What Is Wrong With Modern Beekeeping?

A BRIEF HISTORY OF BEEKEEPING

IN BRITAIN AND THE USA

P J Chandler

Honeybees, in something like their present form, have been around for about 150 million years,[1] give or take a few millennia. In that time they have evolved into one of the most successful and highly organised social creatures on earth.

We humans have been around for only about three million years and probably only in the last few thousand have we developed a relationship with bees, largely consisting of us finding new and more creative ways of robbing and exploiting them.

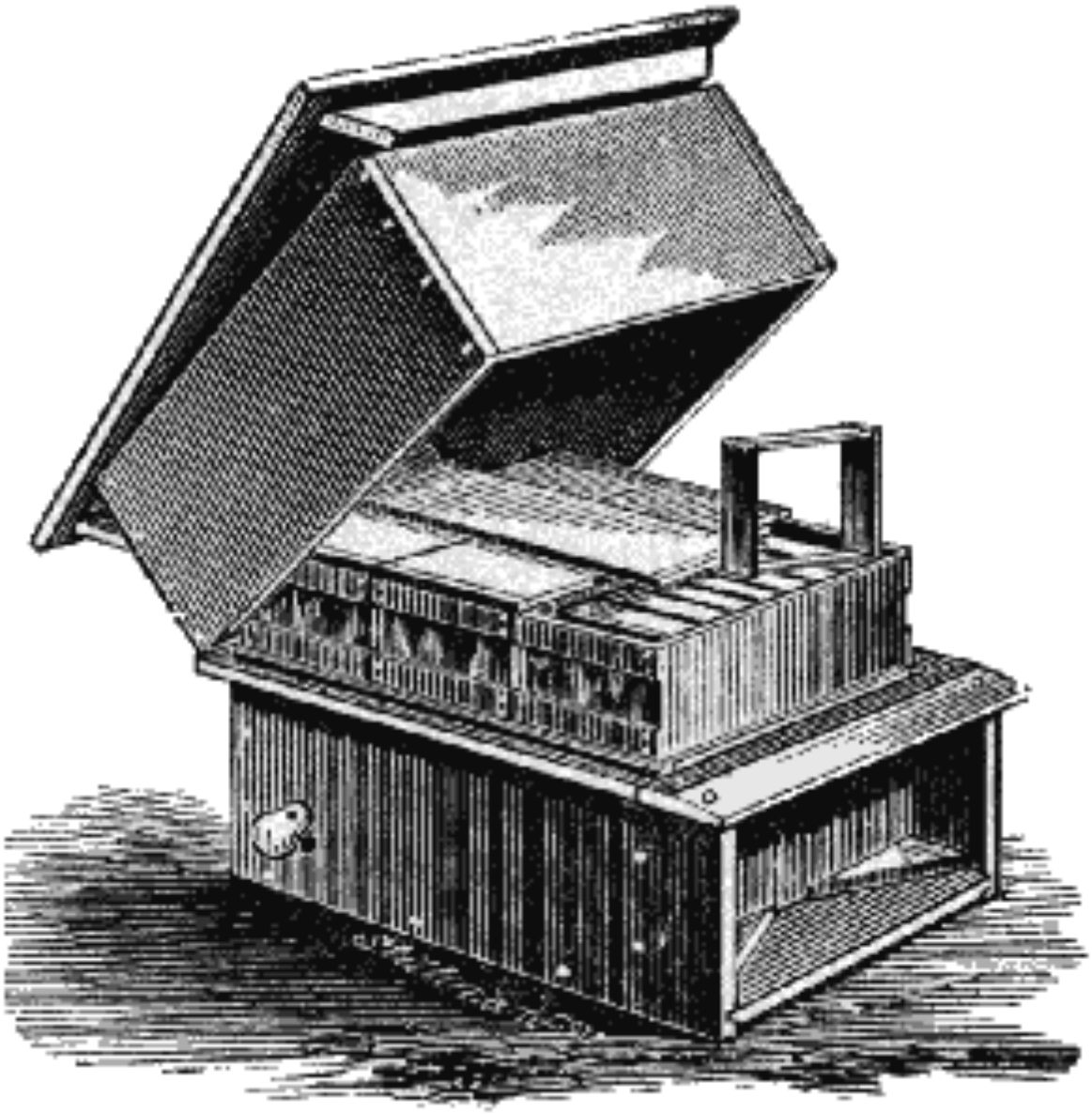
Straw skep

Primitive hives made from logs, baskets and pots of various kinds were – and in some places still are – used to provide homes for bees, while offering more-or-less convenient means by which their honey could be removed as required. In the UK and much of Europe, straw skeps of many and varied designs were the standard hive for centuries and were in common use right up until the middle of the twentieth century. I know of a group of beekeepers in Germany who still use skeps on the heather and there are still some dedicated skeppists dotted about Britain.

For an unknown period – perhaps 1000 years or more – beekeeping in Britain was carried out mainly by monks and peasant farmers, usually in straw or rush skeps. Swarming was the principle method of maintaining a stock of colonies, prime swarms being captured and housed as they emerged or as soon as they could be caught. A certain number of colonies were killed off at the end of each season in order to extract their honey and wax comb, as no means was then available for non-destructive harvesting. There were plenty of wild colonies around, which provided a reservoir of new blood, strengthened by the process of natural selection. The best managed colonies were overwintered and swarms emerging from them in the following season ensured a plentiful supply of bees for everyone.

MOVABLE FRAMES: THE HOLY GRAIL

The advent of modern beehives and their associated technology during the latter half of the nineteenth century made the processes of bee management and honey extraction easier and more efficient and laid the foundations for industrial-scale, commercial beekeeping as we see it today. The hobby beekeeper was also able to take advantage of this new technology, resulting in many enthusiastic amateurs keeping a couple of hives at the bottom of their gardens. A new breed of beekeeper emerged among the clergy and middle classes, driven by the scientific and industrial impulse of the Victorian era, who sought ways to control this fascinating wild creature and bend her behaviour to the needs and desires of man.



Langstroth's original hive

