



Flowers and Bees – A Symbiotic Relationship



a PowerPoint Presentation
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The relationship between bees and flowers is called symbiosis.

It comes back to equation $a + b = \mathbf{FOOD}$

$\mathbf{FOOD} = b + a$



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How Flowers Benefit Bees

Flowers produce pollen, which bees use as food.

Pollen provides the nutrients that bees need. Besides honey that bees make, pollen is the only food that bees eat.



How Bees Benefit Flowers.

Bees pollinate flowers, which means they transfer the pollen made by one flower of one plant to the flower of another plant. Bees do not purposely do this.

Actually, the bees are trying to collect the pollen to take back to their hives. In the process of going from one flower to another as they collect pollen, some pollen is picked up from one flower and accidentally dropped on another flower. Pollination results in the formation of seeds.

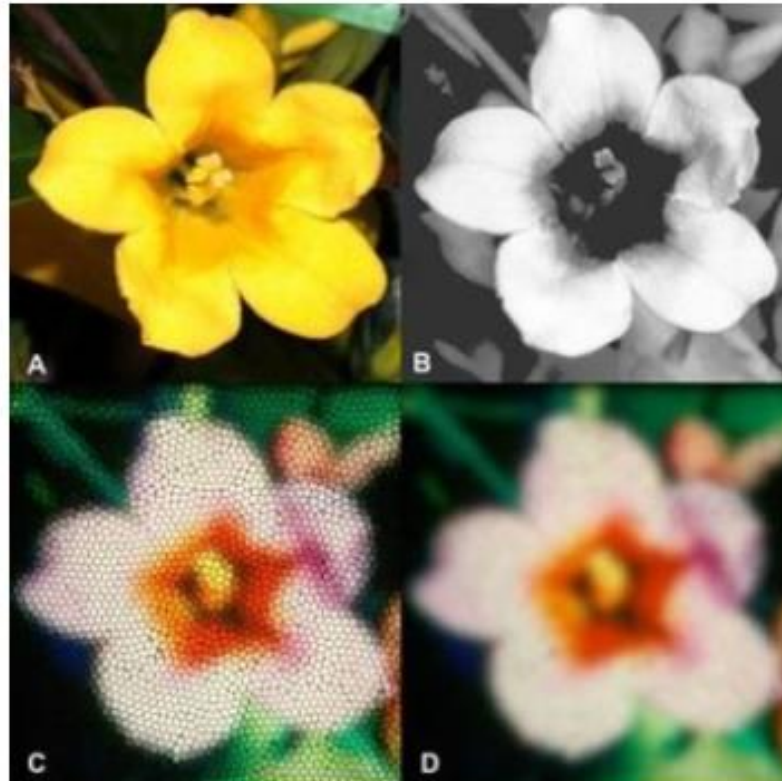
In the photo, the bee has pollen covering its whole body.
The yellow pollen makes the bee appear to be yellow.



Research reveals that bees rely on an array of visual and sensory clues such as humidity level, shape, pattern and colour to discern whether flowers have something to offer. In fact, it is known that bees have three times the colour recognition ability of humans, but the electrical aspect, and the fact that it can last up to a few hours is new information.

But the colour vision was still pretty quick relative to other animals, and about 3 to 4 times faster than human colour vision, bees probably use their colour vision to help identify flowers. But since flowers remain relatively still, this doesn't explain why bee colour vision needs to be so fast.

Human eye



Bees have different trichromatic colour vision. Image seen through a bee's simulated compound eye

