

A B C's



of Beekeeping

By Sandy Tabako

Amazing Bee Characteristics

We know and love our honeybees ~ dedicated pollinators, makers of delicious honey and fragrant beeswax, highly organized and efficient team-players, tirelessly hard workers, and often feared and misunderstood. They have survived for millions of years, with and without the aid of beekeepers. They know what to do, how to do it, and when. Let's take a closer look at some of the fascinating facts about this gentle and productive creature: *The Honeybee*

- Known as "Apis mellifera" (their Latin name), derived from Apis, meaning "bee", and mellifera, meaning "honey bearing". Often called the Western honeybee, or European honeybee, these domestic bees originated in Europe, Asia, and Africa. Brought to the United States as early as 1622 by European settlers, they are not 'native' to the U.S. This is the most common honeybee species in the entire world. Honeybees are found in every continent with the exception of Antarctica. Bees are very social, and are related to ants, termites, and some wasps.
- There are over 20,000 kinds of bees, but only about seven known living species of honeybees, and 44 subspecies.
- The specific study of honeybees is called Melittology.
- Honeybees are considered to be to be eusocial - - or truly social. The three main components of this are: 1) cooperative care of their young; 2) division of labor with females highly specialized for different tasks; 3) an overlap of generations.
- Bees are adapted to live purposeful and productive lives - - they are extremely efficient and do not waste any time, energy, or natural resources at any time of their busy lives.
- Honeybees don't see themselves as an individual bee, but only as a functioning and necessary component of the highly structured super-organism - - their colony.
- Originally, honeybees were tree dwellers (which is why so many feral hives are still found inside of trees or nestled deep within the branches). Now they are considered 'domesticated' because we are helping to manage their living conditions and collecting what they produce.
- Dark colors are threatening to bees, as they represent one of their worst predators, the bear! They become fearful and defensive. This is one of the reasons most beekeeping protective gear is usually white. . . obviously honeybees do not feel threatened by polar bears!!

- Honeybees are unable to see the color red - - it appears as black to them because they lack a photo-receptor for it, but they can see in the ultraviolet spectrum, which humans cannot. They also see polarized light when foraging as another component of 'floral signaling'.
- Honeybees can detect motion in as little as 1/300th of a second, as opposed to humans at 1/50th. This is one of the reasons why swatting at a bee can quickly irritate them.
- Beekeeping is sometimes described as being the 'second oldest profession' in the world!
- A honeybee relies on vibration to 'hear' as they do not have ears. However, they use their antennae to hear because the machanoreceptors located there respond to the movement of air particles at frequencies that are associated with sound.
- Honeybees have different personalities, attitudes, and temperaments, just like humans!
- Honeybees can remember facial features and recognize people, (better than some humans)!
- They are very intelligent creatures and can be trained or 'conditioned' to new behaviors. Honeybees are able to store and process information, and also to make decisions. Recent experiments have been successful in training bees to detect drugs and bombs using their acute sense of smell, which is so precise and 50 times stronger than a dog's, and they can detect explosives at concentrations as low as two parts per trillion! Some scientists have even trained bees in simple math skills, using colors and shapes as numbers. Bees can recognize 'zero', and current researchers are excited as to how our wonderful honeybees may be able to help in the field of robotics as well as AI (artificial intelligence).
- A honeybee's brain is about the size of a sesame seed. Even though this seems so tiny, one cubic millimeter, it is relatively large compared to the brains of other insects. Inside this amazing brain are a million neurons, of which our amazing honeybee uses every one of them. Honeybees have an incredible sense of time, distance, and direction. Studies have shown that a bee is capable of calculating the most efficient route faster than a modern computer.
- Honeybees are believed to experience suffering and also pleasure, but there is nothing to indicate that bees are capable of experiencing pain.
- Honeybees themselves are cold blooded, but their colonies are warm blooded. This is because bees are thermoregulators, able to keep their body temperature within certain boundaries, even when the surrounding temperature is vastly different.
- Honeybees do not naturally know how to fly, but must have lessons to learn this necessary skill. Sometimes, usually in mid-afternoon, you can observe this "flight training". First they just fly in and out of the hive....then around the hive. Gradually the distance increases so they can orient themselves on the location of their colony, and also develop strength. If there are lots of 'trainees', it may look like a small swarm is starting....just practicing!
- The wings of a honeybee beat at 170 -200 times per second, or up to 12,000 times per minute! This rapid vibration is what creates the 'buzzing' sound we hear. By comparison, a hummingbird's wings beat at 60-70 times per second.

