MY LOVE FOR BEES by Dr. Lawrence Gregor

A public debate in 2008 saw five scientists putting their case for saving one endangered species. HONEY BEES!

Bees were declared the most invaluable species on the planet at an annual Earthwatch debate. The audience heard from five eminent scientists who battled it out for fungi, bats, plankton, primates and bees.

While of course all species are invaluable for our ecosystem, the debate was designed to raise awareness about conservation by asking the audience to vote for just one of the species.

I thank God that the audience voted to save the bees. Who would want a world without honey, flowers, and one third of everything we eat including chocolate and coffee? "Not me," you say. A balanced ecosystem is more than a good cup of coffee.

As honeybees gather pollen and nectar for their survival, they pollinate crops such as apples, cranberries, melons and broccoli. Some crops, including blueberries and cherries, are 90-percent dependent on honey bee pollination. One crop, almonds, depends entirely on the honeybee for pollination at bloom time. Without bees many crops would yield 30% less when harvested. This would increase the prices prohibitively. With food prices at an all-time high, some families in Australia would be unable to budget. Certainly without bees worldwide famine would be a given.

In addition, many of our medicines, both conventional and alternative remedies, come from flowering plants. And cotton is another essential product pollinated by the bee, so we could say goodbye to cheap cotton clothing and so on. I personally purchase all my 100% cotton business shirts and other cotton garments. The non-stick 100% cotton is amazing.

Many bird species and small mammals feed off the berries and seeds that rely on bee pollination. They would die of hunger and in turn their predators – the omnivores or carnivores that continue the food chain would also starve. Mankind would have to survive on wind-pollinated

crops; given our weird weather patterns, this may have the effect of increasing skirmishes for the control of dwindling food supplies.

Although other insects and animals pollinate – such as bats, butterflies and wasps – none is designed like the bee as a pollinator machine. There are 20,000 bee species around the world including solitary bees, bumblebees and honeybees. Many are monolectic – pollinate one plant; others like bumblebees and honeybees are polylectic. While bumblebees live in colonies of a few hundred, the sheer number of honeybees in a hive – up to 60,000 in the summer, with an ability to be managed and transported by beekeepers makes them the most valuable pollinator.

Unfortunately, most bees are already under serious threat with industrialized farming with its monocultures (the removal of natural forests and the replacement with palm monocultures). I have seen this in Malaysia. Pesticides have been responsible for spoiling areas used by bees whilst foraging, the air-born spray particles are carried back to the hives and is passed on to other bees. I had many colonies wiped out by pesticides some years ago and was forced to move my hives adjacent to a forest far away from pesticide areas.

While across the globe, the western honeybee – bred for its gentle nature and prolific honey making and pollination – is currently plagued by parasites and viruses. i.e. varroa and hive beetle. Modern agricultural practices continue to decimate the food sources needed for the continuation of western honeybee strains. I recently read that more than a third of honeybees were wiped out in the US recently by Colony Collapse Disorder, a mysterious disease which is thought to be a combination of these manmade practices. Australian beekeepers are currently looking at this with concern. I heard this mentioned two weeks ago at a DPI field day.

Dr George McGavin, who was supporting all things to do with bees said: "Bee populations are in freefall. A world without bees would be totally catastrophic."

Bees perform tasks that are vital to the survival of agriculture: In fact, approximately one third of our global food supply is pollinated by bees. Simply put, bees keep plants and crops alive. Without bees, humans wouldn't have very much to eat.

Briefly, bees need two different kinds of food. One is honey made from nectar, the sugary juice that collects in the center of flowers. The other is pollen which comes from the anthers of flowers. The numerous small grains called pollen are multi-colored just like the flowers. Most bees gather only pollen or nectar. As she sucks the nectar from the flower, it is stored in her special honey stomach ready to be transferred to the honey-making bees in the hive. If hungry she opens a valve in the nectar "sac" and a portion of her personal payload passes through to her own stomach to be converted to energy for her own needs.

The **bee** is a marvelous **flying machine**. She can carry a payload of nectar or pollen close to her own weight. Being a qualified private pilot I know that even the most advanced designs in modern aircraft can only take off with a load of between 25-30% of its own weight. I guess one could say that God's designs are much more superior than man's. The honeybee is certainly superior in all areas of intelligent design and hence a good reason to protect them. I have often asked, "How does the honeybee remain airborne with such a load?"

When her nectar "sacs" are full, the honeybee returns to the hive. Nectar is delivered to one of the indoor bees and is then passed mouth-to-mouth from bee to bee until its moisture content is reduced from about 70% to 20%. This changes the nectar into honey. Sometimes the nectar is stored directly into the cells in the honeycomb before the mouth-to-mouth working because some evaporation is caused by the 32.5°C (92° F) temperature inside the hive.

Finally, the honey is placed in the wax storage cells and after reaching approximately 20% of water content is capped with beeswax in readiness for the arrival of newborn baby bees. Pollen is mixed with nectar to make "bee bread" which is fed to the larvae. A baby bee needs food rich in protein if the bee hive is to flourish.

Before returning to the flower again for more pollen, the bee combs and cleans herself. This is done so that she can work more efficiently. Throughout her life cycle, the bee will work tirelessly repeating this process thousands of times.

Forager bees (adult worker bees) start out from the hive looking for blossom when three weeks old. As their lifespan is only six or seven weeks old they have much work to do in their schedule of maintaining the well-being of the hive. On average, a hive contains about 40-50,000 bees, hence their working environment is noisy with their droning. I will detail other information later.

