A Biodynamic Understanding of the Decline of the Honeybee based on

Indications Given by Rudolf Steiner

By John Bach

Introduction

The original title that I had in mind for this essay was "*A Biodynamic Understanding of Colony Collapse Disorder,"* but I felt that a true understanding of the dramatic increase in honey bee mortality must encompass a greater time frame than just the last decade, and must also encompass mortality issues that do not fall under the umbrella of colony collapse disorder (CCD). The advent of CCD in the middle of the last decade saw dramatic losses of colonies in North America and Europe, but this must be viewed as a new chapter in what has been a steady decline in the overall health of honeybees for at least the last 30 years. This steady decline accelerated violently in the years 2006-7, when a steep rise in colony losses was reported by commercial beekeepers in Europe and North America. Losses had remained stable during the 1990s at a rate between 17-20%, but in 2006, these rates escalated dramatically, with loses in the U.S. averaging over 30%, and some large commercial operations losing almost all of their colonies[i]. What was even more worrisome for beekeepers was the way in which these losses were occurring. Traditionally, bee diseases were relatively simple to diagnose, and could be chiefly attributed to a small number of known diseases, or more recently, to mite infestations. But in 2006 a strange phenomenon appeared. Overwintered colonies, seemingly healthy in the fall, were found in the spring to be abandoned by worker bees. The queen, brood (bee larvae) and food supplies (capped honey and pollen), were left untouched, and the worker bees were nowhere to be found. These doomed hives, with no nurse bees to tend brood and the queen, quickly perished. Since then, a great deal of attention and research has been directed at solving the mystery of CCD and non-CCD increases in colony loses, with, as of 2013, no 'smoking gun' yet discovered to explain its mystery. Perhaps most disconcerting of all, is that losses have not diminished since 2006-7. Californian beekeepers experienced heavy loses this spring (2013), and there are concerns that there will not be enough bees to pollinate California's massive almond crops. Dan Rather reported in a story called *Buzzkill* that colony losses in California this spring have been reported by commercial beekeepers to be over 40%. If these preliminary results prove true, they will be larger than the massive losses of 2006[ii]. Scottish beekeepers suffered

losses of 31.3% over the 2012-13 winter- double their previous year's loses of 15.9% [iii]. Many causal factors have been attributed to the dire plight that we now find ourselves in. Scientists and beekeepers have blamed disease, mite infestations, the use of new pesticides on agricultural crops, as well as the potent chemicals applied to bees to control mite and microsporidian (nosema) infestations. Each of these factors has contributed to some loses some of the time, but none of them alone can explain these growing loses and the phenomenon of CCD. What many experienced beekeepers report is that, in general, bees do not seem to be as strong and vital as they once were, and that this weakness has made them more susceptible to adverse conditions, such as poor weather and disease. Penn State University has become the lead North American university studying CCD and increased honeybee mortality. One of their lead researchers, Maryann Frazier, put it this way: "Something's causing the bees to be particularly weak and that then allows the mites and the viruses to do their job.[iv]" Could it be that the root cause of decline in the honeybee has not yet come under the scrutiny of scientific investigation?

In 1923 Rudolf Steiner gave a series of lectures on various aspects of the honeybee and of beekeeping (originally published under the title *Nine Lectures on Bees*[v]), and in those lectures, Steiner predicted that within a century, if current practices at that time did not change, the honeybee would be decimated within a century. He was specifically referring to the method, which had only been in widespread practice for about a decade, of artificially raising queen bees by grafting worker eggs. Before discussing in more detail Steiner's indications and the practice of queen grafting, I would like to first give a brief history of bee diseases and the current scientific data on the various contributing factors to the decline of the honeybee.

Historical Context

Perhaps the most famous of all books on beekeeping is *The ABC and XYZ of Beekeeping,* written by A.I. Root first published in 1877. The book was expanded extensively by his son, E.R. Root, and was revised up to 1920s[vi]. This massive 600-page volume is still in use by beekeepers today, and covers a wide range of topics, in alphabetical order. Hundreds of different honey bee plants are discussed in the book; a full eighteen pages are taken up discussing different types of frames and frame spacing, a further seventeen pages are devoted to the evolution of the modern bee hive, while, amazingly, only about ten pages of this book discuss diseases of honeybee. In fact, as much attention is given to the various types of fruit blossoms than to bee diseases. Dysentery, bee paralysis, and American and European foulbrood were the main ailments with which beekeepers had to contend with at that time. With regard to dysentery, Root states, "the real cause is long continued low-temperature, further aggravated by bad food [Root is

here referring to the excretion of aphids, called honeydew, which bees will sometimes collect if nectar is not abundant][vii]". This is true dysentery, not what we now see as the sporidian infection nosema, where bees exhibit similar symptoms as dysentery. Bee paralysis was, at the time, a mysterious disease, the cause of which was not clear. This disease was later found to be a viral infection (the first confirmed bee virus), and is now known as Chronic Paralysis Virus (CPV)[viii]. Far and away the most serious disease that confronted the beekeeper at the beginning of the 20th century was European and American foul brood. This disease, which still occurs today, affects, as its name implies, the brood of a colony, the cappings of which have a sunken appearance. The larvae become discoloured with brownish streaks, and eventually die, turning a dark brown or blackish colour. As decomposition of the larvae occurs, a distinct vinegar-sulphurous odour can be detected, hence the name 'foul-brood'. Foulbrood is a bacterial disease, with the American version (the more serious of the two) caused by a spore forming bacterium. The larvae eat the spores, thus contracting the disease[ix].

Interestingly, the disease portion of *The ABC and XYZ of Bee Culture* was only added in the last editions (1910) of the book, with this noteworthy comment introducing the subject: " A few years ago it was considered that bees were freer from disease than perhaps any other class of animated nature, for the reason that individual members of the colonies were so constantly giving way to the younger ones. But this has been shown to be, to a great extent, a mistake; for apparently there are at least three or four distinct diseases with which the bee-keeper has to contend.[x]" Looking back now, one hundred years since the publication of this book, it is easy to see that the honeybee is now under more stress and has to contend with far more disease than ever before. To the diseases discussed above, the honeybee of today also has to contend with a series of new diseases and, perhaps most destructive of all, the varroa mite. The diseases that inflict bees today must be divided into two classes: viruses and carriers of viruses. The carriers of viruses are themselves destructive to colony health, but when they also carry viruses into bee populations, the combination can be deadly. There are two carriers of bee viruses: mites and fungi (microsporidia).

Acarine (Tracheal) Mites

First discovered in the British Isles in the early 1900s, the female mite lays eggs in the trachea of the honeybee. Upon hatching, the mites feed on the haemolymph (blood) of the bee. Mature mites leave the trachea, attach themselves to one of the exterior hairs of the bee to mate and ultimately find a new

host and repeat the cycle. Tracheal mites were first found in North America (Texas) in 1984, believed to have been introduced from Mexico[xi]. Tracheal mite infestations, if severe, can destroy colonies.

Varroa Mite (Varroa destructor)

Varroa mites represent one of the greatest threats to honeybees today. Varroa mite eggs are laid in brood chambers shortly after brood is capped. Typically, the mites lay several female and a single male egg in a cell. The mites reach maturity at about the same time as the bees do, but prefer drone (male) larvae, as it has a slightly longer incubation period, and because drones visit other hives, giving mites the opportunity to further colonise. As bees emerge, the several mites accompany these bees and search for a new host[xii]. Varroa mite reproduces exponentially in a hive, and lethal infestations can develop within only a few months. Varroa mites were first discovered in Southeast Asia in the early 1900s, where they parasitized the Asian honeybee Apis ceranae. From Wikipedia: "The jump to *A. millefra* [the common honeybee of today] probably first took place in the Philippines in the early 1960s where imported *A. millefra* came into close contact with infected *A. ceranae*[xiii]*".* The Varroa mite punctures a hole into the exoskeleton of bees, where it feeds on its hemolymph.