- Honeybees have almost 3 million tiny, fuzzy, branched hairs all over their bodies....the head, thorax, abdomen, legs, antennae...even on their eyes and their tongues! Most of the hair is for pollen collection, and for increasing warmth. The hairs are strategically placed on the body for maximum efficiency in grooming. Bees are able to remove 15,000 particles of pollen in just 3 minutes as their mid-legs groom the pollen into their baskets on the hind legs. Hairs on the tongue are to help draw nectar up from blossoms, and on the eyes to help with wind detection.
- Honeybees have a preprogrammed cleaning routine. Amazingly, this doesn't vary, and doesn't matter if the bee is covered in pollen or just has a little bit. First, they swipe their compound eyes a dozen times - - 6 times with each foreleg. They are efficient and never have to brush the same part twice. The spacing on these eye hairs is about the size of a grain of dandelion pollen. This keeps the pollen suspended just above the eye for easier removal.
- A honeybee is attracted to and feels threatened by the carbon dioxide in human breath.
- A honeybee has two stomachs - - the midgut is for the food they eat for their own nourishment, and the honey sac is strictly for the collection of nectar. Here it is mixed with enzymes before it is passed to another bee who also mixes it with enzymes in her honey stomach before transferring it to a cell in the comb to mature into honey. So no, honey is NOT bee vomit, though the bees do regurgitate the nectar during the transferring process and the mixing of enzymes.
- A little known fact is that honeybees actually fart to remove flatulence from their bodies.
- Female worker bees have many different responsibilities within the hive, which is dependent on their age and the development of certain glands within their body. I find it especially interesting that the progression of their 'jobs', starting with cleaning their own cell, gradually moves them throughout the hive and ever closer to the entrance, then finally outside. (Housekeepers, Queen's Retinue, Nurses, Guards, Wax Builders, Food Storage, Flight Trainees, Undertakers, and finally Field Bees) I'll go into these 'jobs' in depth in a future ABC's.
- Honeybees pollinate about 90% of all flowers, and can visit 10 flowers in a minute.
- All of the honeybees seen foraging for nectar, pollen, propolis, and water are females, and they are typically within the last two or three weeks of their life. This is their final 'job', so to, speak - - working as a 'field bee' to provide for the colony. As they become too tired and tattered to make it back home, they would rather die 'in the field' than return to the hive being unproductive and feeling unwelcome. They also don't want to die inside the hive and have their corpses contaminate food sources or pose a threat to the developing brood, so they die outside.
- The honeybee is the ONLY insect that produces food eaten by humans.
- Honey is the only food that will never spoil. Though it will crystallize, it is still completely safe to eat. It can easily be liquefied by placing the container in warm water. Honey was typically stored in clay jars and entombed with Egyptian mummies, in order for them to have healthy nourishment in the 'afterlife'. Honeybees were considered to be sacred, had great religious and spiritual significance, were considered as 'royalty', and were often a King's symbol, Most of the world has evidence depicting honey, honeybees (and beekeepers) as vital to society.