I was first introduced to bees 45 years ago. It was my love for honey and the cost to buy it that pushed me to get started producing my own. About a mile from my home I found a bee box manufacturer who had turned an old 3 bedroom house into a tooled up factory. I purchased an eight frame box, baseboard and lid with eight frames in parts and set about nailing it all together ready for paint. My father-in-law knew the address of a bee keeper who gave me two frames of brood with bees. These frames I put into my new bee box. The bee keeper suggested I join the Amateur Bee Keepers Association. This helped give me a foundation of much needed information. For more than forty years I have gathered information from many sources to learn as much as possible. Because bees multiply prolifically, my two frames became 4, then 8 and so on. I just had to keep making extra boxes and add these supers over the queen excluder, which was a specially made steel mesh membrane with exact spacing of thin wire allowing worker bees (smaller than the queen) to past from the brood box to store honey to the upstairs honey box or super. One of the members of the amateur association was a queen breeder, who reckoned his bees were some of the best and very quiet. He said he could open his hives without smoking them. So I purchased a queen and placed the queen cage into my box of brood. The cage had five worker bees inside the small cage. I asked why there were five worker bees inside the cage with the queen. I was told that their job was to feed the queen and to work for some days on eating through the sugary/honey plug from the inside of the cage, whilst the bees inside the hive worked on the other end. It usually takes about three days for bees to eat through the candy plug in order that the new queen can be released into her new home. The three days of captivity gives the hive enough time to accept the new queen as part of the family.

It took many months to get to the point where I had enough honey to extract. I was even able to borrow the club's two frame extractor to sample my honey. I found out my bees were visiting the corner shop across the road which stored empty Coke bottles at the rear of the shop. I can say that my first extraction was not as I expected. It was very dark and strong in flavor. I was so upset that I killed my new queen and tried to raise my own. I later regretted my brash actions, for there was more to raising queens than what I read in my book. The fact was that during winter in my suburban street there was only a limited supply of good honey. My bees had gone looking for anything that had liquid sugar just to survive. I soon found out after making many mistakes that there is a balance to maintaining a good hive of bees. If the hive is within two kilometres (1.25 miles) of large honey producing trees and particularly when there is a seasonal honey flow then I got much better honey. The better the gene characteristics of the queen usually means that the bees will forage further to get better honey. If you are licking your lips and think you would like to sample your own honey then this is what you will need to do.

Firstly, you need a good weatherproof housing box constructed to a reasonable standard to aid the internal workings of the hive. The history of the construction of normal hives is as follows:-

The standard beehive currently used in many parts of the world for beekeeping is based on the Langstroth hive design.

Rev. **Lorenzo Lorraine Langstroth** (December 25, 1810 – October 6, 1895) was an American apiarist, clergyman and teacher. He is considered to be the father of American beekeeping. He created the modern day Langstroth hive, which in design is used all over the world. Langstroth was popularly credited with discovering the "bee space," though this discovery had already been implemented in European hives. Langstroth revolutionized the beekeeping industry by using bee space in his top-opening hive. In the summer of 1851 he found that, by leaving an even, approximately bee-sized space between the top of the frames holding the honeycomb and the flat coverboard above, he was able quite easily to remove the coverboard, which was normally well cemented to the frames with propolis, making separation hard to achieve. He later

used this discovery to make the frames themselves easily removable. If a small space was left (less than 1/4 inch or 6.4 mm) the bees filled it with propolis. However, when a larger space was left (more than 3/8 inch or 9.5 mm) the bees filled it with comb.

[Propolis is a compound produced from the sap on evergreen trees of which we have in abundance in Australia. Bees combine the sap with their own discharges and beeswax. This process creates a sticky, greenish-brown product used as a coating to seal up cracks and gaps inside their hives. Thousands of years ago, ancient civilizations used propolis for its medicinal properties. Greeks used it to treat abscesses. Assyrians put it on wounds and tumors to fight infection and help the healing process. Egyptians used it to embalm mummies.]

On 5 October 1852, Langstroth received a patent on the first movable frame beehive in America. Langstroth spent many years attempting to defend his patent without success. He never earned any royalties because the patent was easily and widely infringed. Langstroth hives are still in common use today.

In 1853, Langstroth had moved back to Greenfield, Massachusetts from Philadelphia and published *The Hive and the Honey-Bee* (Northampton (Massachusetts): Hopkins, Bridgman, 1853), which provided practical advice on bee management and, after more than 40 editions, is still in print today. *Langstroth on the Honey Bee* was published in 1860.

I also have a copy of this book. My copy was published by Dadant and Sons (1946, 1949 - USA) who gave credit to Langstroth for his original version.

In modern beekeeping a Langstroth style hive is considered as any vertically modular beehive that has vertically hung frames, a bottom board with a slit entrance running the full width so the bees can have easy access to the brood box. The entrance should be about 3/8 of an inch (1cm). I had experimented with larger entrances over the years because of Australia's hotter climate. I now recommend ventilated lids to help cool the hive on very hot days, otherwise many field bees will be engaged fanning air at the entrance. It is best to use the standard size entrance and place the hives under shade. You will need boxes containing frames for brood and honey (the lowest box for the queen to lay eggs, and boxes above where honey may be stored) and an inner cover and top cap to provide weather protection.

In a Langstroth hive, the bees build honeycomb into the frames, which can be removed with ease. The frames are designed to have the correct space between them in order to prevent bees from attaching honeycombs where they would either connect adjacent frames, or connect frames to the walls of the hive. The movable frames allow the beekeeper to manage the bees in a way which was formerly impossible.

