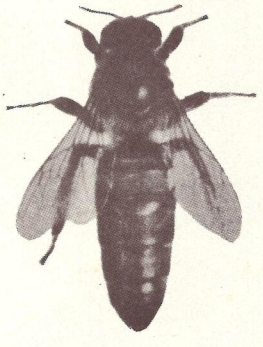
# The story of BEES and HONEY

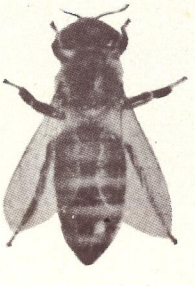
# This is the story of bees and honey

**The bee family is comprised of a ruling queen, thousands of worker bees and some drones. The make-up of the family is complex, and to understand their relationship to each other, we must study their respective responsibilities.**



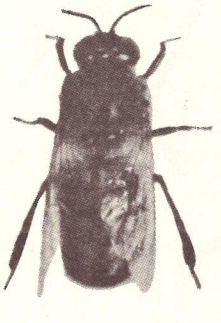
## The Queen

**She is the most important member. She is the mother of workers and drones and if she dies and is not replaced, the whole hive will perish.**



## Workers

**These gather nectar from the flowers to make honey, nurse the baby bees, keep the temperature of the hive at a constant 34 degrees celsius or 93-95 degrees F. and have many other duties. They are females but cannot lay fertile eggs.**



## Drones

**These bees are males and their only useful purpose in life is to perpetuate the race by impregnating a virgin queen. The drone develops from an infertile egg laid by the queen.**

There is a great deal that we do not understand about bees, despite years of study by scientists and beekeepers, and it is only possible to mention a few facts about them in this booklet.

There is a "master mind" in every hive which directs the work to be undertaken under circumstances which have never arisen before, but the bees know the correct procedure to benefit the whole hive and not individuals. Bees can communicate to each other the exact location of abundant food supplies several miles

away from their hive, and on the return of a forager, precise directions are communicated to other bees how to find their way by taking a bearing on the sun, just like the navigator of a ship or aircraft.

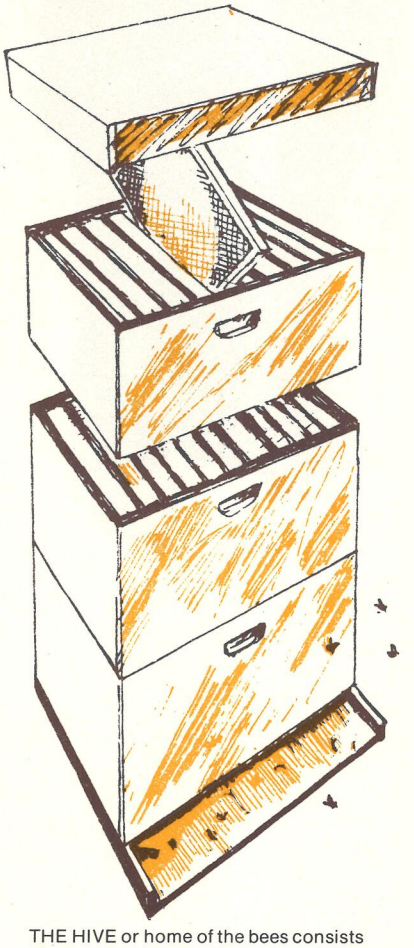
In flight, a bee beats its wings 12,000 times a minute and can fly at 20 miles or 32 kilometres an hour for a distance of 3 to 5 kilometres away from its home hive. In the season of the nectar flow from the flowers it's active life is only three weeks for it works itself to death. A modern aircraft can carry a quarter of its own weight in passengers or freight, whereas a bee can carry practically its own total weight in pollen and nectar. Aeronautical engineers maintain that it is "impossible" for a bee to fly with such a load; — but it does do so, and to make a single pound of honey, a bee would have to bring home 30,000 loads of nectar. Of course, no one bee makes so much honey, and the jar on your breakfast table is the combined result of the labours of many bees.