Nosema

There are now two known strains of Nosema- apis and ceranae. Nosema is a microsporidian that lives in the intestinal tract of bees, and is believed to be an increasing danger to hive health in relation to the percentage of bees infected within a hive, although some hives with large infestations seem healthy. Nosema apis and ceranae are related and both impair digestive processes within the intestinal tract of bees, but both also have idiosyncratic characteristics. Nosema apis infections in bees tend to peak in spring, and then decline throughout the summer, as bees take regular cleansing flights. Apis also causes diarrhoea in bees, which can be seen as fecal staining both on the inside and outside of the hive. Over the last several years, the incidence of apis has decreased, while ceranae has increased. Nosema ceranae was first found in the Asian honeybee, Apis ceranae in 1998, and in the European honeybee, Apis millefra, in 2004[xiv]. Nosema ceranae is now widespread throughout Apis millefra populations around the world. Ceranae is more difficult to detect than apis, as it is not as easy to detect because fecal staining does not generally occur with a ceranae infestation. Also, apis infestations tend to decline during the spring, while ceranae has been found to remain throughout summer, weakening bees during summer months, and into winter. Randy Oliver has written an excellent article on Nosema, and its impact on colony health, which is well worth reading[xv].

Viruses of Honeybees

There are now at least eighteen known viruses that affect honeybees, some of which are recent additions to the host of pathogens that threaten bees today. Because they are new, how they affect bees and how they react with one another is still not completely understood, and is the subject of a great deal of research. Most of the following historical information is from a very extensive publication by the European Commission titled 'Virology and the Honeybee '[xvi]. I have listed only the most prevalent and deadly bee viruses here.

Acute bee paralysis virus (ABPV) and its cousin chronic bee paralysis virus (CBPV) were the first honeybee viruses to be isolated. They were discovered in laboratory work conducted by the great bee pathologist Leslie Bailey in Britain in 1963, who went on to discover several other viruses of the honeybee (Bailey et al. 1963)[xvii]. Bailey noted that these infections in high numbers caused honeybee mortality, but that he had not found a colony without some infected bees. Bees infected with either one of these diseases tend to shake or tremble, may exhibit a dislocated wing, or sometimes have a black, greasy appearance. Bees infected with ABPV or CBPV often cannot fly, and are seen walking on the ground in front of hives. ABPV causes death more quickly and in smaller infection rates then CBPV. Infected bees usually die within a day or two of noticeable symptoms. Both of these viruses are have existed for at least a century, and the description of symptoms is similar to those given by Aristotle who observed sick, trembling honeybees in ancient Greece. The appearance of varroa destructor in Europe in the 1980s also saw a relationship between ABPV and varroa as a carrier, or vector, for bringing ABPV into colonies. Researchers found that colonies with large infestations of varroa also had large infestations of ABPV (Ball, 1983; Allen and Ball, 1996). Later lab experiments found that female varroa could act as a vector and transmit the virus not only to adult bees but also to larvae as well (Ball, 1983; Wiegers, 1986). ABPV is not considered to be a large contributor to honeybee mortality or CCD. As we will see, varroa as a vector for viral pathogens repeats itself with other viruses.

Black Queen Cell Virus (BQCV) was first isolated in 1977 from dead queen larvae within cells that were black in appearance. The virus affects developing larvae, which take on a pale yellow appearance when infected. The larvae then fail to completely develop and die. This virus is completely dependent on the microsporidian Nosema apis for its transmission. The virus does not cause infection when injected into or ingested by adult bees or developing larvae without Nosema apis present (Bailey *et al.*, 1983a). BQCV increases the mortality of bees infected with Nosema apis, and there is some evidence showing that it

may also be related to high varroa infestation levels, but this is not yet certain.

Bee Virus X (BVX) was found in 1974 by researchers in Arkansas looking for a different virus. BVX only multiplies in newly emerged bees, and only in the warm environment of the hive. It does not immediately kill bees, and has no outwardly visible symptoms. Laboratory infected bees demonstrated significantly shortened life spans (Bailey *et al.*, 1983a). BVX is not correlated with CCD.

Cloudy Wing Virus (CWV) was first isolated in the lab of Leslie Bailey in 1980. This virus causes the wings of honeybees to take on a cloudy, non-transparent appearance. Bees die within a few days of showing this symptom. Infection in some bees occurs when lab bees are in proximity to one another. Rubbing or spraying bees with preparations of CWV has caused infections in some experiments, but other identical attempts to infect different sets of bees have often failed to cause infection. Researchers believe that there may be unknown factors involved in order for infection to take place. CWV has been found to be more prevalent in hives infested with varroa, in some cases (Ball, 1997). Despite its high prevalence in some areas it has not been associated with CCD (Nordstrom et al, 1999).

Deformed wing virus (DWV) was first found in Japan in 1983 and is closely related to varroa destructor infestations. It causes death in both brood and adult bees in hives with high varroa infestation levels (Ball, 1983). Honeybees with DWV have deformed or poorly developed wings and are unable to fly. Bees with DWV also often have abdominal abnormalities, and sometimes cannot sting. Bees suffering from DWV are usually expelled from the hive and usually do not survive for more than 48 hours[xviii]. DWV is believed to have mutated from the Egypt bee virus first discovered in Egypt in 1977. A recent French study found DWV in 90% of colonies sampled, and in 100% of the varroa mites from the same colonies[xix]. Studies in the United Sates came up with similar numbers. DWV is very common, exists on all continents, and infection levels are directly correlated with varroa infections levels. DWV may also be transmitted by queens infected with DWV, and also by workers feeding larvae. DWV is currently the most frequently detected virus, and is found in honeybee populations around the world.

Israeli acute paralysis virus (IAPV) and Kashmir Bee Virus (KBV) are relatives of acute bee paralysis virus (ABPV) are the most recent and potentially most deadly viruses of the honeybee. KBV was first discovered in 1974 in the Asian honeybee Apis ceranae in northern India, hence the name Kashmir bee virus. KBV is considered by some as the most lethal of all bee viruses, where in lab work only small amounts of the virus initiated infection. Once infected, bees usually died within three days (Bailey et al

1979)[xx]. IAPV was first described in Israel in 2004, and KBV probably made the jump to apis millefra sometime in the 1980s, perhaps in Australia, although this is still a matter of debate. Bees infected with IAPV present symptoms of shivering wings, which quickly progresses to paralysis and death on the ground near the hive. An American study conducted in 2007 found a strong correlation between these two viruses and CCD[xxi]. The table below has been taken from the Beeoligics.com website, and shows in table form the relationship between IAPV, KBV, Nosema apis and ceranae.

Agent	CCD (n=30)	Non-CCD (n=21)	Total (n=51)	Positive predictive value (%)
IAPV	25 (83.3%)	1 (4.8%)	26 (51.0%)	96.1
KBV	30 (100%)	16 (76.2%)	46 (90.2%)	65.2
N.apis	27 (90%)	10 (47.6%)	37 (72.5%)	73.0
N. ceranae	30 (100%)	17 (80.9%)	47 (92.1%)	63.8
All four agents	23 (76.7%)	0 (0%)	23 (45.0%)	100

Table I: Analysis of bees tested for pathological candidates in CCD and non-CCD operations

Researchers did a very thorough investigation of 30 colonies that suffered CCD and 31 healthy colonies, screening for all known pathogens of bees. The four pathogens listed in the table were found in numbers ranging from 76.7%, to as high as 100% (KBV) of colonies that perished from CCD. IAPV was most strongly correlated with CCD, occurring in 83.3% of hives suffering CCD, and in only 4.8% of non-CCD hives.

Sacbrood virus

Sacbrood is a disease that was first suspected to be a virus in work done by G.F. White in America in 1917. White was able to inoculate extracts from diseased larvae into healthy larvae, suggesting the disease was viral in nature. This was later confirmed by Leslie Bailey in 1964. Brood with the disease are unable to pupate properly, and are enclosed in a thin fluid sac which accumulates between new and old layers of skin. The larvae turn to a yellowish colour and soon die within the brood chamber. Sacbrood is usually detected by worker bees, who then remove diseased larvae from the hive, thereby limiting the spread of the disease. In 1988, an Australian study found SBV in 43% of what appeared to be healthy worker pupae, who were seemingly unaffected by the virus, suggesting that healthy colonies can carry low levels of the disease without it becoming lethal. Bailey found that SBV was common in colonies but

that large numbers of diseased larvae were rarely seen (Bailey, 1967)[xxii]. Varroa does not yet appear to be a carrier for this virus.

Slow Bee Paralysis Virus

First isolated in 1974 by L. Bailey, slow bee paralysis virus (SBPV) causes bee death around 12 days after initial infection. Shortly before death, SBPV causes the front legs of the bee to become paralyzed. SBPV was considered rare before the onset of varroa, but is now being found more frequently and is strongly associated with varroa. Studies in the U.K. have found that varroa has been found to carry SBPV, and became established at the time of highest varroa infestation levels (Carreck et al., 2005)[xxiii].