- In her entire lifetime, a honeybee is capable of producing just one-twelfth teaspoon of honey. Just think, it took twelve bees their entire lifetime to fill up just one honey stick!
- Keep in mind that ALL of the jobs necessary to keep the colony running smoothly, both inside and outside of the hive, are done only by female worker bees.
- However, without the male honeybees (drones) mating with the Queens, *there would be no bees*, so let's give them credit where it's due! They are essential providers for the health and survival of future honeybee colonies. Drones, as a rule, generally get a "bad rap" - - being accused of being lazy bums, "couch potatoes", sitting around expecting to be fed (which is true), watching the females do all the work (true), and doing none of the work inside or outside the hive (which is true). What is also true is that they can't do most of those jobs anyway as they are not designed for them.....they have one specific job only, which is to mate with a newly emerged Queen. They respect the cleanliness of the hive because they do fly outside to defecate.
- Drones comprise up to just 15% of a healthy hive. They live from between a couple of weeks to 3 or 4 months. They are easily distinguished by the huge compound eyes which take up most of the sides of their head. These help him have excellent vision for spotting that young Queen. . . (*"The better to see you with, my dear"*), and although most of them never actually get the chance to mate (1 in a 1000), that is their only purpose in life. A drone's antennae has 4 stronger odor receptors than worker bees' or Queen's (*"the better to smell you with"*). Both his vision and his sense of smell are enhanced features to help him find his mating partner. Mating never takes place within the hive, but always during a nuptial flight, about 100 feet in the air. Starting around their second week, they actually do fly outside of the hive for a daily afternoon meeting at a "Drone Congregation Area" (DCA)- - usually within a mile of their colony. This area is about 100-650 feet in diameter, and and between 50-130 feet above the ground. They fly in formations called 'drone comets', which is actually a noisy mating swarm. Here they release pheromones as a group to attract virgin Queens and they 'hang out' daily for between 2 - 4 hours with as many as 1,000 other drones, hoping to mate with a young Queen! Once he does locate a Queen and mates with her, unfortunately for the drone he becomes paralyzed and dies! (details to follow) He leaves behind about 5 million sperm, capped with the bulbous, barbed end of his penis which detaches and acts like a plug ... this "mating sign" acts as a beacon to the next drone, who removes it and then proceeds with his mating ritual, duplicating the process. . . . if by some strange miracle, the drone survives this mating flight, which is rare but occasionally happens, he will be rejected if he returns to the colony as his purpose (mating) has already been fulfilled and he is no longer a viable part of the hive. He will also be ejected from the hive at the end of the season and prior to winter because drones are a drain on food resources and will compromise the balance needed for colony survival.
- Once the drone finds a Queen and becomes excited, he mounts and enters her, forcefully everts his endophallus by a contraction of his abdominal muscles, and he has a TWO-SECOND mating frenzy, which he can repeat 7 - 10 times in rapid succession, but usually once is enough. His ejaculation, endophallic separation, and abdominal tissues tearing as he detaches from the Queen is so explosive that it can actually be heard with the human ear!! Thank goodness they don't feel pain!

- Ideal mating conditions are temperatures of at least 69 degrees and no more than 104 degrees, no rain, little if any wind, and an ample supply of eager males within a mile of so from her colony. If there are enough males in the DCA, she will be able to detect them as far as six miles away based on their collective pheromones inviting the Queen to join them.
- The Queen's biological clock ticks faster than you might think. When she is just one week old, she flies out of the hive to mate. If she doesn't do this within 20 days, usually from being confined to the hive due to poor weather conditions, she will have missed her window of mating ability and it's then too late. She will still lay eggs, but they will all become drones as the eggs are unfertilized. . This is one condition in which you may have a “drone layer” Queen. Another cause of a drone layer is an inadequately mated Queen, who doesn't have enough sperm stored in her spermatheca to productively lay for a prolonged period of time.
- A virgin Queen mates with about 20 +/- drones (not her own brothers) during one or two mating (or nuptial) flights. Each mating flight lasts between 5 – 30 minutes, depending on how quickly she encounters the drones, and also on the weather. Queens have been known to show dominance by stinging other 'mating flight' Queens, in the air, that are competing for the healthiest drones. Upon returning to the hive, her attendants remove the 'mating sign' left by the last drone, so she will be able to lay eggs. The Queen receives about 100 million genetically diverse sperm, mixes them and eliminates some, and then stores up to 6 million selected sperm in her spermatheca, where she keeps them viable for up to 7 years. She has the potential of producing 1.7 million offspring in her lifetime!
- Drones have several unique compounds in their semen and seminal fluid. One of them temporarily affects the Queen's vision, hopefully discouraging her from taking additional mating flights. Another compound has antiviral properties to protect against Nosema (an intestinal virus which can be sexually transmitted). And as a genetic protection, their seminal fluid contains a toxic substance that can kill the sperm of rival drones, insuring that their sperm has priority. Researchers are currently determining whether Africanized drones are out-competing the managed drones in the long term with overall mating behavior.
- A Queen bee is an egg laying machine, 24 hours a day, 7 days a week. This begins around 48 hours following her mating flight and continues throughout her typical 2 – 3 years of life (up to possibly 7 years). Usually laying up to 1,200 eggs daily, during the summer she is able to lay up to 2,500 eggs per day, space permitting. This can be equivalent to her own body weight each day, which is why her attendants, or 'retinue' are constantly feeding, grooming, bathing, attending to, and communicating with her - - keeping her healthy, happy, and productive.
- Amazingly, the Queen doesn't have digestive glands, so the workers must actually pre-digest the food before it is fed to their Queen.
- The Queen can selectively determine whether to lay a fertilized egg (worker) or unfertilized egg (drone) depending on the needs of her colony.
- Ironically, unfertilized eggs create fertile drones.
- Female honeybees typically live for 6-7 weeks during spring, summer, and fall, and 4 to 6 months during the more sedentary winter season (colder climates) due to being house-bound.