Ultra Violet Vision

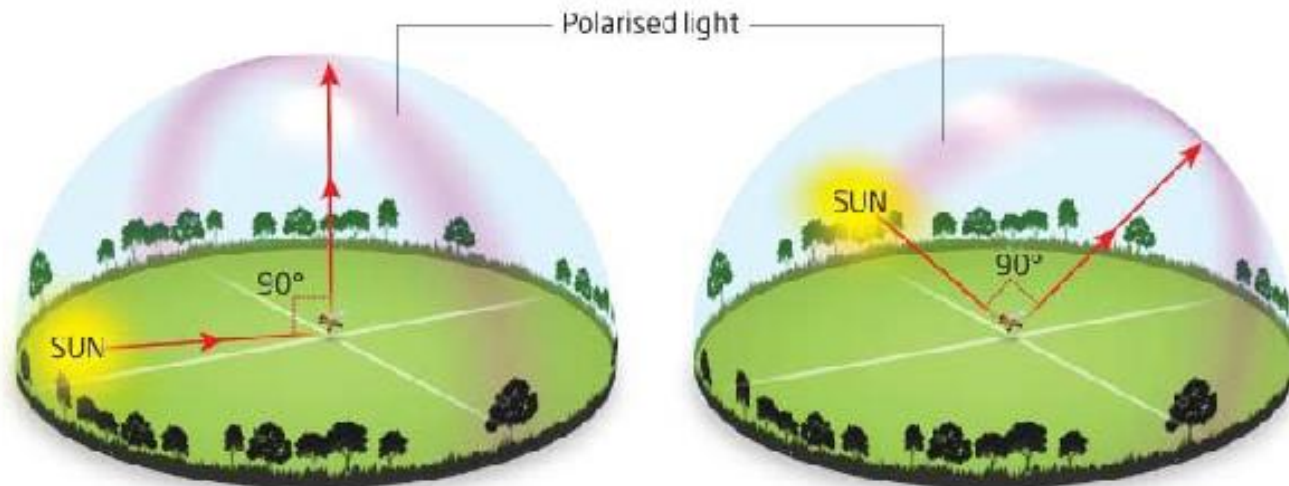
A bee's hypothetical colour perception. Bees have worse eye-sight than humans by comparison.

When a bee flies into your garden, it doesn't see what you and I see. Flowers leap out from much darker-looking leafy backgrounds, and they have ultraviolet-reflecting landing strips that show the way to the nectar.

A polarised view

©NewScientist

Air molecules in the atmosphere scatter photons to create a circle of strongly polarised light at 90° to the sun. This band moves with the sun throughout the day, allowing bees to use this information to navigate, even when the sun is obscured