Other Potential Factors Contributing to Honeybee Mortality

CCD is the newest, but certainly not the only way that a colony can perish. One of the most common ways for bees to die is from a massive infestation of varroa, in conjunction with a nosema ceranae and DWV infection. This has happened to beekeepers that I have spoken to, and I have lost colonies from this combination of pathogens. The record losses experienced in California this spring were not largely attributed to CCD. Most of the hives died from what was considered numerous factors- heavy varroa infestations, cold weather, a resurgence in European foul brood, and poor forage being the chief culprits[xxiv]. An excellent UK research paper by N. Carreck, B. Ball and S. Martin published in 2009 shows the very strong relationship to hive mortality and high infection levels of varroa and DWV[xxv]. There is also a great deal of debate and scientific work being done surrounding the role pesticides play in honeybee mortality. One class of pesticides in particular, known as neonicotinoids, have received a great deal of attention in the media, as are believed by many to be a major factor in honeybee mortality. I would like to focus on one study implicating neonicotinoids that was conducted by biologist Chensheng Lu at prestigious Harvard University, which received a great deal of attention in the media [xxvi]. Honeybees in a controlled environment were fed high fructose corn syrup containing various amounts of neonicotinoids. The study made the conclusion there was a direct link to neonicotinoids and CCD. Many scientists, however, found that the study was deeply flawed and did not replicate doses that would be found by foraging bees in agricultural areas that used neonicotinoids. For example, the study claimed to use what are known as 'field realistic' doses of the neonicotinoid imidacloprid. As the name implies, a field realistic dose of what in this case is a pesticide, would be the same dose that bees foraging in an area where imidacloprid had been applied to crops would be naturally exposed to. The lowest dose used in the study was fed to bees for an entire month, and had no effect at all on the bees,

in particular their ability to forage or navigate. This is of importance, as neonicotinoids at higher levels cause bees to become disoriented and not return to the hive, giving rise to speculation that the empty hives seen with CCD are caused by neonicotinoids impairing the ability of foraging bees to return to their hive. In the peer review process, several scientists felt that this initial low dose was already several times higher than those that would have occurred in the field. The researchers then went on to increase the level of imidacloprid fed to the bees to levels 100-400 times larger than levels that scientists had already established as field realistic doses! Not surprisingly, this high dosage of imidacloprid did have cause mortality in the bees. The study then went on to make assertion that there was a strong link between imidacloprid and CCD. This is, of course, an absurd assertion. If, for example, I conducted a scientific study where I fed human beings 100 times the recommended daily intake of water (say 500 glasses per day, which equals about one glass per minute for eighteen hours), I would almost certainly cause severe medical problems and probably fatalities in the test subjects of the study, and it would bet then irrational to then say that water is poisonous to humans. This is the danger that poorly conducted scientific studies pose, and this study is an example of scientists performing bad science. Randy Oliver has written an outstanding article on this much-publicized study, and on the reaction to it in the scientific community[xxvii]. Another study, which gives clear indications of field realistic doses of neonicotinoids and examples of over dosing of lab studies done by several other research studies was conducted by the British government and is well worth reading[xxviii]. This study also points to a growing body of research showing that neonicotinoids *do not* play a significant role in the decline of the honeybee. It should come as no surprise that neonicotinoids, which are used to kill a wide variety of insects, also kill honeybees in high doses. Neonicotinoids are in very wide spread use in Canada and Australia, countries where there have been almost no cases of CCD reported[xxix]. Blame on neonicotinoids is now the flavor of the day, with France going so far as to put a moratorium on their use for two years, to allow a clearer picture of their true impact to develop. There is a seductive simplicity in blaming neonicotinoids on the decline of the honeybee- we could solve all of the problems facing honeybees simply by stopping their use. Unfortunately, the problem is much more difficult than this, and the solutions to the problems, as will be discussed below, are by no means simple and painless. Great difficulties lie ahead if we are to ensure a safe future not only for our honeybees, but also for ourselves, as we are so dependent upon them. I would also like to point out that I in no way endorse or support the use of neonicotinoids or any other insecticide or herbicide. I do not. The use of these chemicals on plants and to combat insect infestations runs completely against biodynamic practices and should always be avoided. There are cases where neonicotinoids have been used incorrectly and have

killed large numbers of pollinators (including honeybees), but these incidents are isolated and are do not reflect what is normally the safe application of these chemicals[xxx]. Having said this, I believe it is *extremely* important to understand issues surrounding the demise of the honeybee with clear judgment that relies on the most up to date peer reviewed science to help navigate this emotionally charged issue. What scientists have found is that hives that have succumbed to CCD often have a large number of different chemicals, chiefly in their combs, that have built up over time. These chemicals are fat-soluble and once they are in the wax of the combs, they do not leave. The chief chemicals found are those that are used to combat varroa mite in the miticides Apistan and Check-Mite, and in fungicides to prevent fungal infections on fruit trees[xxxi]. In contrast, neonicotinoids are water soluble, and do not build up over time in comb.

Finally, I would like to very briefly discuss electromagnetic radiation. A study published in 2011 by Daniel Favre found that when cellular phones were placed inside beehives, the electromagnetic waves emanating from the phones produced piping behaviour in worker bees, a sign that the bees were preparing to swarm[xxxii]. The notion behind the study is that ever-increasing electro-magnetic radiation present in the world is affecting honeybee's ability to orient and to return to the hive. In the study, even though the bees seemed to be disturbed by the extremely close proximity of the phones, they did not leave the hive. One very simple exercise in logic can prove very definitively that electromagnetic radiation does not cause CCD, or is a significant factor in honeybee mortality: If electromagnetic radiation is the cause of CCD and colony mortality, then the highest rates of CCD and colony mortality would occur in urban, highly populated areas where there is the highest level of electromagnetic radiation (the most cell towers, the highest usage of mobile phones and electronic equipment, etc.). This is not the case. In fact, urban survival rates for honeybee colonies have been shown to be higher than those in rural areas, where electromagnetic radiation is much lower [xxxiii]. It is believed that this is because there is a higher diversity of flowering plants for bees and lower pesticide usage. Urban beekeepers are also more likely to give more attention and care to the smaller number of hives that they usually have.

What did Rudolf Steiner Say?

I have, in the first ten pages of this essay, tried to give a clear picture of the research and discussion that has been taking place around the world in regards to the decline of the honeybee. I have also tried to

give the most comprehensive and best peer reviewed research available on the subject, with the goal of cutting through the very deep and very often unscientific opinions that are rampant everywhere in the media. This groundwork is important, as it sets the stage for a discussion to take place regarding what Rudolf Steiner said in the now famous words of his 1923 lectures on beekeeping[xxxiv]. Before getting into the details of these lectures, I would like to briefly speak about who Steiner was, not just for those who may be reading this essay who are unfamiliar with anthroposophy or the biodynamic movement, but also to correct anthroposophists who refer to Steiner as a philosopher or as a mystic. He was neither, and when we speak of Steiner in these terms, the false impression can be given to those not familiar with anthroposophy that his ideas may have been 'thought up' as some type of philosophical exercise, or that they were the result of some vaguely defined mystical experience. Rudolf Steiner was an Initiate. Initiates are leaders of humanity, and are given the task providing the impulses that will lead to the proper evolution of the human race. Rudolf Steiner incarnated at a particularity important time for humanity, when the new age of Michael had recently begun, signifying that the gates of the spiritual world, which had been closed for several thousand years, were slowly again reopening, and will continue to do so for the next millennium[xxxv]. Steiner's high level of clairvoyance allowed him to peer deeply into the spiritual world, where he witnessed the activity of many different types of spiritual beings. It was with this high level of clear vision and access to the spiritual world that Rudolf Steiner conveyed the true realities of the world of the honeybee. As anthroposophists know, each animal species has a group ego, where the traits of the species, which exist in the spiritual world, find their expression in each animal of that species. Every dog, for example, acts in familiar ways because of the group ego of the species. The same can be said for elephants, sharks, spiders, etc. But when Steiner spoke of honeybees, he said the following:

> In the initial stages of evolution, they [honeybees] were not connected with the same evolutionary chain of events that animals and humans have completed. *The consciousness of a beehive is of a very high nature. Humankind will not attain the wisdom of such consciousness until the next major evolutionary stage- that of Venus which will come when the evolution of the Earth stage has finished (p.170).* [xxxvi]

There is not a single group ego that governs the behaviour of the entire species of the honeybee, as is the case with other animal species. Instead, each hive has its own individual consciousness. Steiner spoke of this by saying "The group soul of a beehive is *a very high level being* ….It is of such a high development that you might almost say it is cosmically precious…. We must view it as we would a

precious child; it stands apart from lines of the normal evolutionary progress that most animals have followed (p. 176)[xxxvii]." Here we are given a clear view of the true nature of the honeybee and of a honeybee colony. Each individual colony of honeybees acts with a high level of consciousness and intelligence, and behind each colony there is the working of a spiritual being that acts *consciously* to carry out the activities of the hive in the earthly realm. This fact is of immense importance, and sheds light on statements Steiner made regarding the practice of queen breeding.