- Before laying an egg, the Queen carefully and quickly examines the cell, checking to see if it is cleaned and polished enough for her sometimes fussy standards. She uses her front legs as tiny 'calipers', measuring the cell opening. If it is about 1/5th of an inch in diameter, it is suitable for a fertilized egg. If it is larger, she may decide to lay an unfertilized egg or continue looking.
- Queens have hairs next to the ovipositor which help them place eggs upright in the cells.
- If workers detect an inbred or abnormal egg, they destroy it and remove it from the hive.
- Though formerly thought to be unusual, it is possible for a hive to have multiple Queens simultaneously. In fact, it is now commonly thought that about 10-15% of all honeybee colonies actually do have multiple Queens. For whatever reason, one Queen's pheromones become so weakened that the workers create another Queen. Due to the lack of the scent signaling the first Queen, the new Queen doesn't feel threatened and the two of them are able to co-exist. {side note here: as beekeepers, once we see evidence of good brood patterns, and especially after we find "the Queen", we generally do not continue looking for any additional Queens that may also be in the same hive. Interesting thought... }
- Worker bees can and sometimes do lay eggs, but these are never fertile and always produce drones. Noticing only drone brood in a colony often indicates that the hive is queenless and you have laying workers, or you could have a drone-layer Queen.. Time to re-queen!
- The Queen is the only bee who defecates inside of the hive, and there is a 'clean up' crew always ready when duty calls. (Probably not their favorite part of attending to the Queen!).
- Worker bees 'hold it' during cold winter days, as they hygienically refuse to go inside the hive. When the temperature finally rises above 55 degrees, there is often a mass 'cleansing flight' where thousands of bees leave each colony to relieve themselves.
- If a Queen has continued laying eggs for up to 5 days prior to her death, workers can create an 'emergency Queen' from one of the fertilized eggs.
- In proportion to her body size, a Queen's wings appear to be shorter as they only cover half of her long abdomen. A worker bee's wings extend the full length of their abdomen. Just knowing this fact may make it easier to locate the Queen: long abdomen ↔ short wings.
- Queen bees can sing! Called 'piping', she emits a high pitched sound for certain signals.
- If a honeybee were to fly around the world (30,000 miles) she would need the energy provided by just one ounce of honey to fuel her entire flight. How's that for efficient fuel economy??
- Honeybees can fly around 15-20 miles per hour, and can travel up to 6 miles round trip on each foraging flight. They usually gather either nectar or pollen on each flight, but occasionally will forage for both.
- Often a honeybee is able to carry a load of nectar or pollen that is equal to more than half of their own body weight, thanks to it's two sets of powerful wings.