**LET US IMAGINE that an accident has befallen the queen of the hive and that she has been crushed by the bee-keeper in moving the honey combs in the hive.**

The whole colony immediately knows that a tragedy has befallen them and the 'master mind' decides that action must be taken at once to ensure that the life of the hive can continue. Without a laying queen — and a healthy queen lays between 1,500-2,000 eggs each day — the whole colony will perish.

On realising the tragedy, some worker or nurse bees select some day old eggs laid by their queen and begin to feed the tiny eggs with a special substance called Royal Jelly secreted from the glands in the heads of the workers when a new queen is needed. Other workers set about enlarging the size of the wax cell containing the egg, for a queen is larger than a normal worker bee and must have more space for growth. A mixture of honey and pollen in the form of bee bread is also fed to the egg, and the end of the wax cell sealed over.

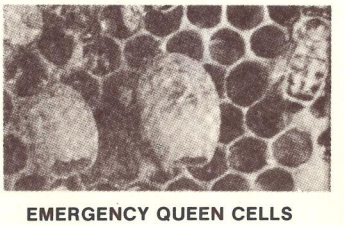
It is miraculous that a tiny egg so small that it can hardly be seen when first laid and which was destined to be a worker bee is transformed into a beautiful elongated queen simply because it is fed in its formative stages on Royal Jelly. Incidentally, the bees always select eggs which are less than three days old for development into their new queen.



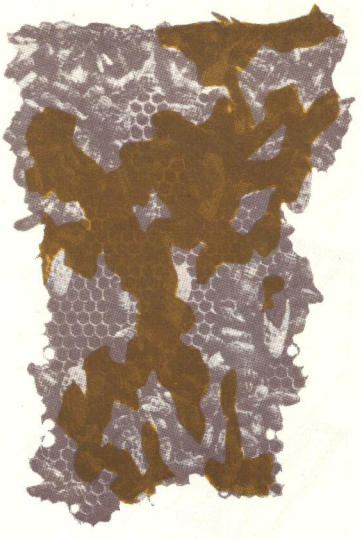
THE HIVE or home of the bees consists of moveable frames of wax foundation sheets from which the worker bees draw out perfectly shaped six sided combs in which honey is stored and larvae are reared. The lower section is called the brood chamber, for it is here that the queen deposits her eggs and the nurse bees rear baby bees. A metal screen is placed across the top of the brood chamber through which worker bees can pass to store their nectar, but the queen is prevented from entering because she is larger in the width of her body. By this means, the upper chambers or "supers" as they are called, are reserved exclusively for honey and pollen storage.

## Queen cells

When built under such emergency conditions are bulbous, as you will see in the picture, and after 11 or 12 days the young virgin queen is ready to emerge into the hive. If you stand close to the hive at this stage, you may hear her high pitched piping as she bites her way through the wax capping of her cell. Her first object in life is to ensure that she is the only queen present, and as soon as she is sufficiently strong enough to walk round the frames, she hurries to see if there are any rivals. If another queen cell is found the sides are torn down and the embryo queen destroyed; if she should meet another queen hatched at the same time as herself, there is a fight to the death, for only one



**EMERGENCY QUEEN CELLS**



QUEEN CELLS

queen remains as ruler. The queen has a sting which she normally reserves solely for the purpose of stinging and destroying another queen.

## First flight

Within a few days, the queen will make one or more orientation flights which enable her to fix in her multi lens eye objects close to her hive and enable her to find her way back home after her mating flight.

## Mating flight

When the virgin queen is ready for mating, there is great excitement amongst the drones of the hive and others which happen to be in the vicinity. The queen leaves the hive and flies in spiral motions high into the air pursued by drones trying to catch her to implant their seeds into a special sac within her body called the spermatheca. Only the fastest and strongest drones succeed in mating with the queen in flight, and sufficient seeds or spermatozoa are implanted by the drones to last the queen for the whole of her egg laying life, enabling her to produce fertile eggs. Sometimes, a queen will make several mating flights to ensure that she is adequately impregnated with drone seeds.