The discussions that took place regarding the practice of queen breeding were with a beekeeper named Muller, who was not an anthroposophist but attended the lectures. Muller gave a lecture on beekeeping to an anthroposophical audience several weeks (10 Nov 1923) prior to the lectures given by Steiner, and in this lecture, he spoke of artificially breeding queens. Immediately following the lecture, with the audience still present, the following dialogue took place between Steiner and Muller:

> *Dr. Steiner* : I've just a few comment to make, namely in regard to the cause of continuous fertility in bees [a queen bee needs only to mate once, and then can lay fertile eggs, up to several thousand per day, for the rest of her life]. You may have already noticed from Mr. Muller's comments that there is a problem connected to the artificial breeding of queen bees. It might be interesting to ask Mr. Muller if he thinks this method holds much promise for the future.
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> *Mr. Muller:* Yes, I hold this method in high regards for the most part. If you leave a colony up to its own devices, and you don't tend it carefully, it might happen that the whole colony will deteriorate. The bad qualities will come through more and more, and what ever was good before is lost.
>
> *Dr. Steiner:* Since when have bees been bred artificially?
>
> *Mr. Muller:* For about twelve to fifteen years.
>
> *Dr. Steiner:* …Next time we'll investigate more thoroughly the matter of breeding of bees, and we'll see that what proves to be an extraordinarily favourable measure upon which something is based today may appear to be good, but that a century from now all breeding of bees would cease if only artificially produced bees were used. We want to be able to see how that which is so wonderfully favourable can change in such a way that it can, in time gradually destroy whatever was positive in this procedure (p. 177-8)[xxxviii].

Further comments by Steiner, this time on 5 Dec 1923 further emphasizes and clarifies his meaning. Discussions had taken place between Muller and others in the weeks leading up to this lecture, and before Steiner began his lecture, a summary of discussions between members of the audience was given to him. Part of that summary went as follows:

> Mr. Muller cannot comprehend that the bee colonies may die out in eighty or one hundred years. He simply cannot understand Dr. Steiner can say that, in fifty or one hundred years, artificial breeding can cause serious problems for the bee colonies to which it has been applied.

Steiner answered as follows:

> This is what I mean when I say that from the conditions of beekeeping today, you cannot draw conclusions as to what artificial methods of bee-keeping signify, or do not signify. One must think how it will be 50,60, or 100 years hence! It is quite comprehensible that someone should say today- I do not understand how this will be quite different in 50,60, or 100 years time- this is quite comprehensible.
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> But it must be recognized that there is a great difference in whether one allows Nature to take free course, or whether one brings artificial methods into the mater. I do not want to protest against what Herr Muller has said. It is quite correct. Today one cannot as yet confirm these things; one must wait for this. We will discuss it together in a 100 years time, Herr Muller, and see what your opinion is then. It is a question that cannot be decided at the moment.

The practice of artificially grafting queens was refined by Gilbert M. Doolittle in the mid 1800s, and came into widespread practice around the turn of the century with the publication of his book *Scientific Queen Rearing* in 1889[xxxix]. In this method, known as the *Doolittle Method,* four-day-old larvae, which were laid in horizontal hexagonal worker cells by the queen, are transferred (grafted) into vertical queen cups, which mimic the form and size of a naturally made queen cell. Sometimes a little royal jelly is placed in the cup with the larvae. These eggs are then placed in a small colony of bees in which the queen has been removed. The worker bees soon detect that the queen is not present (the queen emits a powerful pheromone) and begin at once to tend to the vertical larvae that are present in the hive and appear as queen cells. In this way, a beekeeper can produce dozens or even hundreds of queens within a short period of time (the whole procedure, including the four day development of the larvae is completed in

the seventeen day incubation period for a queen bee). This method has tremendous advantages for beekeepers, and is the foundation upon which modern beekeeping rests. Beekeepers don't have to wait for the colony to make its own queens, which it does when it is preparing to divide through swarming, or when a queen is old and failing through supercedure. Newly grafted queens can be used to make many new colonies, by placing each of the new queens into a new hive with two or three pounds of worker bees. Dramatic changes occurred with the advent of queen grafting. Beekeeping was historically a part farming practice. In order to have crops pollinated, the farmer needed bees, and several colonies of bees were an intricate part of the farm. With the advent of grafting, the practice of migratory beekeeping also developed. Beekeeping became a profession on its own, and operations developed in which hundreds of colonies were kept. These colonies could then be transported to farms, where they would pollinate crops and then be removed. The beekeeper charged a fee for the service, and also kept the honey. The farmer benefitted, because he could free up more land for expanding his crops, not having to worry about leaving wild spaces as nectar sources for bees when the narrow pollination window of most fruit and vegetable crops, which occurred in early spring, closed.

This practice has now reached monstrous proportions, with perhaps the archetypal example of this being the 600,000 acre almond producing region of the central valley of California, where 80% of the world's almonds are grown. Here, vast almond orchards stretch out as far as the eye can see, and very little vegetation other than almonds is permitted to grow. Honeybees are trucked in from as far away as New York State, some 4,000 kilometers away to pollinate this massive, monocultured area. These truckloads of bees are driven all over the United States to pollinate crops- apples, cherries, sunflowers, cucumbers and citrus fruits to name but a few[xl]. Since 2006, when CCD first occurred, the per-hive pollination fee for honeybees in California has jumped from under 60 U.S. dollars per contract, to over 200 in the spring of 2013[xli]. Ironically, the greater the failure rates of overwintering colonies, the more grafting takes place. Grafting has also evolved, and queen's eggs are now 'harvested' in sterile laboratories, under microscopes. These queens are usually first artificially inseminated, again in laboratory conditions, in what is considered by many, myself included, to be a cruel practice. I have included a YouTube link for anyone interested in what is done.[xlii] We have discussed diseases and parasites that have been strongly implicated in the growing levels of bee mortality, but how does this fit in with Steiner's predictions on the practice of breeding queens through grafting, and of the negative effects he predicted it would have on honeybees?

Of key importance in understanding the connection of grafting and the increase in bee mortality is that the hive itself, as quoted above, is connected with a conscious, spiritual being, of whom the honeybee colony is an earthly reflection. It is in this conscious activity that the laying of eggs by the queen, including eggs intended to be queens, must be understood. *When a queen lays an egg as a queen, it is consciously meant to be a queen, and a worker egg is consciously laid as a worker by the being of the hive, through the activity of the queen.* This is of the highest importance. When eggs laid as workers are then grafted into queen cells, these eggs become queens, but were intentionally laid to be workers[1]. They become inferior, weak queens that carry this weakness into their progeny. In nature, it sometimes happen that bees will turn worker eggs into queens, but Steiner speaks of this as an aberration and that it is a reflection of a weak and sick colony.

In lecture six of *Bees* Steiner had the following conversation, again with Herr Muller:

> Dr. Steiner: "You could say that the effect of what you feed them is truly very strong, and you can't dispute the fact that in certain isolated cases, it is possible to turn a worker into a bee that could lay a few eggs, but a true queen it is not.
>
> Mr. Muller: That's what we call a pseudo queen, which is due to a diseased beehive.
>
> Dr. Steiner: …In the beehive there is this tendency for bees to be able to change a would-be worker into an egg laying queen by applying a special method of feeding it. This is a type of illness. The beehive is a single entity. **In this case the beehive is sick….If you make a worker into a queen, then this queen is, in reality, an overly healthy worker, but the entire hive should be considered ill.**

This is what we would today call an emergency queen, and usually happens when the colony goes queenless unexpectedly. I believe, based on Steiner's indications, that this is the foundation upon which <u>*all*</u> of the problems facing beekeeping must be understood. Steiner gives the following analogy of taking all of the earth's coal and using it without any thought to future generations. "You must then tell yourself, well, all right, we'll rob our descendants of coal. But they will be able to find another source of energy, so they won't need the coal. In the same way, you could, of course, talk about the disadvantages

[1] This is an area where little, if any research has been conducted. To know the exact time that a queen lays an egg into a queen cell would be of great interest and perhaps help to understand the cosmic connections of when this takes place. Steiner spoke of the influence of the Sun and Venus in connection with the hive and the queen. Some type of camera equipped for the dark in a hive to record this event, several times over several years would be, I believe, an area of fruitful biodynamic research.

in the artificial breeding of bees (p. 21)[xliii]. By grafting queens, Steiner uses an analogy that the 'energy' that the bees will need in the future will be exhausted. What type of energy does Steiner here refer to?