- These hinged wings twist and rotate, allowing the honeybee to hover, fly backwards and forwards, or in any direction. This is helpful when approaching or leaving a flower, for take offs and landings at the entrance of the hive, and for avoiding mid-air collisions.
- After visiting a flower, bees leave a sticky residue indicating the nectar is gone for the day, saving both time and energy for other foragers who can sense the 'closed message' left behind.
- Honeybees must visit about 2 million flowers in order to gather enough nectar to make one pound of honey. This is the equivalent of flying 90,000 to 150,000 miles (3 to 5 times around the world) in order to create this pound of honey, which is composed of approximately 80% sugar and 20% water. Bees dehydrate the nectar until it is between 17-18% moisture before capping it.
- During each foraging flight, a honeybee will visit between 50 and 1000 flowers. They are attracted to nectar and pollen by the electrical impulse emitted by the flowers. Not only that, but when they go out they will specifically gather only one type of nectar or pollen on each trip to ensure cross pollination. This is called 'flower constancy'. When they return to the hive, often the bees will store this nectar and pollen into separate cell chambers determined by the flower or plant type. As beekeepers you can often see the different color bands of honey that the bees have so carefully stored. Pollen stores typically have just one type of pollen per cell, and it's beautiful to see the array of colors..
- During their three weeks performing this job, hardworking foragers can cover 500 miles.
- Though they are tasting sweet nectar and pollen, bees do not eat while foraging. They wait until they get back 'home' to have a snack before heading out again.
- Multiple daily foraging trips are made, with bees visiting up to 2000 flowers each day. Each trip usually lasts between 30 minutes to 4 hours, depending on the forage locations. They seem to have their preference and are selective foragers. In fact, most bees prefer blossoms on trees and shrubs, which is part of their tree dwelling instinct.
- Some foragers act as scout bees, returning with samples of nectar or pollen for the others in the hive to taste and decide whether or not they approve it for their colony. If they like it, the scouts begin to dance to give directions to those forage areas.
- The logistics of bee dances are amazing! Foragers do this to instruct other workers as to the location of nectar, pollen, propolis, water, or a future nesting site. The bees use the top of the frame as the orientation for the sun (up is up), and show the coordinates by moving directionally in degrees. The more vigorous the dance, the further the distance between the coordinates. A 'round dance' is performed when the location is close by (within 100 feet) and is not accompanied by any directions. Instead, the bees watching the round dance smell the fragrance of the visited flowers, and the forager leaves her scent on those flowers as an indicator. Foragers know to fly within a 100 foot radius of their colony to locate this forage area. A 'waggle dance' is done to indicate a location that is farther away and has explicit instructions, as mentioned above. There is also a transitional dance, sometimes called a 'sickle dance' or 'figure 8'. The quality and quantity of the food source determines the liveliness of the dances. Last, but certainly not least, is the 'tremble dance' which is just what the name says - - the

nectar forager who has returned home and needs to transfer the nectar to another worker will 'tremble' until she is noticed and helped with unloading her contribution to the colony.