Langstroth, as I said was the one who discovered the correct "bee space", a gap size of between 6–9 mm (1⁄4–3⁄8 in) in which bees would not usually build comb or close off spaces with propolis. However, as I have found, there is nothing certain with bees. Some bees refuse to follow the pattern of the foundation within the frame, especially on the modern plastic foundation.

Modern Langstroth hives have different dimensions from the original L.L. Langstroth's beehive that was originally patented in 1852 and manufactured until approximately 1920, however even today most beekeepers have retained the main features of allowing bee space as well as easy access which works well for the bees but also makes management of the beehive easier for the beekeeper.

The usual boxes are designed to take 8 frames or 10 frames. The standard and common size for a deep hive body is: **19 7/8"** in length, **16 1/4"**wide and **9 5/8"** in height. A deep hive body is heavy when it is full of bees, honey and pollen. Therefore, some beekeepers choose to use the medium size super for hive bodies. The dimensions of the frames vary according to the depth of the honey super boxes. I find it is better to purchase the frames from a beekeeper's supplier. However, for those who have the time to build their own hive; plans with sizes can be found on the internet.

Worker bees gather pollen and nectar which is carried back to this box/nest. The duties of the worker bees is to store supplies, care for the queen, the babies, clean the nest/box and maintain the internal working structure of the **hive**, to ensure it functions smoothly. They also make reproduction for the queen possible by providing clean cells in the brood

chamber and to ensure honey is produced at the highest rate possible. One may say they are certainly busy bees!

Secondly, you will need a **young queen** that has mated many times to ensure that she is up to the task of laying the thousands of eggs required for the rest of her laying life. Usually, a queen will mate with 12-15 drones (male bees) usually in springtime, which is smarming season or as I have found anytime within the warmer months usually after a swarm has left the hive and a new queen is needed for the survival of the depleted hive. There is no guarantee of the quality of the drone if the hive is near bushland. This is why some hives have multi-colored bees. Many queen breeders put their queen raising colonies in places far away from bushland. To maintain the quality of the breeder's queens with particular bred characteristics like color, quietness, housekeeping and above all aggressive foraging for nectar, drones are taken with the virgin queens to areas far away from other colonies to guarantee pure lines. A good queen can cost about $40-00 in Australia.

Thirdly, you need a good supply of **drones** (male bees.) Each hive has one queen, and 100 female worker bees for every male drone bee. This is the usual approximate figure during summer. The queen's only job is to lay eggs and a drone's job is to mate with a virgin queen. The worker bees forage for nectar and pollen. There are usually one or more frames with pollen depending on the numbers of bees in the hive. The bees collect **pollen** and nectar as food for the entire colony, and whilst foraging they pollinate trees and plants. (**Pollination** is the process of transferring **pollen** grains from the male anther of a flower to the female stigma of another flower. The goal of every living organism, including plants, is to reproduce. Successful pollination by various kinds of bees including honeybees allows plants to produce seeds necessary for survival.)

As a child my grandparents taught me that they needed a male tree for the many female pawpaw trees in the side yard in order to guarantee a good supply of fruit. My grandfather taught me about the necessity of cross-pollination.

The **honeybee** has a very **unusual stomach. Nectar** stored within their stomachs is passed from one worker to the next until the water content

within it diminishes. At this point, the nectar becomes honey, which workers store in the cells of the honeycomb. There are different figures given for an optimum moisture content of honey, but it should be about 17.8%. If the moisture content is too high, say greater than **20%**, the honey may ferment due to yeasts in the honey. Since honey is hygroscopic, if it is not in a sealed container, it will attract moisture from the air. A sealed glass jar is the best way to store honey. Some of my special honey is 15 years old (stored in glass) Honey nectar is 80 to **95 percent** water and 5 to **20 percent** sucrose (table sugar).

Honey can **Crystallize** and degrade over time. Even when stored correctly, it's quite normal for honey to crystallize. That's because it contains more sugar than can be dissolved. Much of my stored honey has crystallized, however I have proven that certain honey will crystallize faster than others. I simply warm the jar in a saucepan of hot water or place a jar on a window sill in the sunlight for some hours. Commercial Apiarists are more concerned with water content in honey than backyard amateurs for the following reasons. Fully ripened honey has converted flower nectar sugars and evaporated the moisture to approximately 18-20%. At this point the worker bees cap the cells with beeswax.

I was always fascinated by the accuracy of the worker bee builders who built hexagonal shaped comb slightly angled upwards so that the honey does not run out of the comb before the capping process is completed. Even without frames (in trees) the honeycomb is perfectly sized and shaped. There is no other shape that has the strength and the fact is that this hexagonal shape takes less honey to construct the comb necessary for storage. I believe that God who the intelligent designer put these characteristics within honeybees.

Some purport that fully **capped honey** will last forever. However, I think that is an overstatement given that beeswax capping by nature is proven to be porous. Capped honey is always ready for extraction and storage. As I have already stated honey is “hydroscopic”, which means that honey is affected by atmospheric moisture which left unsealed after harvesting may ferment. My experience has proved that when I harvested honey that was not fully capped and thinner due to high water content, the flavor of the honey changed after a period of time even though it was stored in glass jars. Sometimes I had to heat the honey in

a microwave oven to remove the fermented flavor, which is NOT a good idea. Hence, the lower the moisture within in honey before it is capped the better. Honey with 16-18% moisture content should last forever!
While excavating Egypt's famous pyramids, archaeologists found pots of honey in an ancient tomb. The honey, dating back approximately 3,000 years, is thought to be the world's oldest sample – and still perfectly edible.