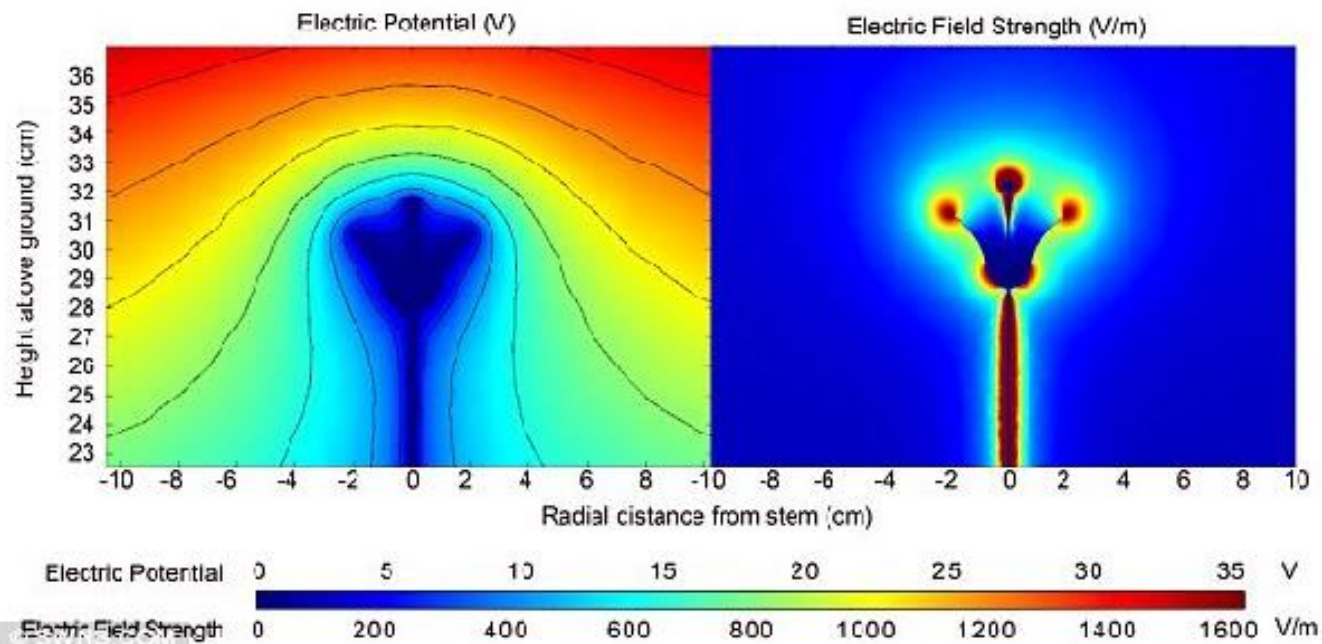
THE HORIZON FROM THE BEE'S PERSPECTIVE



Bees see the world almost five times faster

The researchers suggest this high-speed vision might come in handy when bees need to keep track of colour in flickering light, which could happen when the insect is flying quickly through a bush.

The ability to see at high speed is common in fast-flying insects; allowing them to escape predators and catch their mates mid-air. However, until now it wasn't known whether the bees' full colour vision was able to keep up with their high speed flight. This research sheds new light on the matter; suggesting that although slower, it is also about twice as fast as human vision.



Bees can sense the weak electrical charge emitted by flowers in order to determine if they have nectar, the new study revealed. Even better, scientists say bees are capable of altering the electrical charge of the blossoms they come into contact with to help them choose which ones contain the most nectar and pollen.

Bees also can tell which blooms have already been divested of their sweet ambrosia by their pollinating competitors. This serves to improve their resourcefulness as they reconnoitre their nectar prospects. As they approach for a landing, the bee transfers some of its charge to the plant stem and keeping it positive for as long as two minutes.



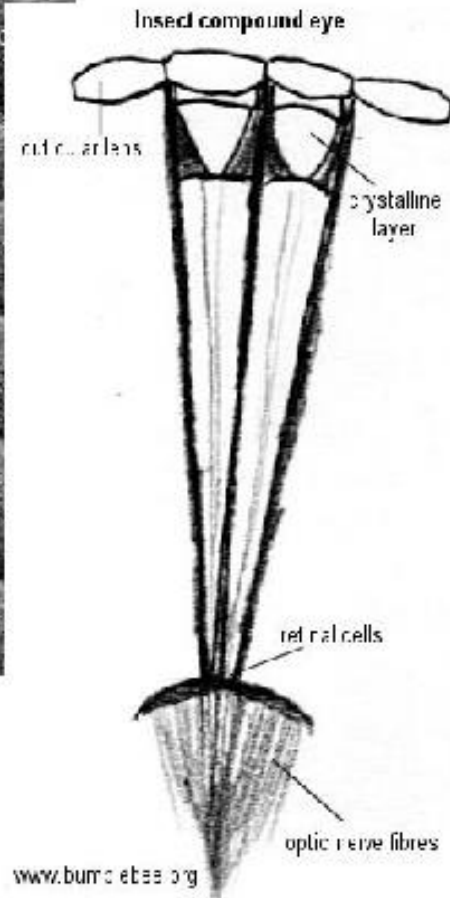
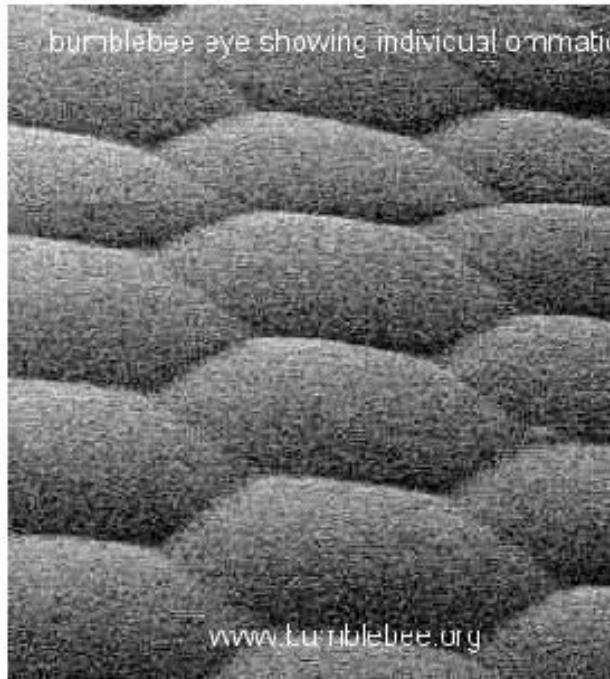
Bees have five eyes.