- Honeybees navigate using the sun (which they can still see on cloudy days thanks to their use of ultraviolet), visual landmarks, scents, their memory, and the magnetoreceptor located in their abdomen which keeps them aligned with the earth's magnetic field...an internal compass!
- Utah is called the “Beehive State”, and the honeybee has the honor of being the official “state insect” of this state, as well as 16 other states in our country!
- Honeybees must consume between 8 to 20 pounds of honey in order to biochemically produce each pound of beeswax, actually making the treasured beeswax more valuable dollar-wise than the honey! The honey provides the sugar needed for wax production.
- An average sized colony of bees requires approximately three pounds of wax to create their necessary comb for maintaining their brood and food reserves.
- Beeswax is produced by 8 paired glands that develop on their abdomen within their first week. Worker bees have a different shaped mandible (round) for shaping the wax into comb.
- Antennae are one of the most important parts of the honeybee's anatomy. They are used for taste, touch, smell (170 odorant receptors), and hearing. An amazing fact is that most bees predominantly use their right antennae as compared to the left. (Actually, I have observed this trait while watching ants!) This might be similar to humans being right or left handed, but scientists are not really sure why this is such an obvious preference for honeybees.
- Outside of the primate family, honeybees are known to possess the most complex symbolic language and pheromonal communication system on earth.
- A honeybee is able to sense fear based strictly on the scent emitted, and will alert the hive.
- In order to sustain their colony through winter, workers must produce about 60 pounds of honey from spring to fall to keep as their 'reserve'. A conscientious beekeeper will make sure to leave this reserve honey on the hive if they are planning to help keep their hives strong and viable until spring.
- Unlike other species of bees, the honeybee does not hibernate in winter. Bees huddle to stay warm and are basically dormant except for jobs performed within the hive, or outside if warm enough. Honeybees are the only bee species that overwinter because they keep food reserves of honey and pollen... because of this they are also “preppers”, ready for lean times!
- Honeybees maintain a temperature of approximately 93 - 95 degrees Fahrenheit in their central brood nest, regardless of the outside temperature. They 'shiver', or vibrate their flight muscles, keeping their wings still, to increase heat when it's too cold (about 50 degrees), and cluster or 'huddle' together close to the brood nest and to the Queen to maintain the heat. Younger bees are at the center of the cluster, with older bees on the outside. This is where the 3 million branched hairs on each worker bee help trap the heat and insulate the brood. When it is too hot, they fan with their wings to cool the hive, sometimes even bringing water droplets into the hive to fan across. During hot weather, bees will also 'beard', or hang out, on the front

of the hive to help lessen the heat inside from so many bees. The brood nest is the main area where 'temperature control' is extremely vital, as opposed to honey supers and empty frames.

- Honeybees can't easily fly when the temperature is below 55 degrees; it's too cold for their flight muscles. They also get irritated when the temperature rises to 100 degrees or higher.
- Honeybees are true vegetarians....relying strictly on plant sources for their nutrition and that of their brood -- unlike many other insects who do enjoy eating meat, other insects, etc.
- The honeybee is the only insect that doesn't prey on other insects. They are not 'the enemy' to any living organism on our planet, though they have multiple enemies of their own. They are naturally curious, very intelligent, and are one of the most shy, social, and gentle creatures that exists. They will defend their own Queen and colony, but wish no harm to anyone or anything.
- Honeybees love caffeine and can become addicted to it, the same as humans. It actually does give them an energy boost when they consume it.
- Scientists are convinced that the onset of dementia can be slowed by studying the honeybee's brain, which ages in reverse. It stops aging when the bee performs jobs normally done by younger bees.
- Female honeybees are the only ones with barbed stingers. Worker bees' stingers are hollow tubes, like a hypodermic syringe, and the barbs are scissor like, pushing the stinger in further by vibrating. The muscles on the venom sac can pulse for 3 minutes. The Queen can sting repeatedly as her stinger is completely barbless, and she normally only uses her stinger to fight off and/or kill other Queens. It is unusual for her to sting a human unless they have traces of pheromones on them from handling another Queen, in which case they'll feel threatened. Drones are defenseless, not having a stinger at all, so they is a 'safe' bee to handle and play with!
- Honeybee venom is acidic and causes a burning and itching sensation when injected due to the toxic peptide compound called 'melittin'; this is actually a protein made up of 26 amino acids and has antiviral, antibacterial, and antibiotic properties. It is proving it's worth medically.
- Humans are typically the only creature that causes the honeybee to die when it stings. . . because our skin is thick and flexible, it retains the stinger. When bees sting a bird, reptile, fish, or a furry mammal, it feels like a painful pin prick because the barbed stinger does not embed when stinging. Sometimes we will also feel a 'warning' sting or 'ping' when a bees taps you with her stinger rather than thrusting it. Consider yourself warned!
- You can still get stung by a dead honeybee! Recently deceased bees still have viable sting mechanisms. If you touch their back, the stinger will surprisingly still eject in self defense.
- The younger the bee, the more potent the sting as they haven't learned how to regulate the amount of venom being released the same way an older bee does. This is typical for most young venomous creatures. The bite of a juvenile rattlesnake can be far more deadly than an adult's.
- It takes approximately 1,100 bee stings to be fatal to a normally healthy adult human.