The ancient Egyptians used honey for a multitude of purposes including as a sweetener, and an ingredient used in their embalming fluid.

Thanks to Egyptian drawings depicting ancient beekeeping, we now know that mankind has worked with bees for thousands of years. Previous studies were only able to date the use of bee products to around 2,400 BCE. However, it is now known that bees and their products date back much further. Other archaeologists have unearthed old honey. Ceramic jars containing the **world's oldest honey** (as far as archaeologists have found) — about 5,500 years old — were discovered in the tomb of a noblewoman in Georgia, not far from Tbilisi.

I guess we can say that honey has an incredible shelf life; it certainly does not need refrigeration. In fact I do not encourage refrigeration for it speeds up crystallization.

Let me now give more information on honey nector.

As the bee transports the nectar back to the hive, a protein **enzyme** in her honey stomach, called **invertase**, breaks the sucrose down into the two simple sugars, fructose and glucose. **Nectar** is a sweet fluid found in flowers. The different flowers give the honey **different flavors.** Honeybees are not the only ones that need it for their survival; Hummingbirds need a large supply of the sugary substance to maintain their high energy lifecycle. There are many of God's creatures that rely on nector in Australia. **Bees**, wasps, hornets, butterflies, **bats**, honey possum, some frogs and toads, **humming birds**, flycatchers, some spiders, **dragon** flies, **Mantis**, some hornets, a water strider and the list continues.

There are many other animal species in USA that eat nector, namely: Raccoons, honey badgers, skunks, bears and opossums. A friend of mine in North Carolina recently had his beehives torn down with a bear.

Honey has slightly more calories than sugar, because it is sweeter, less is required.

The majority of honeybee larvae eat honey, but larvae that are chosen to become **future queens** are fed with **royal jelly**.

Royal jelly is a white secretion produced by young, female worker bees. It is a special food used by the bees to nourish the young larvae and the Queen Bee. Worker bees produce royal jelly by mixing **pollen** with a secretion from glands in the hypopharynx to create a liquid food high in protein and vitamins.

The next drone (male bee) to mate with the queen will remove the previous endophallus and eventually lose his own **after** ejaculation. After **mating**, a **drone dies** quickly, as his abdomen rips open when his endophallus is removed.

Wikipedia gave me some ideas for the following information:-

In honeybees, the genetics of offspring can best be controlled by artificially inseminating a queen with drones collected from a single hive, where the drones' mother is known. In the natural mating process, the queen mates with multiple drones. These drones may not come from the same hive. Therefore, batches of female offspring have fathers of a completely different genetic origin.

The drones' main function is to be ready to fertilize a receptive queen. Drones in a hive do not usually mate with a virgin queen of the same hive because they drift from hive to hive. Mating generally takes place in or near drone congregation areas (DCA). How these areas are selected is poorly understood, but they do exist.

Mating occurs in flight, which accounts for drones needing better vision, which is provided by their large eyes. Should a drone succeed in

mating, he soon dies because the penis and associated abdominal tissues are ripped from the drone's body after sexual intercourse.

Honey bee **queen breeders** may breed drones to be used for artificial insemination or open mating. A queen mating yard must have many drones to be successful.

Mating between a single drone and the queen lasts less than 5 seconds, and it is often completed within 1–2 seconds. Mating occurs mid-flight, and 10–40 m above ground. Since the queen mates with 5-19 drones, and drones die after mating, each drone must make the most of his mating opportunity.

Drones greatly outnumber the quantity of virgin queens produced per season, so even with multiple mating by the queen, very few drones mate successfully (estimated at less than one in 1000). If needed, a virgin queen can embark on multiple 'nuptial flights', to be sure to receive enough semen from enough drones.

In areas with severe winters, all drones are driven out of the hive in the autumn. A colony begins to rear drones in spring and drone population reaches its peak coinciding with the swarm season in late spring and early summer. The life expectancy of a drone is about 90 days.

Splitting hives in Spring/Summer

One should consider splitting a strong hive in spring when bees are increasing in number. You can also split a hive for the purpose of raising queens. This also has the effect of reducing the probability of swarming.

This is what I want to focus on because there is nothing more natural than your hive swarming. In fact it is an inbuilt urge given by God. Even though stronger hives multiply greatly each year it is still a good idea to split them before they swarm. If your hive swarms you will not have enough field bees to gather in the honey during summer. So, in order to hold onto your beehive investment one needs to pay close attention during springtime when the swarming urge is at its peak. As a missionary I have not always been at home when this has taken place. Even this year I have lost many swarms which has weakened about 25% of my hives. Hence the reason for splitting a hive before an old queen does it for you. If you split the hive before it swarms you won't lose your bees. It can be rather a courageous act if your bees are aggressive. If this is the case good protective clothing is mandatory. The use of a

head veil is most important as stings on the face and around eyes are not pleasant and can become swollen. Forty or more stings can make one feel a little sluggish. Hives usually give obvious signs that they are getting ready to leave and performing a split is needed within days. When the queen begins to get crowded and starts running out of room to lay her eggs, you will begin to see queen cells in the broad box.
Swarming is the process when a new honeybee colony **is** formed from the original hive. This mass evacuation occurs when the old **queen bee leaves** the colony with a large group of worker bees usually on a warm day. In this swarm, about 60% of the worker bees **leave** the original hive location with the old queen. This is because the bees have built queen cells in the brood chamber in order to raise a second queen. When the new virgin queen hatches or is about to hatch the old queen will leave the hive and up to 60% of the bees will locate her usually nearby in a tree. The bees will swarm around her whilst selected bees go hunting for a new home for the thousands of bees in that swarm. The larger the swarm the larger is the requirement of the new hive location. Sometimes it takes some days for the bees to find a suitable place, hopefully not inside the roof of your house. If hives are located near bushland, they will relocate probably in a hollow tree trunk.