A bee's brain is about ten thousand times smaller than that of a human being and still accomplishes amazing things.



Flower in normal light, ultraviolet light and a representation of its electric fields. When a bee lands on a flower it is an electric connection. The meeting of these two charges causes pollen to literally jump from the flower on to the bee. This static will keep pollen lodged safely onto the bee's body until it is rubbed off back at the hive or on to a flower of the opposite gender, resulting in a successful pollination.

This process is just another incredible addition to the pollination methods employed by flowers. Along with seasonal coincidence, colour, pattern and fragrance, flowers use an electrical charge to convey critical information to bees.

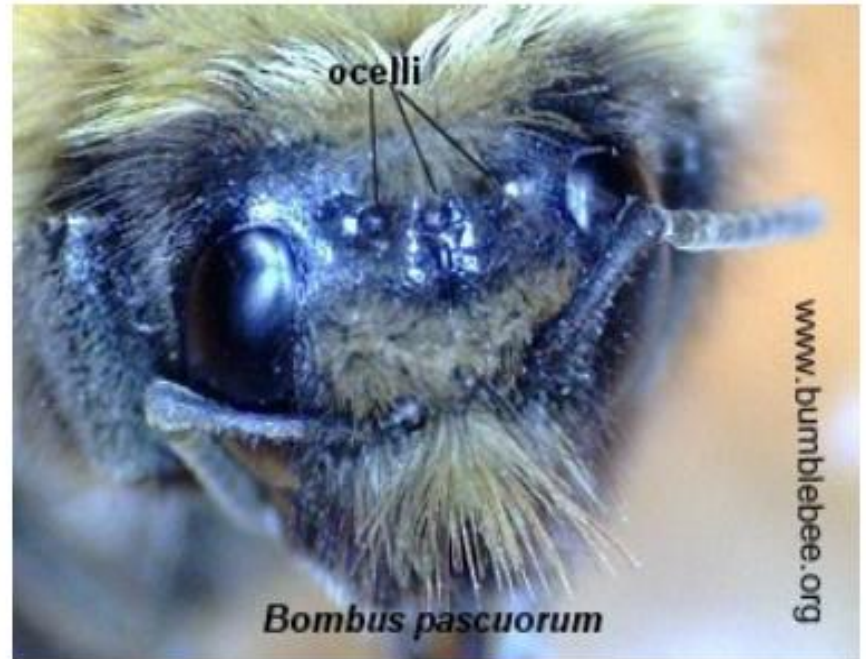


The compound eye

In common with most other insects the bumblebee compound eye is formed of a large number of individual hexagonal units called **ommatidia**

Ocelli (primitive eyes)

Bumblebees, again in common with many other insects, also have three **ocelli** (often called primitive eyes) arranged in a triangular pattern on the top of the head,



Range of vision of humans and bumblebees compared

The diagram below compares the range of bumblebee vision and human vision. The centre line shows the wavelength is in nanometres, and the colours are written below the line. So humans can see wavelengths from around 400 (blue) to as far as 800 (red) nanometres, whereas bumblebees can see from as low as 300 (ultra violet) but only up as far as 700 (orange) nanometres.