- **Swarming is the most fundamental job of bees.** . . this is their ultimate method of reproduction and duplication, and of ensuring that their species will continue to exist. They are programmed to do this....to get their hive so fully functioning and crowded to the point where the one colony can now branch out and become two successful colonies. **Think of bees swarming as them giving birth to a “baby honeybee colony”.** This is one of the most vital processes that is natural to the survival of honeybees. Though it can happen at any time of the year, most swarming typically occurs in spring or early summer.
- ***“A swarm in May is worth a load of hay; a swarm in June is worth a silver spoon; but a swarm in July is not worth a fly.”*** This is a proverbial saying of beekeepers from the mid 17th century. What does it mean? That the later in the year it is, the less time there will be for the bees to collect pollen and nectar from flowers in blossom . . . less chance of a honey harvest.
- **Planning to swarm requires weeks of advance planning.** Not only do the workers need to make a new Queen to remain in the colony and to keep things going strong, they also have to prepare their existing Queen for flying, which is typically something she only does for her mating flight/s. Because of her size and weight, she is too heavy to fly the minimum 800 feet distance to their new home location which the workers have chosen and voted on. So, it's time for a crash diet for the Queen....and fitness training! The workers in her '**retinue**', or 'royal court' of attendants, so to speak, start restricting her food intake. During this time, they also start 'chasing' her around the frames....to help her lose weight and get into shape for flight. **She must lose about 1/3 of her body weight in order to fly.....so diet and exercise really is the key to losing weight!**
- **Epigenetics is the term meaning “shared genetics”.....as in the Queen and the female workers in most colonies.** Because workers and Queens both develop from a fertilized egg, it is **only the feeding method that determines whether this particular egg will become a worker or a Queen.** In a way, **a worker bee is basically a starved potential Queen, and a Queen is an overfed worker!** This is determined in a very brief window between the 3rd and 4th day, when the genetic pathway to become a Queen is turned on with the continued feeding of strictly royal jelly, as opposed to changing the diet to 'bee milk' (similar to royal jelly but not as nutritious) and 'bee bread' (a mixture of pollen and nectar) for the workers. This creates a “Super Bee”, so to speak, with special powers and abilities that a worker doesn't share. She can mate, has an elongated abdomen which contains her ovaries, has a stronger immune system, lives longer, lays fertilized eggs, has a barbless stinger, and has a group of attendants meeting her every need. She has fewer body hairs, and does not have pollen baskets on her hind legs. She also has stronger pheromones, some of which help bond the bees in the hive to help them recognize and remain loyal to her, and others to discourage and suppress reproduction among the females in the colony. Each colony has their unique “colony odor” determined by the Queen, and where the workers forage.
- **After 3 days as an egg, on the 4th day a larva emerges, and eats so much on it's first day that it's weight increases 5 ½ times!** In comparison, a human child who weighs 60 pounds one day would weigh 330 pounds on the very next day.
- **A strong, healthy colony usually consists of between 40,000 to 60,000 bees.**