Because about 60% of the colony will leave, the remaining bees will then become satisfied with the extra room to store honey.
So, regardless, your bees are going to have to separate. The beekeeper has a choice. Does he separate them and create the 'illusion' that the bees have swarmed or does he just let them split naturally in which case he loses half his field bees necessary to bring in summer supplies of honey? Swarming is not a good idea in a suburban street as large swarms can put fear into your neighbors. One needs to have a duty of care to neighbors when more than 20,000 bees show up in their yard.

When you begin to see queen cells in your hive you have two options. The first option is just to cut out the queen cells and add more frames. Many beekeepers use this method. I have just found in my experience that once bees make up their mind to swarm, they do it usually on a warm day.
Your second option is to perform the split when you notice a large increase in bee numbers. You will begin with catching the queen. This is not always easy if she has not been marked with a color marking pen.
When inspecting the beehive, it can be useful to check that the queen is alive and well. However, this is easier said than done with a strong

colony of over 45-55,000 bees. So, to make your life easier, you can mark the queen with a colored dot on her thorax before putting her into the hive.

How to mark your queen

You can mark the queen with either a special coloring pen, paint or even a stick-on dot. You can buy either of these queen marking kits from most bee suppliers.

What color or choose?

Unfortunately there isn't a large color swatch to choose from. In fact there is an international color code for bees. This allows you to tell the age of any a marked queen. This system is usually used by commercial beekeepers.

Year ending:	**Colour**
5 or 0	Blue
6 or 1	White
7 or 2	Yellow
8 or 3	Red
9 or 4	Green

For example: if you re-queen a colony in 2018 - you would put a red dot on her thorax. The hobbyist beekeeper probably will not be overly concerned with the correct color especially if he changes his queens every year. I have found that the best colors for finding queens are white or yellow.

The best time to find the queen is in October (southern hemisphere) at the start of the season when there are only a small number of bees in the colony. Alternatively, if you are buying a nucleus of bees then it is worth asking the bee supplier to mark the queen for you.

Once you have found the queen, you can either pick her up with your fingers (be careful not to squash her) or use a queen cage. While the queen is on the comb, you should lower the cage over the queen. The worker bees will escape from the spikes but the queen will remain. Using a queen marking pen or numbering kit - you should put a dot on the back of her thorax. (See position on diagram below)

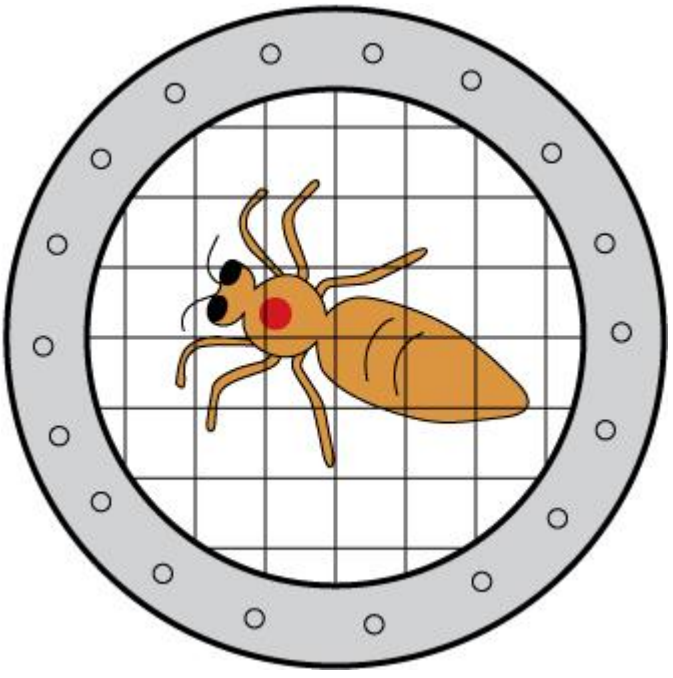


Diagram of a queen marking cage giving the position of the pen marking. Queen marking cages can be purchased from Bee equipment companies.

If you don't physically want to catch her (which will make your work easier) at least you will know where she is when checking your hive.

After you have separated the queen, you will need to split the frames in the hive as equally as possible. If you have 8 frames, try to give 4 to each hive.

You will want to make sure that each hive is left with at least one frame of honey; plenty of pollen; and some empty frames so that the bees can begin working. After this, you insert the frames into the box, the brood with the queen cell will need to be in the middle. Then you'll place the pollen frames on either side. Finally, you'll place the empty frames with comb on either side of that.

After this process, the nurse bees in both hives will stay with the brood. The forager worker bees from the split will continue to forage but will return to the original hive unless you relocate the new split to a different area. If not relocated it is important to give your split hive plenty of food.

In about three weeks, you should begin to see brood from your new queen. You may notice that your new hive is extra active. The brood will have hatched by then so that hive should have new foragers in the

field. The new queen will usually be actively laying eggs throughout the brood chamber.
If you monitor the activities of the new hive and find it isn't doing so well, this means that the hive is not functioning normally or as I say it is not yet in balance. You will need to locate your queen and make sure that she is there doing her job.