human vision

300 nm

750 nm

UV

blue

green

yellow

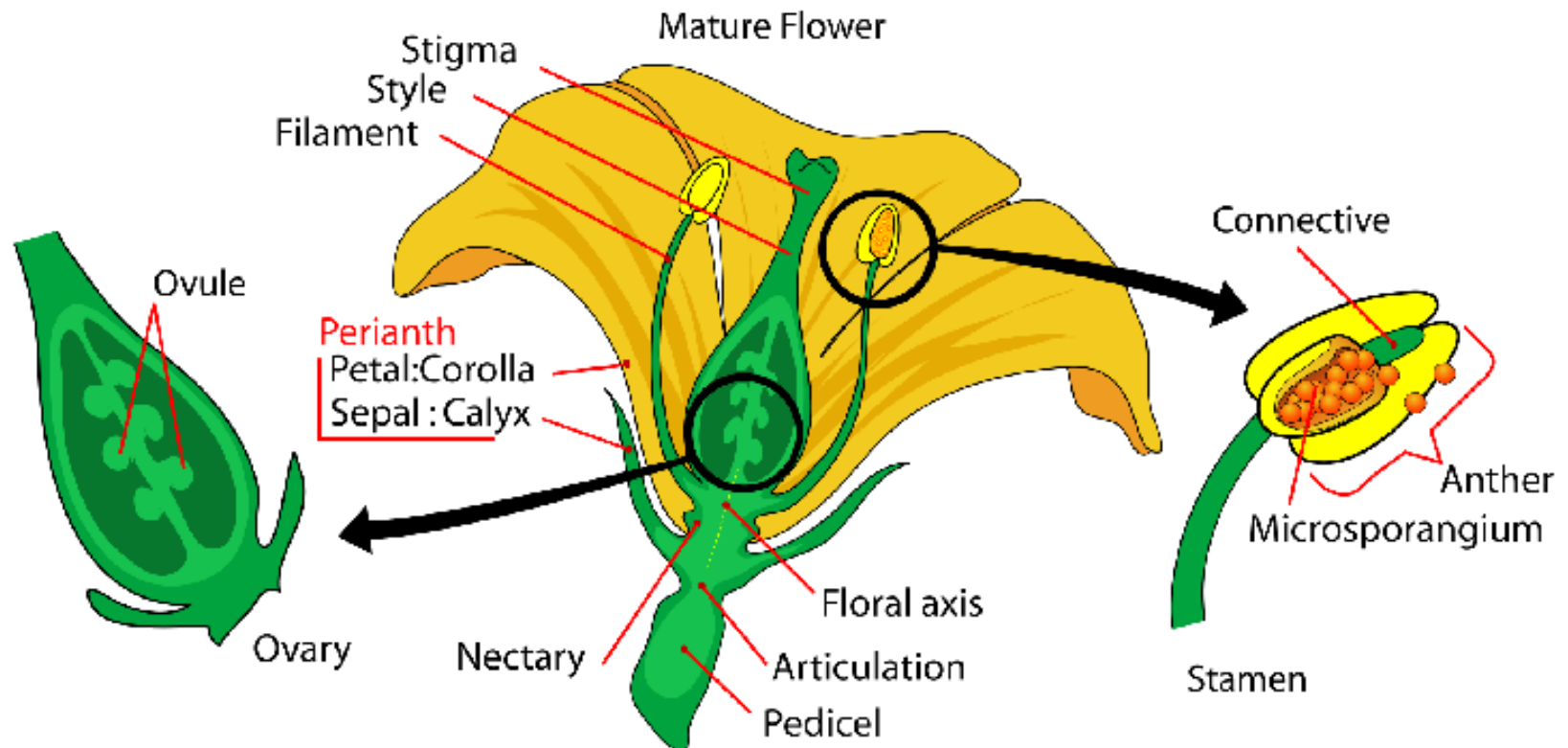
orange

red

bumblebee vision

It has been said that except for man, nowhere in the world is there anything to compare with the incredible efficiency of the industry of the honeybee. Inside the beehive each bee has a special job to do and the whole process runs smoothly.

Bees need two different kinds of food. One is honey made from nectar, the sugary juice that collects in the heart of the flowers. The other comes from the anthers of flowers, which contain numerous small grains called pollen. Just as flowers have different colours, so do their pollen.