Before we leave the subject of impregnation of the queen by drones or males, mention must be made of the extra-ordinary fact that the queen can deposit a fertile egg into a cell whenever she wishes which will grow and develop into a worker bee, and she can also deposit an egg which is not fertile and will become a male bee or drone. Thus, there is the phenomena that a worker bee has a father (the drone that impregnated the queen on her mating flight) but the drone has no father because the egg from which it develops is not fertile. This may be hard for you to understand, but your teacher will be able to help you comprehend this oddity of nature.

THE QUEEN OF THE HIVE is not always reared under 'panic' conditions, as described when the ruler is accidentally killed. Under normal conditions, when a queen is two or three years old and begins to fail in her ability to lay her quota of eggs, the 'master mind' of the hive decides that a new and more vigorous queen must rule to keep the hive at full strength.

Worker bees having taken the decision; start to build acorn shaped cells, usually at the lower end of a brood frame (see photo) and the old queen will deposit one of her eggs into the base of the cell when it is first started. If she is contrary, and keeps to normal brood cells, the worker bees will remove a day old egg from a cell and deposit it into the specially prepared queen cell, and begin to feed the larvae or egg on "royal jelly" as previously described. Before the young virgin emerges, however, the old queen realises that she is no longer wanted and on a sunny day before the expected emergence of her daughter leaves her hive with worker bees and drones in attendance.

# The swarm

This departure of the old queen is called a "swarm", and the departing bees usually settle on a bush or a fence post within twenty feet of their old home.

SWARM

The beekeeper, not wishing to lose his valuable bees will collect them and place them in an empty hive, often destroying the old queen since she is failing, and giving the colony a young queen to continue their activities. If left to their own devices, however, the swarm sends out 'scouts' for several miles distance searching for a suitable home which may be an entrance to the roof of a house, a cavity in a tree, or a dry hole in the ground under a large rock. On return of the scouts with reports of their findings, the "master mind" decides which site will provide the best shelter, and the whole swarm flies off to the new home.

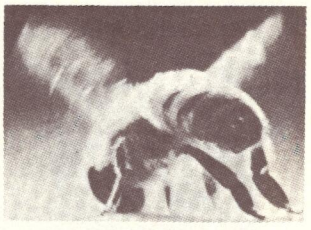
If the queen is still found to be lacking in her capacity to lay sufficient eggs, the "master mind" may decide to raise a new virgin queen and the old queen is destroyed and bundled out of her home to die. This seems very callous and barbaric by human standards, but in the bee's view, it is the health and strength of the colony which counts, and their ability to survive as a unit is all important.

Having studied the family pattern of the bee colony you now know that there is a fertile, egg laying queen as the head and most important member, with workers and drones. Before leaving the structure of the family it must be mentioned that the worker bee is an incomplete female. That is to say, whilst the worker bee is capable of laying eggs, those eggs will always be drones because they cannot be fertile. The worker bee's body is incapable of fertilisation. In fact, worker bees only lay eggs under such dire circumstances as the death of the queen and where no newly laid eggs can be reared into queens by being fed with Royal jelly. The workers are so worried and upset, that they lay their infertile eggs in imitation of their queen, but the result can only be the formation of drones and the whole colony of bees will perish.

A BEE'S STING

# Worker bees

These have stings at the end of their bodies which they use only in defence of the hive or to defend themselves. The sting is only 2.11mm long and is barbed like a fish hook, so that once the bee pushes it into a surface such as human skin, it is "hooked". In trying to pull the sting out the bee tears the sting away from its own body and thereby dies soon afterwards. Remember, therefore, that a bee will not use it's sting on you unless it is absolutely necessary, for by so doing it is causing its own death. Never be afraid of a bee flying near you, and do not make the foolish mistake of many adults who should know better, and try and hit it with a newspaper or your hand. If you are in a car and a bee enters the window, ask the driver to stop and allow the bee to fly away. This is simply common sense.



BEE FANNING

## Work

WORK is the paramount duty of the worker bee from the time it is hatched. They provide their own air conditioning by fanning their wings at the entrance to the hive and inside on the combs to keep an even temperature in the summer. In winter, they cling together as a cluster keeping each other warm. Those bees nearest to the comb consume honey and convert it to heat and energy, slowly moving to the outside of the cluster, whilst those on the outside move inwards for food and to create warmth, thus maintaining a temperature of about 34 degrees celsius at all times. In hot weather, workers fly to a stream or pond to fetch water, which they bring back to the hive to help the cooling process.