Those familiar with Steiner's work and with Anthroposophical concepts will know that Steiner could only be referring what he called life or etheric forces. All life on earth must have an etheric sheath, or body which surrounds it and prevents it from its natural tendency to decomposition into organic matter, and eventually into minerals. When the life or etheric forces of any living thing leave, life ceases, and instead of the building and upholding etheric forces, which emanate from the sun and are life itself, the opposite forces, emanating from the earth, break down formerly living bodies back into mineral, lifeless matter. When the etheric body of the human being is weakened, for example, illness and disease inevitably set in[xliv]. This fact, even though not explained in these terms, is common knowledge in society today. When we are exhausted, or stressed, it is commonly known that we are much more susceptible to illness and disease, and this has been supported by a large body of scientific data[xlv]. Additionally, human beings have karma, a destiny that predisposes us to illness and health. In particular, Steiner's comments on the nature of karma in human beings and infectious disease is worth visiting. In the fifth lecture of *Manifestations of Karma* Steiner discusses malaria and cholera in connection with the human ego[xlvi]. In this lecture he describes how a human being with, in the case of a weak ego constitution, may seek out the illness cholera in order to strengthen the ego, and in the case of an overly-strong ego may seek out malaria to effect balance in the ego. The chief point that I would like to make here is that illness (in the case of malaria a parasite, and in the case of cholera a bacterium) are not blind and the result of chance, as those following evolutionally theory believe. Illness and disease also has, as does the honeybee colony, a form of consciousness that serves a purpose in the world. In the case of the animal, which cannot be said to have karma, at least on an individual level, illness acts to bring about death in the weak and unhealthy, not as is thought of with the concept of natural selection, which is again unconscious, but rather as guided from the spiritual world with full consciousness, to keep the species strong and in a healthy balance.

With this in mind, the increase in illness and mortality in honeybees must be seen as a response to the weakened etheric forces of the species that have been brought about through human intervention in the form of the widespread practice of grafting queens. For example, someone who has contracted the AIDS virus has a compromised immune system and is open to a whole host of infectious diseases that attack the weakened patient[xlvii]. But in the case of someone suffering from AIDS, we know that the *underlying* cause of the host of illnesses and infections are ultimately the result of the AIDS virus itself. If

an AIDS patient dies of pneumonia, we can say that pneumonia was the ultimate cause of death in the patient, but that the root cause, the true cause of death, was the AIDS virus. In the same way, we must say of the honeybee that the *root cause* of illness and mortality in honeybees is not in the host of viral and other pathogens that are infecting bees, but that this root cause must be sought in the practice of grafting queens, and the dramatic increase of disease and mortality are but reflections of this root cause. It is the greatest mistake for the anthroposophist or biodynamic practitioner, who wishes to give an anthroposophical view of the plight of the honeybee, to state that the plight of the honeybee is the cause of many factors, queen breeding among them. The words of Steiner are clear, and as this essay has attempted to demonstrate, the dramatic increase in honeybee mortality must be considered, at root, as being caused by queen grafting.

Historical records of honeybee loses have not been accurately kept, but the general consensus, at least in the North America and Europe, is that average loses prior to 2006 were in the range of 10-15%, and that since 2006 those numbers have escalated to somewhere around 30%[xlviii], with the largest loses to date occurring in 2013. As has been shown above, accompanying these loses has been a large increase in the number of pathogens that are now infecting honeybees. The most serious of these are newcomers, and should be viewed as indicating a point of etheric exhaustion in the honeybee: Kashmir Bee Virus was first found in North America in the 1980s, Varroa first became a problem in the 1990s, shortly after Deformed wing virus began to make its appearance, Nosema ceranae became widespread 2004, and Israeli acute paralysis virus was first seen in 2004. The newest virus of all, reported in 2010 and known as **i**nvertebrate iridescent virus (IIV), has been found to be highly correlated with colony mortality when nosema ceranae infection is also present[xlix]. We are now at a point where loses, if this trend continues, will reach truly catastrophic levels. Perhaps most disconcerting of all, is that there is, as far as I have been able to judge, no scientific work currently being conducted looking at the practice of queen breeding as being the cause of honey bee weakness. With no real understanding of the problem, we must be prepared for much higher honeybee loses to occur in the western world in the very near future, I believe before the current decade has passed. Interestingly, there have been studies that show that some areas seem to be mysteriously immune from high overwintering colony losses and CCD. One study looked at beekeeping in Uruguay, where there are over 400,00 hives, and reported that significant losses beyond historical norms had not occurred, even though Varroa mite, Nosema ceranae, DWW, and other pathogens had been detected[l]. I suspect that in these areas, there are still vestiges where old ways of beekeeping exist, and where bees are allowed to produce their own queen through swarming and supercedure.

The Future of the Honeybee and the Task of Anthroposophy

As I have state above, I believe that much larger and catastrophic loses of honeybee colonies are inevitable, and based on the acceleration of bee mortality, and also of new pathogens that are infecting honeybees, these crippling loses will be occurring in the very near future. This will mean that the costs of many of the groceries pollinated by honeybees in commercial agriculture will become much more expensive in the western world. Fruit, melon, squash and cucurbit crops in particular, which cannot produce at all without pollination, are most at risk. It is with this in mind that the anthroposophist, and in particular, the biodynamic beekeeper must understand their important role in this highly important developing crisis. There are many other problems today in society that are a reflection of our collective lack of morality and understanding of the true spiritual nature of the world. Global warming, corporate greed, poisoning of the oceans, loss of species, and world poverty and hunger are all signs of the turbulent times that we now live in. We can also include the plight of the honeybee as being a reflection of the poor state of affairs in which the human being now stands. In all of these events the beings of the spiritual world gaze sternly at the human race, waiting for us to correct the problems of the times in the way in which they must be addressed- with a true understanding of the world. But in the case of the honeybee, the spiritual world focuses squarely on the anthroposophist. The spiritual world, speaking through Rudolf Steiner, has given us the solution to this problem almost a full century before it has reached its crisis point. In 1919, at the close of World War 1, Rudolf Steiner foresaw a real opportunity for true and spiritual social change to take place. In his lecture cycle *The Social Future*, Steiner gave the framework through which a new social order could be formed out of the ashes of a decimated Europe, which would have provided for the advancement and spiritualization of Western culture to take place. This opportunity was lost, and through it, an opportunity of bringing an anthroposophical understanding of the world, essential to the proper evolution of humanity, was also lost. Such an opportunity is now again placed before the anthroposophical movement, in which the solution to the problem of the honeybee can only be seen in its true light through an anthroposophical understanding of the world.

Practical Solutions

The most important measure that must take place in order for honeybees to again become healthy is for the bees to allowed create their own queens. Far and away the best way for this to happen is for bees to be allowed to follow their natural inclination to swarm. The biodynamic beekeeper, must, above all, allow bees to produce queen cells, and to allow at least one swarm to occur from a hive that has produced queen cells. After this, if there are numerous queen cells left, especially if they are on more

than one frame, what I would term 'natural division' can then be carried out. In natural division, one frame with queen cells is placed in a five- frame nucleus (nuc) hive, with at least one frame of capped honey. The rest of the nuc can then be filled with empty frames to be drawn out. There is also the possibility, which I have read about but never tried, of taking remaining queen cells, carefully cutting them from frames where there is more then one queen cell, and then gently pressing them into existing frames of brood with no queen cells on them, and putting them in a nuc hive with at least one frame of honey. In this way, several new colonies can be made from one colony that is in swarm mode. This is, of course, not the ideal. The ideal is to allow the bees to swarm at will, even if it means that there are swarms of new virgin queens after the primary swarm with the old queens (we should not be concerned with creating large amounts of honey, but healthy bees). Often, however there is only a primary swarm, with the other unhatched queen cells being killed by the new virgin that was first to emerge. Allowing bees to swarm is widely frowned upon in beekeeping, as it reduces honey harvests and it is widely believed that allowing the hive to create new queens may introduce undesirable traits into the colony. It is these types of opinions that must be addressed by the biodynamic beekeeper. I believe that it is also important for biodynamic beekeeping be in a position to create healthy colonies of bees that can be sold to beekeepers and farmers who have the need. This would call for a level of commercial biodynamic beekeeping to take place, similar to the way in which medicines are sold under the Weleda name. If Steiner's indications are correct, there will certainly be a large market for the sale of honeybees in the future, but more importantly, the weakened etheric forces of the bees could be gradually built up with the introduction of strong colonies with natural queens replacing weaker, grafted queen colonies in as many areas around the world as possible. Additionally, the interest in these healthier bees would also lead to great opportunities to lay the ground work for a true, spiritual understanding of the honeybee and beekeeping.