The key invention that made all this possible was the self-spacing, 'movable frame', introduced by the Rev. L. L. Langstroth around 1850 in the USA. Wooden frames, arranged side by side across the width of a rectangular box, spaced apart according to Langstroth's recent discovery of 'bee space'[2], meant that bees could conveniently be manipulated and 'managed' as never before, according to the various theories and whims of beekeepers. Because Langstroth had chosen a box that just happened to by lying around in his workshop on which to base his 'standard' (which remains to this day as the standard American Langstroth hive), the shape of his frame was that of a rectangle approximately twice as wide as it was deep – utterly unlike the tall, catenary curves of the comb that bees like to build when left to their own devices. Nevertheless, bees are versatile and flexible and they adapted themselves as best they could to the new shape.

In Britain, where it seems that nearly every Victorian beekeeper considered himself an inventor, there was less standardization of dimensions and any number of variations arose on the theme of movable frames in a box. Notable among these was the WBC hive, invented by one William Broughton Carr about 1890 and still around today in a limited

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way. Having featured in innumerable children's books it is the shape the general public most readily associate with beehives and is still often (and inexplicably) recommended to beginners, despite its prodigious use of timber and considerable 'nuisance factor' due to the extra lifting, maintenance and storage required.

The WBC Hive

The WBC and its innumerable variations have largely given way among hobbyists to the British National Hive, which, though dull and functional in appearance compared to the WBC, is more restrained in its use of timber and therefore cheaper, lighter and more practical in many ways. There is a deep frame variant of the National, which has many adherents, while the capacious Commercial hive is favoured by larger-scale beekeepers. The only other notable 'modern' British hive is that built to the specifications of the late Brother Adam at Buckfast Abbey in Devon. Bro. Adam's 'Modified Dadant' hive is a monster, some 20 inches square by 12" deep and containing up to 12 frames, each having roughly twice the brood area of a National (14" x 8 ½") frame. Moving these hernia-inducing boxes and their accompanying supers requires considerable strength (Bro. Adam had a labour force of monks at his disposal!) and no hobbyist need give them a second look, save from curiosity. The American Langstroth hive is little used in Britain (except, for some reason, in Hampshire), although ubiquitous in the USA, Canada and many other

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countries.