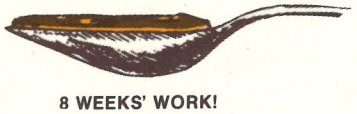
BEE GATHERING NECTAR

## Nurse bees

These bees have to feed and look after the nursery where young larvae or baby bees are developing, thoroughly clean out brood cells in the wax frames ready to receive eggs from the queen, and store pollen and bee bread into the combs for later feeding. When they are three weeks old in the busy season of the year, when flowers and shrubs are secreting nectar, they go forth on flights to gather precious cargoes of nectar to turn into nature's sweetest and health-giving food, honey.

## Honey

HONEY is still something of a mystery to the world's cleverest scientists, and though man has tried to copy the bee and make honey commercially, he has never succeeded. Chemists and very clever men can tell us the composition of honey, but they have never been able to copy it exactly. Whilst it is too involved to describe to you in detail the process by which bees make honey, suffice it is to say that the workers scour the paddocks and plains visiting the flowers from each of which they gather minute drops of nectar through their long seven-pronged tongue, like an elephant drinking water. The nectar is stored in a special honey sac in the bee's body and taken back to the hive where other waiting bees performing the duty of warehousemen and packers store the nectar to ripen in their wonderful wax six sided cells. Each cell slopes slightly backwards to help retain the liquid honey, and has walls only .07mm thick. When nectar is plentiful, the bees make every effort to gather as much as possible, for they know that the time will arrive when supplies are scarce. In eight weeks of gathering nectar a single worker bee collects only enough to make one teaspoonful of honey! Many workers fly so many trips to the flowers that their wings become frayed and they can no longer be airborne. In fact, they work themselves to death.



8 WEEKS' WORK!

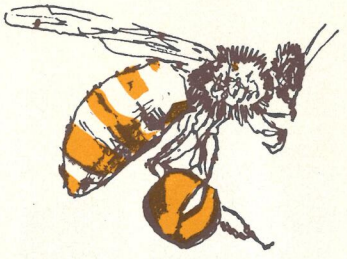
HONEY is the most important function of the bee from the food point of view in producing nature's finest sweet, but we must always remember that their other great service to mankind is pollination. In gathering pollen from the flowers they fertilise and cross-fertilise the stigma of the flowers thus ensuring fertile seeds which will grow next year. Whilst other insects perform a

pollination service, it must be emphasised that without bees there would not be sufficient food for humans to eat because pollination would not be sufficient to ensure adequate crops.

BEES AND HONEY are so wonderful that it is only possible in this booklet to give you a brief insight into their life and work, but here are a few interesting facts for you to remember in preparing your project and social study:

NEW ZEALAND HONEY is considered to be among the best in the world. On the world market it commands a higher price than any other imported honey, such is it's excellence of flavour and texture.

HONEY varies in colour from white (from pohutukawa flowers, thistle, or clover) to dark amber (as from manuka). When first extracted from the comb by the beekeeper it is liquid and runny. By a natural process the honey hardens, although treatment by controlled heat will make honey stay the consistency of thick cream. If the honey in your cupboard is hard and you would like it to be liquid, stand the jar in water heated to approximately 150 F. or 66 celsius. Thick or thin, liquid or solid, honey is still the same wonderful food. Some people prefer honey in the comb just as the bees store it in their hive, and this is called "comb honey". For ease of application as a spread, most honey is 'extracted' from the combs by the beekeeper.



**BEE CARRYING POLLEN**

## Honey as a food

It is not only pleasant and delightful to eat, but many medical authorities claim it has properties contributing to health and energy. It is assimilated into the bloodstream very quickly and can be digested with ease.

## Beeswax

This is produced by worker bees after eating large quantities of honey. Wax develops on the abdomen or stomach of the bee as little plates. These plates or segments are scraped off with her legs, chewed into soft pellets and used to make perfect six-sided honey comb cells.

