the Honey Bee, Mark L. Winston
Bee Time, Mark L. Winston
Honeybee Democracy, Thomas D. Seeley
Honeybee Ecology, Thomas D. Seeley
The Wisdom of the Hive, Thomas D. Seeley
Following the Wild Bees: The Craft and Science of Bee Hunting, Thomas D. Seeley
The Incomparable Honeybee, Reese Halter
Towards Saving the Honeybee, G. Hauk
Farming for the Landless: New perspectives on the cultivation of our honeybee, Sarah Waring
A Beekeeper's Progress, John Phipps
At the Hive Entrance, H. Storch

Natural Beekeeping: Organic Approaches to Modern Apiculture, Ross Conrad
Beekeeping with a Smile, Fedor Lazutin
Sensitive Beekeeping – Practicing Vulnerability and Nonviolence with your Backyard Beehive, Jack Brette-Mills
From Flower to Jar, M. Weiler
Bee-Friendly Beekeeper, David Heaf
Beekeeping for All, Abb Mile Warr & Abbe Emile Warre
Natural Beekeeping with the Warre Hive, David Heaf
The Tree Beekeeping Field Guide, Jonathan Powell (Kindle)
Top-Bar Beekeeping: Organic Practices for Honeybee Health, Les Crowder and Heather Harrell
A Guide to Natural Beekeeping in Top Bar Hives, Christy Hemenway
Top Bar Hive Beekeeping, W A Mangum
Balanced Beekeeping I: Building a Top Bar Hive, Philip Chandler
Care of Bees in Warré and Top Bar Hives (Without Fuss or Chemicals), Joe Bleasdale
Taming the Mighty Mite, Kefyn M Catley

Plants and Beekeeping, F N Howes
The Bee Garden: How to Create or Adapt a Garden To Attract and Nurture Bees', Maureen Little
Skeps: Their History, Making and Use, F. Alston
The Handy Book of Bees, Pettigrew
Traditional Japanese Beekeeping, Kindle Edition
Bees, Rudolph Steiner

Letters to the Editor

Please send comments and questions regarding apicentric beekeeping to the Editor - editor@naturalbee.buzz
The questions will be answered by our team of experts and appear on the magazine's website: naturalbee.buzz
We are also interested to hear about any meetings and courses that are being organised so that they can be listed on our website.

Acknowledgement

The editor and publishers of NBH magazine thank the Natural Beekeeping Trust, particularly Heidi Herrmann and Gareth John, for the very important advice that they have given and the enormous help in promoting this first issue.

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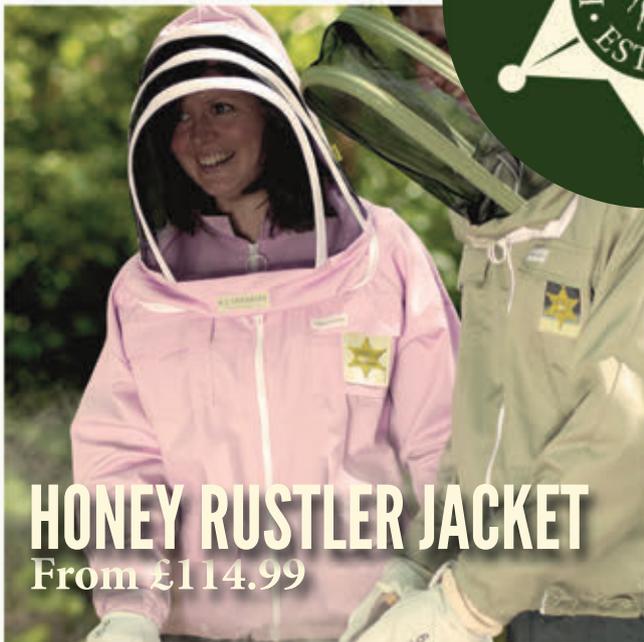
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