Both in Britain and in America, along with the rest of the developed world, movable frames fitted with wax foundation to a standard pattern became the unquestioned orthodoxy of beekeeping. New beekeepers acquired equipment and knowledge from old beekeepers in the same way that apprentices learned their trades from master craftsmen and thus perpetuated the status quo.

The next important invention that handed yet more control to the beekeeper was that of pre-fabricated wax 'foundation'. It was considered that bees spent too much of their time and energy (and, therefore, honey) on building wax comb and, if they could be 'helped along' by the provision of thin sheets of wax, impressed with a suitable hexagonal pattern, pre-fitted to the wooden frames, then that could only be a Good Thing.

Because the embossed pattern was designed to emulate the beginnings of worker cells, bees were thus 'encouraged' to fill their homes with worker comb and were discouraged from making 'useless' drone cells. Foundation was made according to measurements made by A I Root around 1884 and, largely due to Root's ubiquity in the US beekeeping supplies market, seems to have been milled more or less to these dimensions to this day.

Bees will take any opportunity to build drone cells in odd corners and often they will build a whole comb of them against one of the internal walls, despite the beekeeper's efforts to thwart them.

The general practice among beekeepers is to prevent their bees from raising 'too many' drones by culling drone brood: a maximum of 5% seems to be the accepted figure. The thinking is that drones, being unproductive and having no obvious work to do aside from mating, must therefore be supernumerary and dispensable. They also consume honey, of course – a lot according to some and hardly any according to others – but that is often given as a reason to cull them. Left to their own devices, bees will ensure that, in the queen mating season, they have up to 20% of their number as fertile males (drones). This discrepancy may, I suggest, be a major factor in the recent reports of many queens failing to mate or being poor layers and has almost certainly accelerated the spread of the feral 'Africanized' bees[3] in the USA, which are not subject to the whims of beekeepers and can flood an area with their own drones with little competition from hived bees.

I think it is more than likely that drones do in fact have other functions within the hive. In particular, I think they have a role to play in maintaining the correct hive temperature for the brood. Remember that, in temperate climes, the inside of the hive – especially in the main brood area - is *always* warmer than the outside world: around 94ºF (34ºC), a temperature they maintain throughout the year with little variation[4]. *This means that opening a hive at any time of year will cause the bees a deal of extra work in returning their environment to its correct temperature* – a fact that receives barely a mention in any beekeeping book I have read, other than Abbé Warré's *Beekeeping For All*[5]. In hotter countries, opening the hive gives bees the opposite problem: how to cool it back down to their working temperature. This is a powerful argument for 'natural' or 'leave well alone' beekeeping in a hive designed to be managed in this way and an equally powerful argument against opening any hive unnecessarily - even in summer - and especially a hive that opens at the top exposing bees all at once as is the case with all framed hives

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Conventional, framed hives create a lot of extra woodwork and a storage problem.

In the 1940s, Johann Thür, a German beekeeper who favoured vertical top bar hives in the style of Abbé Warré, described in *Bienenzucht* his concept of *Nestduftwärmebindung*.[6] This introduces a notion of a combination of heat and scent that provides a beehive with its unique, nurturing and disease-resistant 'nest atmosphere', which should not be disturbed. In his view, it is incumbent upon us as beekeepers to respect the bees' need to maintain this 'nest atmosphere' and to design hives and management protocols that disrupt it as little as possible.