The **Hopkins Method** is very different. Might you well ask, what is the Hopkins Method? The Hopkins method is the removal of a frame with eggs or newly hatched larvae from a selected breeder queen. This frame is then given to a queenless cell builder colony. But it is not hung in the normal way; it is placed in a horizontal position above the brood nest. This method is usually done by amateurs when only a few cells are required.

Once a hive becomes queenless, the nurse bees will be stimulated to feed these larvae with an abundance of royal jelly and raise queens from them. The Hopkins method of raising queen bees is a simple method requiring no special equipment that can be employed easily by those who wish to raise queens for their own use. It works pretty well and can be counted on to produce good quality queens just as good as those purchased from a commercial beekeeper. Some say that this method allows the beekeeper to raise as many as 20 to 30 queens or more from one frame of brood. However, with this number there is virtually nothing left of the frame after the queen cells are cut away. For a good quality queen it is best to have a strong colony of bees to raise no more than say 12-15 queens at a time.

When getting young larvae from the breeder queen, it is best to choose a colony containing your best breeding queen, for example, one that lays well and produces a lot of brood. This is the hive that you intend to start a cell-builder hive. This is a strong colony <u>without a queen</u>. Put your good queen in a safe well protected place, so that you can put her back in the original hive at a later date.

A colony will only build queen cells if it does not have a queen. If a comb of eggs or young larvae were to be put into a normal queen-right

colony with the intention of create queen cells, this colony will not do so. Bees can be encouraged to make queens by deliberately making a colony queenless. In this condition the bees will attempt to raise a number of queen cells when given eggs or young larvae. That is what the cell-builder colony is for. Select a strong colony well supplied with honey and pollen, and many young bees. A single hive body colony can be used when only a few queens are to be raised. Temporarily remove the queen and the comb she is on with bees and place in a nucleus hive. The **cell-builder hive** is prepared overnight before the comb is put into the cell-builder. It takes a few hours for the bees to decide they need a queen before you put the freshly prepared comb in. The prepared comb is placed flat over the middle of the brood nest of the cell-builder hive with the prepared side facing downwards and raised up on small wooden blocks about 3 to 4 cm (1¼ inches) between the comb surface and the top bars of the frames below, so that the bees can draw queen cells down from the face of the comb. The comb is covered with a cloth to protect it from cold and an empty hive box or a shallow honey super is placed over it. All that is left to do is to put the lid on the hive If there is no honey flow, feed with sugar syrup during the cell building process, which takes about 4-5 days. This will help stimulate the production of wax. The young nurse bees will draw down many queen cells on the horizontal frame, nurture larvae and complete the work. A larva destined to become a queen is fed lavish amounts of royal jelly throughout her larval development, which causes her to develop large ovaries and gives her the ability to lay eggs. Basically, royal jelly is a protein-rich substance secreted from glands located in the heads of young nurse worker bees. It is very nourishing allowing queen bee larvae to grow faster and larger as well as live for longer periods than other bees.

Always use care after transferring the queen cells. I always keep then vertical so that the wings are not damaged before hatching. When the cells are sealed on day 13-14 of the queen raising process (or on the 10th day after the prepared comb is given to the cell builder), they should be cut out with a sharp knife and transferred to hives that need to be re-queened. Handle ripe cells carefully. To avoid injury to the tender

queen pupae the comb should never be shaken; gently brush the bees off. Mishandled cells result in deformed or dead queens. Some queen breeders transfer the queen cells into a Styrofoam container with drilled holes of 19 mm (¾ in) diameter to hold each cell, or a small box (with a lid) filled with sawdust or wood shavings to minimise vibration. I have used breadcrumbs over the year to carry queen cells to the hives. Place them in an upright position in the box at all times. Keep queen cells at hive temperature until they are placed in queenless hives. It is essential to introduce the queen cells into your hives or nuclei (small hives) immediately after removal. A queen cell can be introduced at any time after a laying queen has been removed, but for best acceptance it is better that the colony has been queenless for 1- 2 days. Destroy any emergency cells that have been started on the combs before introducing your queen cells. Insert the cell gently between the top bars of two frames in the centre of the hive in a vertical position. Care must be taken not to squash the cell as this may kill the young queen.

Mating hives are formed a day or two before the queen cells are due to emerge. These are mini nuclei which usually contain 1- 4 small frames and about one or two cups of bees (1000- 2000), or larger 5 frames colonies. You can place the queen cells into the mating nuclei in the same manner as described above. Leave one cell in the cell builder to replace the queen or reunite the original queen back with her brood and bees.

Remember, successful raising of new queen bees requires suitable conditions. You can raise good-quality queens by following the basic principles outlined here.

- Queens should be raised from the best colonies you have. Select a breeder queen from a colony with the best characteristics to breed from. Those characteristics will be passed on to all her progeny. Such selection will improve your stock.

- They should be raised from the smallest larvae possible, preferably larvae that are under 24 hours old. Larvae of this age will receive plenty of royal jelly (bee milk), so that they will be large and highly fertile

queens. The age of the larvae plays a significant role in the quality of the resulting queens.

- They should be raised in a strong and populous colony. There should be plenty of food in the hive to feed the developing queen larvae. The quality of the resulting queens will depend on the care they receive in the cell-building colony. The advantage of raising queens in a strong colony is that the young queens are well nourished owing to the large number of young bees providing sufficient royal jelly, and the ability to accurately hold the necessary temperature within the hive. The development of a queen from the time the egg is laid to the time she emerges from her cell takes 15 -16 days. Do not permit the sealed cells to remain in the cell-builder more than 10 days. One must be vigilant because the first queen to emerge will kill the other queens that are still in their cells.