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Let us go with the honeybee from her flower to the hive and see what happens. 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 the payload passes through to her own stomach to be converted to energy for her own needs.

Pollen is mixed with nectar to make “bee bread” and is fed to the larvae. A baby bee needs food rich in protein if the bee community is to flourish.

Before returning to the flower again for more pollen, the bee combs, cleans and cares for herself ? not because she is vain but so she can work more efficiently. Throughout her life cycle, the bee will work tirelessly collecting pollen, bringing it back to the hive, cleaning herself, then setting out for more pollen.

Bees transferring nectar



The bee is a marvelous flying machine. She can carry a payload of nectar or pollen close to her own weight. Consider that even the most advanced design in aircraft can only take off with a load one-quarter of its own weight and you'll appreciate the miracle that the honeybee can 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 at once in cells in the honeycomb before the mouth-to-mouth working because some evaporation is caused by the 32.5°C temperature inside the hive.

Finally, the honey is placed in storage cells and capped with beeswax in readiness for the arrival of newborn baby bees.





A Young Bee



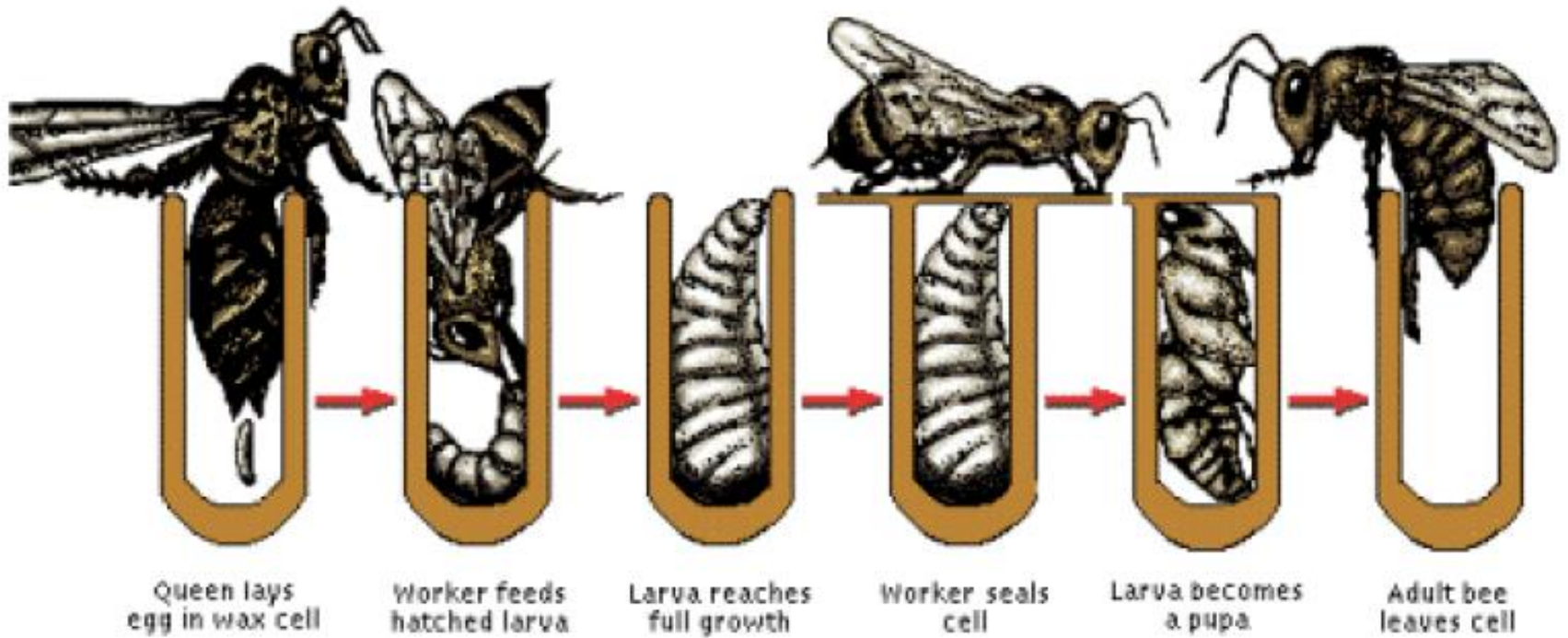
An Old Bee

Can you tell the difference ?