It is possible that this combination of heat and scent may be important for the suppression of the *Varroa* mite. A recent study showed that undisturbed, feral colonies seemed better able to co-exist with *Varroa* mites than those managed in a conventional way.[7]

PESTS AND DISEASES

During the late nineteenth and early twentieth century, honeybee colonies began to suffer on an unprecedented scale from a range of diseases and parasites that had previously been rare, localized or relatively mild in their effects. By 1920, the native British black bee (*Apis mellifera mellifera*) had been virtually wiped out by so-called 'Isle of Wight disease'[8], to which it had no natural resistance. Replacement black bees were brought in from France, Germany and Holland, along with yellow-striped bees from Italy to re-stock the empty hives, but crosses between the black and yellow races were (and still are) overly defensive and difficult to manage. While they were much less susceptible to 'Isle of Wight' disease, the mild-mannered Italians, along with the other immigrants, were vulnerable to both American and European Foul Brood (AFB and EFB), the two most serious bee diseases. And they were (and still are) incurable robbers of other bee colonies. [9]

During the 20th century, various attempts were made to breed the 'perfect' bee, most notably by Brother Adam, a Benedictine monk of German origin, at Buckfast Abbey in Devon. He travelled widely to gather genetic material to incorporate into his famous 'Buckfast' strain. His goal was to produce a disease-resistant, good-tempered, manageable and productive bee with excellent over-wintering abilities and many beekeepers, particularly in Germany, Scandinavia and the USA will testify that, in its 'pure' form, the Buckfast Bee has all these qualities. However, if it is allowed to out-cross with random mongrels, the resulting progeny – while still inclined to be productive – are often very bad-tempered indeed[10].

For the 'pure strain' breeder, maintaining those desirable traits from generation to generation by a careful program of breeding is vital and – together with heterosis[11] - was the secret of Brother Adam's success and worldwide fame

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Despite the brave efforts of Bro. Adam and other breeders, bees continued to die in significant numbers from foul brood, acarine (*Acarapis woodii, a tracheal mite)* and *Nosema apis* (an amoeba-like protozoon) and new pests began to appear, most notably a parasitic mite, originally labelled *Varroa jacobsonii,* later changed to the more ominous-sounding *Varroa destructor.*

Not yet in Britain (as of 2008), but nevertheless posing a longer-term threat, is the highly destructive Small Hive Beetle *Aethina tumida*, and another genus of parasitic mites similar in habit to *Varroa*, called *Tropilaelaps*. These mites are carriers of several viruses potentially lethal to bees and the mites themselves weaken their hosts by feeding on haemolymph, the bees' 'blood'. Kashmir virus, probably carried by mites, has recently been detected (2005) in two colonies in the north of England. Apparently, we can also expect an invasion of giant Japanese hornets from France.

Honeybees, on which we depend for the pollination of so many of our food crops, are now in trouble as never before and much of the blame for this potentially disastrous state of affairs must be placed at the door of negligent, commercial beekeepers.

The inter-continental migration of pests and diseases has widely been blamed on climate change, but in fact the spread of the *Varroa* mite from its native Asia and its original host species, the Asian bee *Apis cerana,* can be directly linked to the commercial bee trade.

> *Ectoparasitic mites of the genus Varroa are known from Asian honey bees, of which nine extant Apis species are recognised (Koeniger and Koeniger 2000). All life stages of Varroa mites feed exclusively on bee haemolymph after perforating the host's integument with their chelicerae (Smirnow 1979;Donze andGuerin1994). The so-called western honey bee, Apis mellifera, with 24 subspecies distributed over Europe, Africa and the Near East (Ruttner 1988), has been repeatedly infested with Varroa destructor during the last century. This occurred through contacts with the closely related Apis cerana as a consequence of the worldwide transport of bee colonies and apicultural projects in developing countries (Matheson 1993). Today Varroatosis is the main problem for beekeeping with A. mellifera colonies (De Jong 1997).* [12]

Varroa probably co-existed with *Apis cerana* for many thousands of years and in that time the two species reached an accommodation whereby the bees learned to keep the parasites down to a tolerable level without actually eradicating them. When, thanks to the activities of bee-keepers in their home area, *Varroa destructor* came across our honeybee, *Apis mellifera*, it found a new and vulnerable host, which had had no opportunity to evolve a defence mechanism. Honeybees began to die in their millions as the mites exploited their new hosts' susceptibility and spread across the globe with astonishing rapidity.