In order for this type of enterprise to succeed, a standardization of beekeeping, at least in the area of colonies for sale would have to take place. Universal Langstroth hives (nucs and full sized hives) and Hoffman frames would be used for commercial operations. I am not advocating the abandonment of more natural hives (straw, log hives, one room hives, top bar hives, etc.). These types of hives could be used as 'mother' hives to produce swarms that could then be placed into standard hives. The idea of this type of enterprise would be for the production of healthy bees. The notion of producing honey would be secondary, and only in the case of clear excess. It is also important to note the most valuable queens, and hence the most valuable colonies, value meaning the strongest and healthiest stock, will be achieved by producing long generations of natural queens. For this to take place, the queens that are

born from natural queen cells are the ones that should be kept. Let us take a concrete example: A colony of bees with a grafted queen swarms. The grafted queen (the old queen) leaves with the swarm, and the newly hatched first generation natural virgin queen remains in the hive. This queen is a stronger queen of higher quality then original grafted queen. Two years later, this hive again swarms. Now, the first generation queen (now the old queen) leaves with the swarm, and the new, second-generation virgin queen remains in the hive. This second-generation queen is of higher value and quality then the first generation queen, and is one more generation removed from the weaker, grafted original queen. This process must be allowed to continue over time. Colonies could be made to swarm frequently by keeping them in a fixed space, without adding more brood boxes or supers. One room hives, straw skep hives, natural log hives, and top bar hives would all be good candidates for this type of natural bee breeding for those who do not favour standard Langstroth hives. Over time, the goal would be to have long lineages, perhaps dozens of generations long, creating strong, natural colonies that would, in turn, have the strength to endure disease and parasites in a much more robust way than the honeybees of today. I believe that parasites attack weakened organisms, and with strengthened honeybees, the level of parasite infestation should naturally also decline.

I picture the etheric health of the honeybee to be twofold. First, there is the general etheric health of the entire species, where all honeybees are affected by large changes in practice. The wide spread practice of grafting would therefore also weaken populations of bees that were not grafted, as the whole of the species would be affected. The reverse is also true, and beneficial practices, like that of creating large-scale natural breeding apiaries for bees discussed here would help to strengthen the entire species. The second picture that I have of the etheric health of the honeybee is that of the individual colony over time. As stated at the earlier, Steiner specifically stated each honeybee colony has a spiritual being associated with it, which stands as a sort of group soul for that individual colony. Thus we can also speak of the health of these colonies being built up, over time, through the natural creation of queens for many generations. These individual colonies would stand out as beacons that would lend strength to the species as a whole- the more of these colonies in existence, the more strength that would be given. In order to also increase the health of bees, consideration to the health and diversity of the land on which colonies are foraging must also be discussed.

In lecture six[2] of *Bees,* Rudolf Steiner spoke of the importance of creating a large and diverse source of nectar from flowers that bees truly love. He spoke as follows:

> It is true, isn't it, that there are years when bees are forced to collect almost all their honey nectar from trees [honey-dew]? During such years, the constitution of the bees' blood is in extreme danger; they contract diseases more easily than in other years. For such a situation, it will be important for future beekeepers to set up a very small greenhouse- it doesn't have to be very large, in which the beekeeper will keep and tend artificially such plants that the bees love at certain times the year, plants that bees definitely need. In this way, the beekeeper will have a small bed of flowers to toward which he can send his bees, for instance, in May. The bees will seek them out by instinct when those specific plants that they need are either doing very poorly in nature, or are not even present during such a period in May[li].

The practice of providing bees with nectar from plants they love is again a natural one. It is letting the bees do what they know is best for them. Here, we must resist the temptation of sowing plants that may be of value to us, like a crop, instead of plants that are the preferred choice of honeybees. For example, it may be of benefit for us to sow an annual plant like buckwheat, which produces nectar, honey and grain, but when placed side by side to a plant like borage, is ignored by honeybees, who far and away prefer borage over buckwheat (this is the experience I have had in my area in western Canada). To this I would also add that it is important to plant as much diversity in the blooming times of plants over the season, and especially in the fall, when a nectar dearth often occurs in many areas of North America and Europe. Also of importance is the practice of applying the life-giving forces of the biodynamic preps over land. 500 and 501 should each be applied at a minimum once per year, and preferably more (see Demeter standards)[lii]. Compost prepared using biodynamic methods should also be applied to flowering pastures to provide healthy plants which will in turn produce healthy, life-imbued nectar for bees. Another important issue to consider in creating the best environment in which honeybees can become healthy again and thrive is that of considerations in dealing with the varroa mite.

There is a movement today which I would loosely call 'natural beekeeping', which considers any type of chemical treatment added to the hive to kill varroa mite, or any other honeybee pathogen as unnatural and counter productive. I am not against this approach to beekeeping, as it should be considered as an ideal to which we should strive in the future, but I would like to point out a significant drawbacks

[2] The reference here occurs in lecture six in the text available from www.rsarchive.org , but is in lecture five of the paperback addition I own (Anthroposophic press, 1998).

associated with this approach to beekeeping at the current time, when viewed in the light of the biodynamic approach. One aspect of this natural approach to controlling varroa is to provide a break in the brood cycle of the colony. Varroa eggs are incubated in brood chambers, so if there is a period where no honeybee eggs are laid in the colony, varroa will have no place to lay their own new eggs, thus slowing the exponential expansion of the mites. One method for providing this break in the cycle is to split colonies in mid to late spring. Newly formed colonies are left queenless, and as explained above, the worker bees soon sense they are queenless and create an emergency queen. In the time it takes for the new queen to emerge, the colony will not have new eggs, and thus no place will be available for varroa to lay eggs. This, however, creates a weaker emergency queen, and not help to increase the overall strength of the colony, as explained above in the discussion on grafting. For this reason, I believe this technique should be avoided. Another natural technique is to place empty drone frames into the colony, into which the queen will lay unfertilized eggs, which will become drones. Drones have a longer incubation period than workers (21days for workers, 24 days for drones), and because of this, varroa have developed a preference for drone comb, with the thinking that the varroa eggs will have a better probability of making it to maturity before the bee emerges. Varroa are believed to be able to detect a different pheromone, or perhaps lack of pheromone in drone brood, which allows them to differentiate between the different eggs being laid in this mysterious phenomenon. In any case, this process does occur, and varroa does have a preference for drone comb. To control varroa, the drone frames are then frozen before the drones emerge, killing both the incubating drone and varroa. I cannot comment of the efficacy of this, as I have not done it, but it is worth noting. The last method of naturally controlling varroa that I would like to discuss here, is that of allowing bees to fend for themselves, without treatment, with the strongest bees, and perhaps most hygienic bees, surviving. Through the process of natural selection, it is felt that these bees will then produce offspring that will also have the best capacity to survive varroa. The methods described above, splitting and creating drone comb, are often done in conjunction with allowing the bees to then fend off varroa without any chemical treatment.