- Queens should only be raised when drones are available. Generally, in Australia drones are present from late September to the end of March. In the northern hemisphere the seasons are in reverse, say from late March to the end of September. Russian strains have characteristics that slightly differ from Italian strains. A honeybee queen usually mates with 10 to 15 drones. A virgin queen is worthless to the colony unless she is successfully mated. Therefore, you must have a sufficient supply of drones to ensure successful mating of queens.

The drone provides half of the genetic material to the new bees. A colony possessing the desired quality should be encouraged to raise drones by giving it drone raising comb or frames with starter strips of foundation. A strong hive may have between 300 and 500 drones at peak periods. **Drones take 24 days** to hatch and become sexually mature at 14 days of age before they are ready to mate. Therefore drone 'mother' hives must have drones hatching when starting to give queen cells to the cell-building colony. Mating does not begin until the virgin queen is sexually mature. This takes place about 5 days after emergence providing the weather is sunny and warm (20°C/69 F or higher). The newly mated queen will start laying eggs after three days.

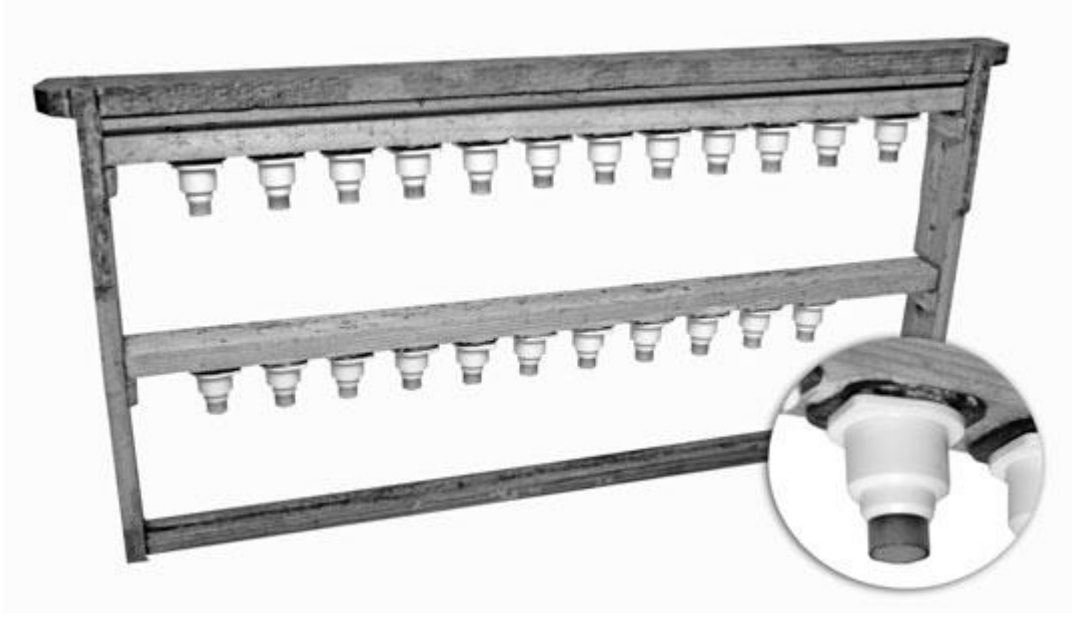
Raising genetically strong queens that produce healthy colonies can help you avoid the multitude of worries and problems currently facing honey bees. Robust colonies are resistant to pests, chemicals, and diseases.

Commercial queen breeders usually use the Doolittle method, which is the most common method of producing large numbers of queens.

Tools and equipment for raising queen bees using the Doolittle Method can be purchased from beekeeper's suppliers. Grafting requires some special tool equipment and supplies, including Queen cages. These are designed to confine the queen and provide, via screen or perforations, a way for the bees on the outside of the cage to feed the queen inside.

To graft larvae of the right age into special wax or plastic queen cell cups that are affixed to bars. The bars are positioned in frames, and the frames are inserted into a queenless nuc equipped with lots of young nurse bees and lots of provisions such as honey (and/or syrup) and pollen (and/or pollen patties).

Cell bar frames: These contain one or more bars that hold plastic or wax queen cups into which larvae are grafted. The frame is then inserted into a queenless colony where queen cells will be raised.