An effective treatment was found in the form of the synthetic, miticidal pyrethroid *fluvalinate* and to some extent the *Varroa* mite was brought under control. However, within a few years the mites evolved a resistance to fluvalinate, aided by some beekeepers who, through laziness or incompetence, applied a low-level dose over a period of months

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instead of a calculated dose over a few weeks. Regrettably, I have myself seen, in a commercial apiary, Apistan (fluvalinate) strips that had been left in hives for as much as nine months.

Nobody knows for sure how *Varroa* arrived in Britain, but it was first detected by an amateur beekeeper at Torquay in Devon, in 1992, which could indicate importation on a Channel Islands ferry or a fishing boat, although the fact of its discovery there may simply mean that it had not previously been noticed elsewhere. It has since spread throughout the British Isles and by the summer of 2005, mites with resistance to pyrethroids were distributed across south west England, south Wales and elsewhere, with patches as far north as Durham. We can now, I think, presume that most of the mites in Britain are pyrethroid-tolerant to some extent.

At the beginning of the twenty-first century we still have no completely effective treatment that is safe for bees and humans alike and *Varroa* mites, along with their associated viruses, are decimating our bees. Continued treatment with chemicals to which mites can develop immunity is counter-productive, as we are simply breeding tougher mites by default.

Across the Atlantic, where honeybees were unknown before settlers introduced them in the 17th century, central America and the southern states of the USA are being colonised by the so-called 'Africanized' honeybee (or AHB), also known – with some justification – as the 'killer bee', due to its unpleasant habit of mounting unprovoked mass attacks on humans and livestock, often resulting in the death of its victims from multiple stings, often many thousands at a time. The AHB is the direct result of an unfortunate experiment in cross-breeding, which escaped into the wild in Brazil. I am indebted to Marty Hardison for the following account:

> *In 1956 the geneticist Warich Estevam Kerr imported some queens from Africa. A year later his bees were mysteriously released. We will probably never know the actual circumstances, but Mr. Kerr was not only a scientist, he was also a highly respected human rights advocate. His criticism of the mistreatment of Brazilians limited the repressive actions of the military government.*
>
> *In 1964 a smear campaign was launched against Mr. Kerr in the press. The bees he was working with were called "abelhas assassins." This label - which literally means assassin bees - was badly translated by time Magazine in their September 24th, 1965 edition as "killer bees." The title caught the fancy of the American press and Hollywood. The bees have been given a lot of hype and have caused some problems. But they don't attack without provocation: they just defend their colony aggressively. You don't want them in your yard. But they are not as fatally dangerous as bathtubs. I have worked with several colonies of the hybrid Africanized bees down in Texas They are not as much*

> *colonies of the hybrid Africanized bees down in Texas. They are not as much fun to work with as our Europeans but neither are they impossible.*

Interestingly, according to some authorities,[13] the AHB seems to be somewhat more tolerant of *Varroa* than our 'domesticated' varieties, possibly because it has been largely left alone by beekeepers.

In the summer of 2007, the news was full of yet another disaster to befall the honeybee: the so-called 'Colony Collapse Disorder' (CCD), which has decimated the North American beekeeping industry and seems also to be affecting Europe to some extent. Various enquiries into the cause of CCD are under way, with some beekeepers pointing the finger at the increasingly widespread use of GM crops, pesticides like Bayer's Imidacloprid (banned in some European countries but still used in Britain and the USA) and a general decline in overall bee health caused by the long-term stresses of being farmed on an inappropriately commercial scale. The latest explanation of CCD is that it is caused by a *Nosema cerana,* previously associated only with the Asian bee, *Apis cerana.* CCD is, in fact, nothing new and its symptoms were first described as long ago as 1915,[14] when a particularly wet spring caused many losses in the USA.

Nosema apis is also associated with cool, damp conditions and stress:

> *Nosema appears to be highest and have the most negative impact on queens and package bees following shipment, and colonies in the spring if one or more other maladies are affecting them.*[15]

Nosema apis and, perhaps, *Nosema cerana*, may be the biggest, unreported killers of bee colonies, due to the lack of visible symptoms. *N. apis* – an amoeba-like protozoon - is thought to be present in 'background' quantities in virtually all hives, kept in check by the bees' immune systems until they are subjected to environmental stressors, such as being repeatedly disturbed or subjected to damp, cold conditions.