There are several fundamental problems associated with overwintering without varroa treatment, when viewed biodynamically. The first is that there will be large levels of colony mortality in years when varroa is rampant, which now seems to be every year. If a biodynamic beekeeper has begun the process of trying to create a long lineage of naturally bred queens, than loses in this process due to varroa will take a long time to recover. For example, if a biodynamic beekeeper had successfully created a third generation queen and corresponding colony, and this colony is then lost to varroa, it would take at least three years to get back to a third generation colony- a significant six year setback. Even though bees that

are allowed to breed and divide naturally over time should, if Steiner was correct, become stronger, this gain in strength will be incremental, perhaps taking decades until truly strong colonies emerge. After all, it took decades of poor management in the process of artificial grafting for the bees to reach the point at which they are now. The second problem I foresee with this chemical-free natural selection process of creating varroa resistant honeybees lies in the root cause of the weakness in bees being breeding and not the pathogens that are now infesting honeybees as a result of breeding. Let us turn again to the analogy of the AIDS patient who suffers from pneumonia. It would be folly to think that we could somehow create resistance to pneumonia in AIDS patients by having them fight pneumonia without any form of treatment or medicine, with the idea that some form of resistance to future pneumonia infections would develop in patients that survived the infection. This is, of course, because the pneumonia infection is a result of the immune system being weakened by the AIDS virus. But is this not what we are asking our honeybees to do when we leave them to fend for themselves against varroa? Varroa must be seen as being an outcome of the root cause of honeybee weakness-namely queen grafting. Because of this, I believe that attempting to create hygienic and varroa resistant strains through natural selection will ultimately end in failure. Perhaps, in time, when a critical mass of long-generation queens have been created, with the accompanying strong colonies these queens will produce, perhaps then we can speak of allowing the bees to fend for themselves, but until that time, we must take measures to help honeybees combat varroa and the lethal combinations of viral infections which often come accompany the varroa mite. What measures should be taken to facilitate this?

When speaking of natural and chemical methods for treating varroa, the distinction that I like to make is between those compounds that occur naturally in nature, and those that are man-made. Man-made varroa treatments are generally antibiotic in nature. In North America the most common antibiotics used to control varroa are Apistan (Fluvalinate) and Checkmite (Coumaphos). There are two problems associated with the use of these chemicals. The first is that varroa mites have developed a resistance to these chemicals- more mites are surviving treatment, and as this happens, more antibiotics are needed to be effective[liii]. Those varroa mites that survive then create varroa resistant offspring. This creates an escalation that ultimately results in stronger varroa mites, something that should obviously be avoided. The second problem that has arisen from the use of these man-made antibiotics is that they are fat-soluble, and, as was briefly mentioned above, they therefore accumulate in the comb of hives. One of the commonalities found in hives that had perished from CCD was that they had large levels of both these antibiotics in their comb[liv]. Even though these antibiotics have been developed to kill varroa, they

also seem weaken honeybees. Based on both of these enormous drawbacks to these man-made chemicals, they should not be used by biodynamic beekeepers.

The second, and what I consider natural method, for treating varroa is through the use of either formic or oxalic acid. Both of these are organic acids, meaning they are created naturally in nature. Oxalic acid is found in all plants, at various levels, including clover, rhubarb and spinach[lv]. Formic acid also occurs in numerous plants, including stinging nettle, and is created by ants in large quantities. Formic acid is also contained in the venom of all stinging bees and wasps, and in honey. It is also used in the food and feed industry as a preservative[lvi]. Both of these organic compounds are water soluble, and therefore do not accumulate in the comb or fatty tissues of honeybees. Rudolf Steiner said the following regarding these two organic compounds: "Just as you will find formic acid (in German this is called 'ant acid' or 'acid from ants,' since ants supply it in concentrated form) everywhere in nature and everywhere in the human body; likewise you will find everywhere in nature and in the human body Kleesaure, or oxalic acid."[lvii] Steiner goes on to describe how oxalic acid is transformed by insects into formic acid, and how it is then spread in fine dilution throughout the Earth's atmosphere, as insects exude it in small quantities as they fly about the earth. Steiner speaks at length about the purpose of both formic and oxalic acid in nature and the human being in lecture 8 of *Bees.* Both the earth and the human being are constantly transforming oxalic acid into formic acid.

> If the body just happens to have too little formic acid, it will decay and will not longer be able to support the soul; the body ages and the soul must leave. …in nature as well, formic acid is derived continuously from oxalic acid, so that the Earth constantly has the possibility of being surrounded not only by oxygen and nitrogen but also by formic acid… Now we can say that in the case of the Earth, formic acid is also the basis for the Earth's soul and the Earth's spirit.[lviii]

Based on this information, it is easy to see why oxalic acid is acceptable in biodynamic beekeeping to treat against varroa[lix]. To this I would suggest that formic acid should be added to this list. Both formic and oxalic acid have excellent efficacy in treating varroa- killing somewhere around 90-95% of all varroa in a hive. The problem with oxalic acid is that it will also kill brood as well, and so cannot be applied until the hive goes broodless, usually in November. This means opening the hive in cold weather, and it also means that the hive goes into the winter weakened from varroa, and does not get relief until the weather has turned cold and all foraging has ended.

For this reason, I believe that formic acid is a better choice. It can be applied as early as mid-August, just when varroa infestations are starting to reach high levels, and formic acid does not kill brood. Formic acid also kills tracheal mites, where oxalic acid does not. The hive can be opened when the weather is warm, and by eliminating most of the varroa before the true cold of winter sets in, the hive can gain strength from being rid of varroa and its accompanying viruses to help cope with the coming cold of winter. Traditionally, formic acid has been applied by soaking an absorbent pad in formic acid and then placing it the hive for a week, and repeating three times, although some methods may vary. I am not spokesperson for any product, but I feel here that I must mention one product that makes the application of formic acid very easy. The product is called Mite Away Quick Strips, and was just made available in Canada this year. It is a formic acid pad, that only requires a one-week application, and two weeks after the application, honey can be harvested. The product has over a 90% total mite kill[lx]. I tried this product in mid-August, and had a very low bee mortality level, and high (300+) mite kill. Experienced beekeepers have been using formic and oxalic acid for decades, and as of yet, no resistance has developed in varroa. By treating with one of these natural acids, bees have a much higher chance of surviving over winter in areas where there are high varroa levels, and this is of crucial importance for the biodynamic beekeeper trying to create long lineages of queens, and to build up an apiary based on this premise.

I would like to make one more recommendation to biodynamic beekeepers before bringing this essay to a close: using insulated hives for all honeybees in northern climates. *The ABC and XYZ of Bee Culture* makes the following comment about overwintering bees in un-insulated hives:

> It is unwise to attempt to overwinter bees outdoors in single-walled hives north of 40 degrees north latitude. While the colonies may come through after a fashion, the shock of the exposure will be so great that they probably will not be good for much to gather honey. It is, therefore, important that the hives be protected from high winds, and that the walls surrounding the hive be double and warm. Special double-walled hives are manufactured, the space being filled with chaff, planer shavings, leaves, or other suitable material…. The cover or roof should also be double so that the heat of the cluster will not too readily radiate away, thus causing a great consumption of stores in order to keep the necessary animal heat; for it should be remembered that, the warmer and better protected the cluster, the less honey they will be obliged to eat[lxi].

Here we see a very logical case being made for keeping bees warm by using insulated hives. Bees keep warm by a process known ‘shivering’, where they vibrate their flight muscles to generate heat. This

process requires energy (honey), and so the more efficient a hive is, the less honey the colony needs to consume. This also keeps bees healthy, as bees that cannot defecate are more susceptible to dysentery and nosema. The less food a bee needs to consume to keep warm, the less fecal matter it accumulates, and the healthier it will be. What seemed to be common knowledge one hundred years ago when the *ABC and XYZ of Bee Culture* was written now seems to have been lost among many beekeepers. Standard Langstroth hives are made of a single layer of plywood, usually only ¾ of an inch thick. This also seems to be the case in top bar and other types of hives I have seem. This single layer will not provide significant protection and insulation for bee in northern climates, especially in the weakened condition of the honeybee today. I have used both insulated foam board and wood shavings. It is quite simple to make insulated hives using a standard Langstroth hive, and then gluing ½ inch foam board to this, and then adding another plywood layer on top of this. The foam board also does not accumulate moisture. The drawback to foam board is that it is not natural. This winter, I will be constructing a hive with an outer plywood wall, then an inner straw lining, which will fit standard Hoffman frames. When constructing hives like this, larger bottom boards also have to be made. I also place a wooden box, 7 ½ cm high (3 inches) with a screen bottom on the top of the upper brood chamber. This is filled with planer shavings, which will absorb excess moisture from the hive. It can be checked throughout the winter, and if the shavings become damp, they can then easily be replaced. I have also heard of lambs wool and leaves being used for this purpose. *The ABC and XYZ of Bee Culture* has some very good diagrams of double walled hives, and also of larger structures used to protect colonies from the elements during the winter. They can be found under the sections on 'hives' and 'wintering'. This book is available as a free download from www.archive.org.