- Making a “Bee Line” for something makes sense when you understand what that really is. Think of it as a bee runway or landing strip. Ideally, honeybees will fly in a straight 'bee line' for about 10 feet when exiting their hive before they fly upwards to 100 feet. They also return to their colony using this same 'bee line'. It is a fast and furious freeway, and it is best not to stand in this area when you are nearing any beehive. It is also the name for the most efficient path for foragers to come and go back and forth from the hive to their forage areas. Humans use the term 'make a bee line' for getting quickly to a location - - a special event, work, or simply home.
- Being “Busy as a Bee” is a true compliment to the industrious, hard working honeybee.
- It is truly a 'honey bee democracy' that rules each colony.....not the Queen as was first thought. “Majority Rules”, as in any democratic system. Honeybees are no different. And since the majority of any colony is made up of the female workers, they are the ones that assess conditions, revise procedures, choose where to forage, decide if and when they will swarm, locate a new hive location for when they split their colony, vote before they make their final decisions, and basically have control of the entire colony with the exceptions being: the Queen's mating/egg laying and her strong pheromones, and the drones going out to inseminate virgin Queens (though not their own). They decide whether or not they like their Queen, and will kill or drive her away if they don't. They have the knowledge and ability to replace her by secretly building supersedure cells, or to build an 'emergency Queen cell' to create a new Queen (as long as they have newer fertilized eggs to select from) in case of accidental loss of their existing Queen due to natural events or beekeeper error.
- Balling the queen means that workers form a tight 'ball' completely around the Queen they want to dispatch and crowd to overheat her while they are smothering her to death.
- Honeybees are one of the most beneficial agricultural insects, helpful for pollinating nearly 80% of fruits, vegetables, nuts, seeds, berries, grains, and fiber, which is about 30% of the food humans consume. Pollination adds approximately 15 to 75 billion dollars annually to our U.S. economy due to improved crop yield and quality (up 71% from those not bee-pollinated).
- One out of every three bites of food we eat is pollinated by honeybees (more if you're vegan). In addition to food provided for humans, honeybees also help feed many animals, birds, and other insects. They pollinate many of the crops that livestock grazes on, especially alfalfa, clover, and buckwheat. And if you enjoy wearing cotton clothing, thank the honeybees!
- Despite the fact that they are so valuable to our survival, honeybees are still one of the most feared and misunderstood insects in the world, even considered invasive by some.
- Every single product that can be obtained from the honeybees is of nutritional and/or medicinal value to humans, and even veterinarians are now using them in their practice- - honey, pollen, beeswax, royal jelly, propolis, pheromones, and bee venom. Apitherapy is one of the fastest growing fields of alternative treatments available in the world.
- Paramedics and hospital emergency rooms now use 'medical honey' on burns and wounds. The honey contains an enzyme called glucose oxidase which creates a customized hydrogen peroxide serum helpful for any open, wet wounds. The antibacterial, antiviral, antifungal, and antimicrobial compounds in honey speed healing and lessen scarring.

- **Who needs Botox?** Bee venom, when applied topically, temporarily relaxes tissue, increases circulation, and causes plumping, helping wrinkles to disappear. The peptides trigger the skin to produce collagen, elastin, and keratin, which also make the skin softer.
- **Scientists and researchers have discovered that the apitoxin, melittin, in bee venom helps :** boost the human immune system, helps arthritis sufferers, and also helps with skin conditions, chronic pain, sinus disorders, heart and blood system diseases, HIV, ulcers, neuritis, colitis, depression, epilepsy, liver issues, diseases of the central and peripheral nervous system (MS, Parkinson's, ALS, Alzheimer's), and the list goes on. Most recently scientists are finding that it is helpful in treating diabetes and cancer. Hope for Covid-19?
- **Honeybees never sleep, though they do rest.** * (on this I found new research)
- ***concerning whether or not bees actually 'sleep'**

It has been commonly thought that bees do not ever sleep, but take occasional rest breaks instead. Current research is beginning to show us otherwise. Bees get tired. . . so tired that they start becoming sloppy and careless if not having enough rest. Scientists have recently discovered that most bees actually DO sleep - - for between five to eight consecutive hours, in fact! Usually this occurs at night, when the hive is crowded and cozy with returned foragers. It appears that there are 'day' and 'night' shifts of active workers in the hive. However, bees have also been observed sleeping on flowers. . . maybe napping is a better term for these little rests.

Not only that, they are studying their circadian rhythm sleep patterns and experimenting to determine if bees actually dream and have developed long term memory and recall. Young bees sleep less than the older ones, who need more sleep because it helps their memory. They have done studies exposing bees, while in deep sleep, to smells that correspond with previous training sessions. . . the next day, the bees have memory of the exposure.

I'd like to conclude with a rather endearing thought. . . when falling asleep, the bees slightly curl forward and put their head down. The sweetest observation has been that while they are sleeping, the honeybees reach out and hold each other's legs in a tender embrace!