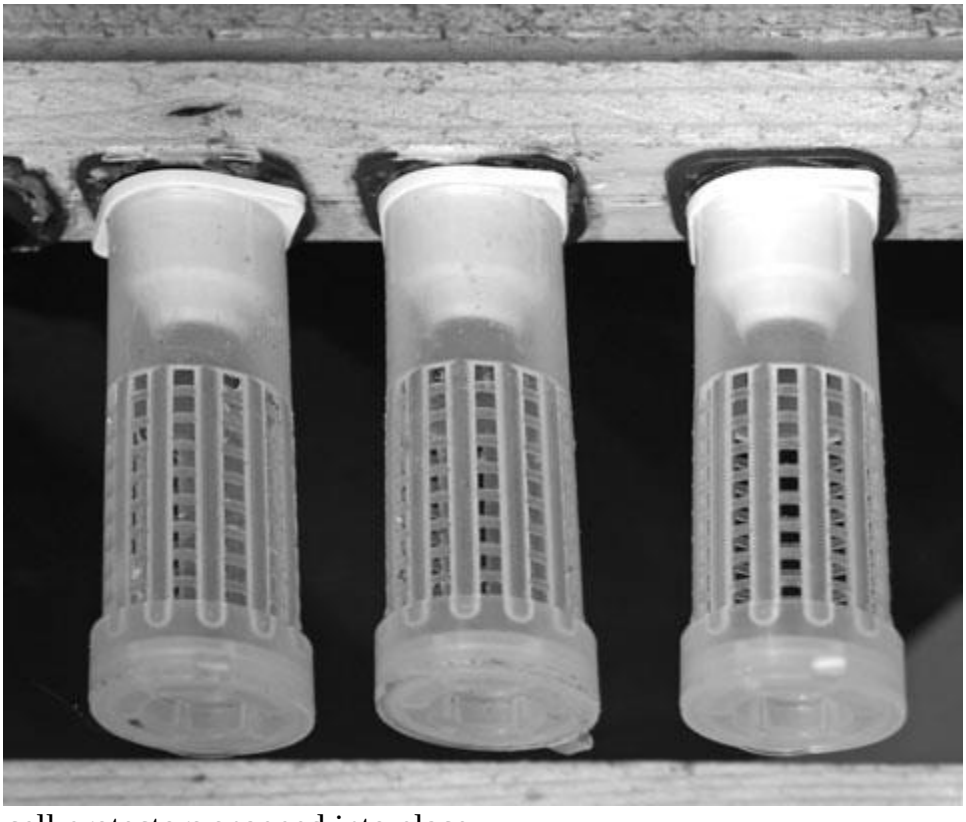


A cell bar frame (detail of individual queen cup, used by commercial breeders).

Grafting tools: You use grafting tools to lift the delicate and oh-so-fragile larva out of its original cell and place it gently in the cup on the cell bar frame. (See diagram above)

Three different kinds of grafting tools.

Queen cell protectors: Cell protectors keep the newly emerged virgin queens confined, preventing them from being able to move about the colony and kill the other queens.



Queen cell protectors snapped into place.

Queen cages: These are designed to confine the queen and provide, via screen or perforations, a way for the bees on the outside of the cage to feed the queen inside.

HOW THE DOOLITTLE GRAFTING METHOD IS DONE

There are steps leading up to grafting day, and steps following grafting day. You select the colony headed by your best queen for grafting. The grafting calendar is the same as the Hopkins method.

The Department of Primary Industries (DPI) in NSW, Australia does a better job of wording the above.

For those requiring a little more information on queen bees, read the following.

Queen bees are very different in makeup from worker bees. A queen is slightly larger than a female worker bee, having a large pea-size thorax and long tapered abdomen. Her reproductive organs are fully functional, while those of the worker bees are not. There is usually only one mature queen in the colony at a time and she is responsible for reproduction in the colony. A mature queen may lay up to 2000 eggs a day in bursts, but averages 700–1000 a day when conditions are favorable. A queen can live for several years, although under commercial conditions she is usually replaced every 1 or 2 seasons to ensure her vigor, which translates to colony health. After emerging from her cell, she mates on the wing six to ten days later with up to 15 drones. She will not mate again after she begins laying eggs.

Replacement of queens is usually done when the queen has reached an age when laying eggs is spasmodic or failing to reproduce. A colony of bees in the wild, or in an undisturbed domestic hive, will raise queen bees for three reasons: to replace a lost queen, to replace the queen when swarming, and to replace or supersede a failing queen. When raising queens, beekeepers will manipulate a colony to duplicate one of these three natural circumstances. Emergency cells are prepared by bees when the normal laying queen is accidentally killed or lost. Workers will select a few very young worker larvae which they convert into

queen cells by tearing down neighboring cells and building an extension to form a vertical cell. The selected larvae are fed extra supplies of rich food called ‘royal jelly’ and raised as queens. Emergency cells may be anywhere in the brood nest, although a central position on the comb is common. They are often in groups of two to three cells. Swarm cells are raised by a colony intending to swarm. The bees prepare special queen cell cups in which the queen lays eggs. Virgin queens emerge about two days after the swarm in which (50-60% the colony, including the old queen) have departed. Young larvae in swarm cells are very well fed with royal jelly and queen bees produced from swarm cells are usually larger than queens produced from emergency cells. A colony will prepare 15 to 25 swarm cells, usually around the edges of the brood combs, often overhanging the bottom bar of the frames. These cells were raised by the queenless hive. This emergency measure often results in large sized queen bees which have been raised especially to replace an old or failing queen in a colony. As with swarm cells, the bees prepare queen cell cups in which the queen lays eggs, and the young larvae are well fed on royal jelly. Normally a colony will produce only a small number of supersedure cells at one time. These queens are usually of high quality.

If purchasing from professional queen breeders, the type of bees selected will depend largely on your own requirements, make sure you make your requirements known to the queen breeder. Buy unrelated queens for successive years. If a breeder queen is used for two years running, there is a good chance that the second year’s daughters will mate with drones from the first year’s daughters, which may give rise to poor quality queens. So, buy some queens from different breeders. Imported breeding stock can be expensive. Some here in Australia have paid US$3,000 dollars for just one quality queen used as a breeding queen. Mostly, queens for normal use cost about $45.

The above article although basic gives enough information to show the importance of honeybees. It also shows the intelligent design (by the creator) in the makeup of honeybees in hive construction, reproduction, pollination and honey storage.