Forager bees start out from the hive for blossom patches when three weeks old. As they live to be only six or seven weeks old they have much work to do and little time in which to do it.

There will be many other bees working at the same time, and the air will be noisy with their droning. It takes 300 bees about three weeks to gather 450 g of honey. On average, a hive contains 40,000 bees.

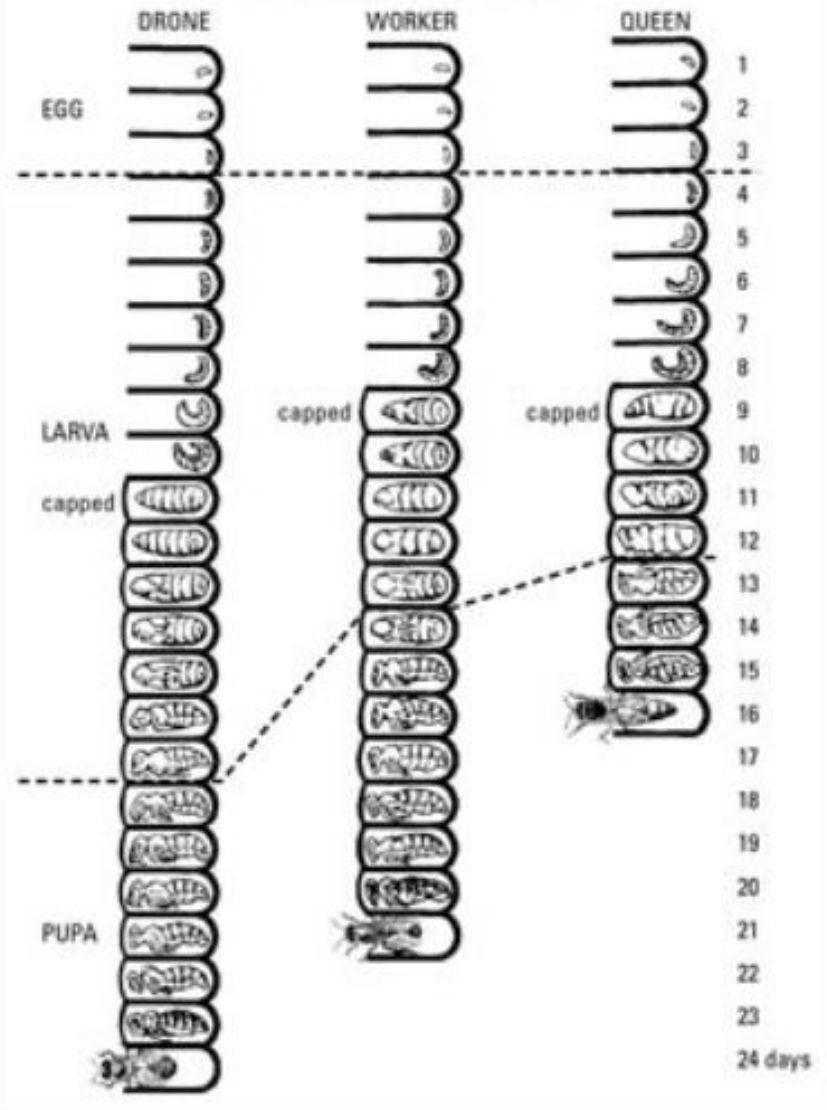
The first stages of a bees life





Bees
Hatching

The Honey Bee Life Cycle



Forage for nectar,
pollen, water



3 weeks

Remove
corpses



Guard the
hive

2 weeks

Receive food from
incoming foragers



Build
honeycomb

1 week

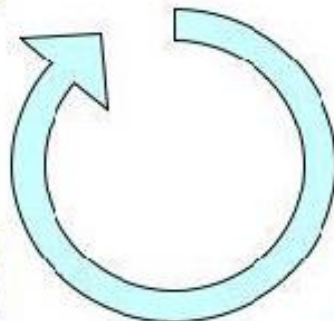
Feed larvae



Clean out dirty
honeycomb

Just emerged!