A benevolent view would be that all these unfortunate events came about as a result of the perfectly understandable but misguided desire to obtain, breed and deploy a 'better' bee - meaning, of course, better for human purposes. They were the side effects of our conviction that we can always 'improve' upon nature.

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That we have succeeded in many ways to bend nature to our will is self-evident. Take, for example, the Holstein-Friesian cow, whose milk production has been vastly and continuously increased by controlled breeding, or the truly spectacular modern racehorse, or the fast-maturing battery chicken.

Genetic engineering is the most recent manifestation of this arrogant, controlling attitude towards the rest of the nature.

However, all these 'improvements' have their costs:

> *Exclusively yield-oriented cultivation ... brings the natural imbalance between plants and animals to the extreme and beyond, e.g. in cows which drag their overdeveloped milk udders over the ground with difficulty or the corn which can produce its ears only with the aid of chemical stem shortening agents. Genetic engineering takes this violation of nature a step further. By tampering with the nucleus of the cell, the plant is forced to make a fundamental change to its metabolism and creative potential, solely to serve financial interests and without any appreciation for the essence of the plant.*[16]

But surely – I hear you interject - what we have done for the cow, the horse and the dog can equally be applied to the honeybee, without necessarily incurring such penalties?

Indeed, by careful selection and controlled crossing we can achieve – at least temporarily - increased yields of honey. As Brother Adam demonstrated, we can likewise select for docility, disease resistance and over-wintering ability. We can, perhaps, reduce the swarming tendency, increase calmness on the combs during inspections and even – at least in theory - select for the ability to tolerate or attack mites. But if our management, medication and handling techniques continue to cause the bees undue stress and our demands on them continue to grow, they will inevitably continue to suffer, to decline in numbers and to succumb to more and more diseases and pests.

And we should always remember that, in matters of evolution, nature will select for the ability to adapt and survive, not for maximum convenience to mankind.

It is not in man's nature to be content with what he has. We see a creature that has evolved over countless millennia to thrive in a range of climates from tropical Africa to the Siberian tundra, so subtly adaptable that it can develop multiple, local ecotypes within a country as small as England, so flexible that it can live contentedly within a hollow log, a chimney or a gap in a wall and we want to impose our criteria on it: to make it behave as we desire and to produce food not only for itself but for us as well.

When beekeeping was largely the preserve of monks and peasant farmers and feral swarms were plentiful, this attitude was less prevalent and in any case, due to the limited scale of individual enterprises, did little damage. Once mass production of hives, frames and foundation became possible, beekeeping on a commercial scale was an inevitable development. A century or so later, with the ready availability of lifting and trucking

development. A century or so later, with the ready availability of lifting and trucking machinery, businesses comprising several thousands of hives are not uncommon and their potential profoundly to influence the health and welfare of the bee population at large is enormous.

Marty Hardison, a more experienced top bar beekeeper than myself and a valued contributor to this book, put it this way:

> *By employing a system of migratory beekeeping, which requires transporting large quantities of hives over great distances to make optimal use of seasonal changes, we have enabled the problems of isolated regions to be the problems of all. If this were not the case, American beekeepers wouldn't be dealing with parasitic mites from the Philippines, aggressive bees from Africa, or a brood disease from Europe. Neither would there be concern for the contamination of honey from the very chemicals developed to combat these problems.*[17]

I invite you to consider the following words, written by A Gilman, an original thinker and author of one of my favourite beekeeping books, 'Practical Bee Breeding', published 1928.

Please - if you will - think about these quotes in the light of what is happening to bees today:

"...disease is an expression of lowered vitality ...and simultaneously with increased fecundity there has been an extraordinary increase of disease. Their connection may be denied, but when we find a similar occurrence taking place with other livestock which we know to have been pushed for super-production, we consider the matter far more than a mere coincidence."