Conclusion:

The most important aspect in understanding the crisis that now faces the honeybee, and also the human being, who is so dependent upon this creature of love, is to understand the true, spiritual nature of the honeybee. I have stated in this essay that queen grafting is at the root of the crisis facing the honeybee, but this must be understood as the physical manifestation of this lack of spiritual understanding. True knowledge has been given to Anthroposophists through Rudolf Steiner, directly from the spiritual world. I believe it is a task of Anthroposophy to bring about the salvation of the honeybee, as we are the only ones who have a true understanding of this most precious of God's creatures. I will close this essay with the words of Rudolf Steiner, given in the third volume of Karmic Relationships on August 3rd, 1924:

I have said that those who stand with full intensity within the Anthroposophical Movement will return at the end of the century, and others will then unite with them, for by this means the salvation of the earth and earthly civilisation from destruction must eventually be settled. This is the mission of the Anthroposophical Movement, which weighs on the one hand so heavily upon one's heart, while on the other hand moves the heart, uplifts it with enthusiasm. This mission we must understand and see.

Any comments or questions can be directed to my e-mail address at:

jbbach1@yahoo.ca

Thank-you,

John Bach

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[i] http://www.fas.org/sgp/crs/misc/RL33938.pdf
[ii] http://www.frequency.com/video/dan-rather-reports-buzzkill/87705620/-/YouTube
[iii] http://us1.campaign-archive1.com/?u=5fd2b1aa990e63193af2a573d&id=b80378a660&e=09c7162298
[iv] http://news.psu.edu/story/141186/2007/02/19/research/probing-question-whats-killing-honeybees
[v] http://wn.rsarchive.org/Lectures/GA351/English/SGP1975/NinBee_index.html
[vi] This book is in the public domain and is available online at the following address: http://archive.org/details/abcxyzofbeecultu00root
[vii] http://archive.org/details/abcxyzofbeecultu00root (p150)
[viii] http://en.wikipedia.org/wiki/List_of_diseases_of_the_honey_bee
[ix] ibid
[x] http://archive.org/details/abcxyzofbeecultu00root (p.134)

[xi] http://entnemdept.ufl.edu/creatures/misc/bees/tracheal_mite.htm
[xii] http://en.wikipedia.org/wiki/Varroa_destructor
[xiii] ibid
[xiv] http://en.wikipedia.org/wiki/Nosema_apis
[xv] http://scientificbeekeeping.com/nosema-ceranae-not-your-fathers-nosema/
[xvi] *ec.europa.eu/research/agriculture/pdf/**virology_and_the_honey_bee**.pdf*
[xvii] Bailey, L., Gibbs, A.J. & woods, R.D. (1963) Two viruses from adult honet bees (*Apis mellifera* Linnaeus). *Virology of General Virology 21*, 251-260.
[xviii] http://en.wikipedia.org/wiki/Deformed_wing_virus
[xix] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1472076/
[xx] Bailey, L., Carpenter, J. M. & Woods, R. D. (1979). Egypt bee virus and Australian isolates of Kashmir bee virus. J Gen Virol 43, 641–647.
[xxi] http://www.sciencedaily.com/releases/2007/09/070906140803.htm
[xxii] Bailey, L. (1967). The incidence of virus diseases in the honey bee. *n. appl. Biol.,* 60: 43-48.
[xxiii] CARRECK, N L; BALL, B V; WILSON, J K; ALLEN, M F (2005) The epidemiology of slow paralysis virus in honey bee colonies infested by Varroa destructor in the UK. In Proceedings of XXXIXth International

Apicultural Congress, Dublin, Ireland, 21st-26th August 2005. 32-3.

[xxiv] http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDEQFjAA&url=http%3A%2F%2Fgallery.mailchimp.com%2F5fd2b1aa990e63193af2a573d%2Ffiles%2FWhat_Happened_to_the_Bees_This_Spring2013_opt.pdf&ei=d90WUuO1POifiQLM54DQAw&usg=AFQjCNH_-AObFmPR-rFwYMz2TtYff7PtkQ&sig2=LKf-2el5dw4_go99OWUpWQ&bvm=bv.51156542,d.cGE

[xxv] Journal of Apicultural Research 49(1): 93-94 (2010) (see bee virus, varroa and moitliry.pdf)

[xxvi] http://www.google.ca/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CDcQFjAA&url=http%3A%2F%2Fwww.hsph.harvard.edu%2Fchensheng-lu%2Ffiles%2F2012%2F10%2Fin-situ-replication-of-honey-bee-colony-collapse-disorder.pdf&ei=N5MVUobBGcH6iwLTnoDACQ&usg=AFQjCNFtqj6kfx8SI_1Elu7P8U0aFoJIzg&sig2=pEF7kd9sN4KT5i_e1zp0EA&bvm=bv.51156542,d.cGE

[xxvii] http://scientificbeekeeping.com/the-harvard-study-on-neonicotinoids-and-ccd/

[xxviii] pb13937-neonicotinoid-bees-20130326.pdf

[xxix] http://www.forbes.com/sites/jonentine/2013/04/11/science-collapse-disorder-the-real-story-behind-neonics-and-mass-bee-deaths/

[xxx] http://scientificbeekeeping.com/sick-bees-part-18f-colony-collapse-revisited-pesticides/

[xxxi] http://scientificbeekeeping.com/the-future-pesticides-and-fungicides/

[xxxii] http://www.scribd.com/doc/56187984/Daniel-Favre-Mobile-Phone-Induced-Honey-Bee-Worker-Piping

[xxxiii] http://fullspectrumbiology.blogspot.ca/2013/06/will-urbanenvironment-stop-honey-bee.html

[xxxiv] http://wn.rsarchive.org/Lectures/GA351/English/SGP1975/NinBee_index.html

[xxxv] For those interested in reading further about the work of Rudolf Steiner a free and very comprehensive library of his works is available at www.rsarchive.org . Steiner gave extremely important lectures on education, medicine, Christianity, science, art and agriculture.

[xxxvi] Steiner, R. (1998). Bees, Lectures by Rudolf Steiner. (Appendix) Anthroposophic Press.

[xxxvii] ibid

[xxxviii] ibid

[xxxix] This book can be downloaded for free from: file:///Users/johnandjenbach/Desktop/Scientific%20queen-rearing%20by%20Gilbert%20M.%20Doolittle.htm

[xl] bee-conomics-1.pdf

[xli] http://projectapism.org/content/view/93/49/

[xlii] http://www.youtube.com/watch?v=3vPV_WeQxV8

[xliii] Steiner, R. (1998). Bees, Lectures by Rudolf Steiner. Antrhoposophic Press.

[xliv] To go more into a more detailed explanation of illness and karma as given by Steiner is not possible within the limitation of this essay, but a great deal of material on this very complex and important part of Anthroposophy is available at: http://www.rsarchive.org/Medicine/

[xlv] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1361287/

[xlvi] http://wn.rsarchive.org/Lectures/ManfKarma/19100520p01.html

[xlvii] http://www.ucsfhealth.org/conditions/aids/signs_and_symptoms.html

[xlviii] http://science.time.com/2013/05/07/beepocalypse-redux-honey-bees-are-still-dying-and-we-still-dont-know-why/

[xlix] http://scientificbeekeeping.com/bromenshenk/

[l]

https://www.novapublishers.com/catalog/product_info.php?products_id=34853&osCsid=44a1c8ecba3140022542d6755e7d4e70

[li] http://wn.rsarchive.org/Lectures/GA351/English/SGP1975/19231210p01.html

[lii] DI bee stds Demeter Biodynamic 12-e.pdf

[liii] newvarroa.pdf

[liv] http://www.beeccdcap.uga.edu/documents/CAPArticle2.html

[lv] http://en.wikipedia.org/wiki/Oxalic_acid

[lvi] http://en.wikipedia.org/wiki/Formic_acid

[lvii] Steiner, R. (1998). Bees, Lectures by Rudolf Steiner. Antrhoposophic Press. (Lec. 8, p.148)

[lviii] ibid (p. 154-5).

[lix] DI bee stds Demeter Biodynamic 12-e.pdf

[lx] http://www.nodcanada.ca/

[lxi] abcxyzofbeecultu00root.pdf (see p.481)