*Dies at 5-7
weeks*

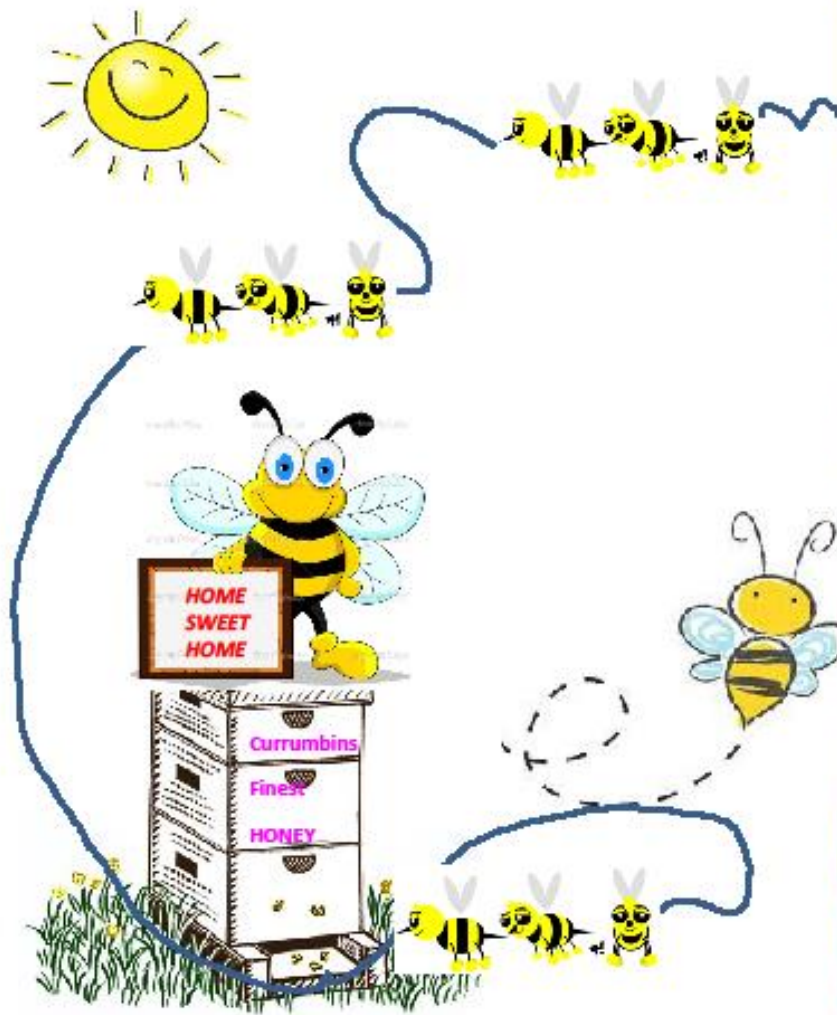




When honey bees are between 12 and 20 days old, they develop a special wax-producing gland in the abdomen of their bodies. This special gland converts sugar from the honey into a waxy substance and deposits flakes of the substance on the abdomen.

Bees guarding the hive entry





Bees travel up to 5 Kilometres....

to find nectar and pollen



A full frame of honey being removed from a hive

Uncapping a frame using a electric uncapping knife





4 frames of honey being extracted by centrifugal force



A photo of how the honey is spun out of the frame

BEE STINGS

Bees will normally only sting when defending their hive or being attacked (or stood on, sat on or squashed)



As soon as you get stung
use your fingernail to
scrape the sting out



After stinging the bee will
fly away and die





The Queen bee will only have 1 mating flight in her life..... with between 15 and 25 Drones who die after mating. She can live for up to 5 years laying between 1200 and 2500 eggs a DAY depending on her age and season.



Without BEES what would happen ??



Without FOOD....

..... where would we BEE



NO BEES = NO FLOWERS
NO FLOWERS = NO BEES



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