"...the increase of diseases has occurred principally in those countries where modern methods of breeding have prevailed. In America, brood diseases became so devastating as to call for legislation... on the continent of Europe, apiarists have been troubled with Nosema disease... we had Isle of Wight disease, which so decimated apiaries all over the country that we had to resort to foreign bees for re-stocking purposes."

"...the only conclusion to which one can come, is that the principles on which the whole structure of modern apiculture are based must be at fault, in either one or more important directions."

more important directions.

He goes on to quote from Dadant's System of Beekeeping (date not given) as follows:

"If anyone had asked us, twenty years ago, how much trouble might be expected from bee-diseases, we should probably have shrugged our shoulders and answered that they were very insignificant and hardly worthy of notice. For forty years after we began beekeeping the only disease we saw in the apiary was diarrhoea... from which the bees suffered more or less after a protracted winter, especially when their food was not of the best... Foul brood, in either of its two forms was entirely unknown to us. In 1903 the writer had to go as far away as Colorado to be able to see some rare samples of it... It was not until the spring of 1908 that we found it among our bees..."

So, **Dadant himself never saw foul brood in his own bees until 1908** - just one hundred years ago, as I write.

And yet, the BBKA and almost everyone else continued to preach the litany of 'movable frames and foundation' for another century! And what is more remarkable, is that they continue to do so despite one hundred years of declining bee health - and they still refuse to take seriously those who have turned their backs on that travesty of a beehive - the Langstroth - and are experimenting with protocols designed to help the honeybee return to its natural state, uncorrupted by synthetic medicines, ill-designed accommodation and ill-conceived breeding methods.

Isn't it time the whole 'modern' beekeeping methodology was re-examined?

'The Barefoot Beekeeper' by P J Chandler is available as a paperback book and as a PDF from Lulu.com

You can listen to Phil Chandler's podcasts and download 'An Introduction to Natural Beekeeping'

If you are interested in sustainable, natural beekeeping, and would like help and support from experienced beekeepers, please visit the Natural Beekeeping Forum

1Estimates vary: this is the longest period I have seen referenced.

2The working space that bees leave between combs: between 1/4" and 3/8"

3An unfortunate cross between Apis mellifera scutellata and A. m. ligustica

4W. E. Dunham, Department of Zoology and Entomology, Ohio State University, Columbus, 1926.

5The 12th (1948) edition translated into English by Dr. David Heaf (see warre.biobees.com)

6from *Bienenzucht. Naturgerecht einfach und erfolgsicher* by Johann Thür, Imker (Wien, Gerasdorf,

Kapellerfeld, 2 ed., 1946) Translated by David Heaf

7Seeley, T. D. (2007). Honey bees of the Arnot Forest: a population of feral colonies persisting with *Varroa destructor* in the north-eastern United States. Apidologie, 38: 19–29.

8 Now believed to have been a massive outbreak of Acarapis woodii, a tracheal mite, in which case 'tolerance', rather than 'resistance' would be a better term.

9This was first noted – as far as I can establish – by A. Gilman in his 'Practical Bee-Breeding' 1928

10 This also seems to be the case with other 'pure-bred' strains.

11Also known as 'hybrid vigour' – the tendency of hybrids to out-perform their parents.

12G. Kanbar Æ W. Engels, Ultrastructure and bacterial infection of wounds in honey bee

Apis mellifera) pupae punctured by *Varroa* mites, published online: 27 March 2003

13*Varroa*-tolerant Italian honey bees introduced from Brazil were not more efficient in defending themselves against the mite *Varroa destructor* than Carniolan bees in Germany. M.H. Corrêa-Marques, D. De Jong, P. Rosenkranz and L.S. Gonçalves, Departamento de Genética, Faculdade de Medicina, Universidade de São Paulo (USP), 14049-900 Ribeirão Preto, SP, Brasil

14According to Dr. James E. Tew, State Specialist, Beekeeping, The Ohio State University

15James C. Bach, WSDA State Apiarist, Yakima WA, USA 1998

16From promotional material by the German company Sonett, manufacturers of environmentally benign cleaning products.

17Marty Hardison, Seed and Harvest, August 1992