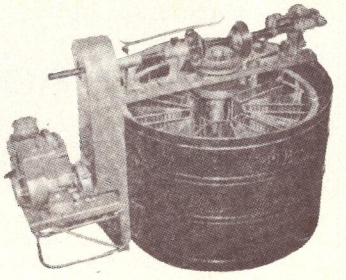
## Bees are clean

Bees do not forage from decaying matter as do wasps. If an intruder, such as a mouse, enters the hive they will sting it to death. Since it is too large for them to move bodily out of the hive, they cover the body with propolis (a gum gathered from tree buds) completely encasing the corpse like an Egyptian mummy so that it cannot smell or pollute the hive.

## Drones

Drones have no stings and cannot feed themselves, and are fed by workers. When winter approaches and there is no longer any use for drones to mate with a virgin queen, the workers bite off the male's wings and drag the drones outside of the hive to die. Otherwise, the drones would consume valuable food in the colder weather and reduce the possibility of the colony's survival. Here is an object lesson for us all. We must work to eat.

A RADIAL EXTRACTOR is used to remove honey stored in the wax cells by the bees. In the picture you will see the wire baskets in which the frames are placed after the cappings of wax covering the honey have been cut off by the beekeeper. The baskets are rotated at high speed which causes the



liquid honey to be flung from the frames to the side of the extractor and to run down into the base of the bin from whence it is removed by turning on a gate tap. This machine is operated electrically and empties 12 frames at once, but smaller machines are made which can be operated by turning a handle.

## Floral source

By careful examination, expert honey graders can tell the exact flowers from which the honey was gathered and the container can be labelled 'Buttercup', 'Rewa Rewa', 'White Clover' or the particular source.


VARIOUS HONEY CONTAINERS

## Beekeepers

There are over 60,000 beekeepers in New Zealand who keep 250,000 colonies producing 8,000 tonnes of honey annually. If there are 60,000 bees in each colony, what is the total number of 'domesticated' bees? How many ~~pounds~~ kg of honey is there in 8,000 tonnes? If you can work out this sum, you could find the average yield of honey from each hive.

CONTAINERS OF HONEY are in many forms. Some beekeepers extract their honey and sell 500 gramme or larger packs to shops for sale. Others pack their honey in bulk and send it in metal drums to the Honey Packers where the honey is graded for colour and texture, the nectar source identified, and re-packed for distribution within New Zealand or to countries all over the world.

## HONEY . . . AND HEALTH

'Eat honey and stay slim', says Lelord Kordel, famous for his health diets. Honey is the only predigested sugar and the best source of quick lasting energy. So replace the sweetness in your diet with nature's natural sweet. Honey is absorbed quickly into the bloodstream to promote increased vigour.

'Honey is "oats" for the heart — its power supply' says Dr Arnold Lorand, an eminent European nutrition expert, while Elie Metchnikoff, the famous Russian scientist, attributes the unusually long life of Bulgarian peasants to their milk and honey diet.

Honey is also good when used in infant feeding, because it is a simple sugar, readily absorbed, and does not need digestion.

Our medical researchers are finding that honey, apart from being a promoter of on-the-spot, energy, has remarkable properties as a healing agent, due directly to its germicidal and antiseptic action.

Until now, twentieth century scientists have regarded the use of honey for purposes of healing as just another 'old wives tale', ignoring mention made of it in the medical profession's oldest handbook of hearly 2,000 years ago when honey was recognised as having outstanding powers applied in its raw state to burns, cuts, abscesses and boils, as well as being of value in the treatment of a number of varying ailments. During recent experiments, when micro-organisms were placed in raw honey they were destroyed in a very short time; as with cuts and boils that were particularly stubborn and slow to heal, after an application of raw honey the healing process was greatly accelerated.

In America, it has been found that within 48 hours honey destroyed the typhoid fever germ, and in 10 hours had gained mastery over the dysentery germ. Meanwhile, many a housewife, taking the law into her own hands, and with a feeling of reverence for the ancients, has used honey and lemon to aid chapped hands, and to relieve coughs and colds; and lemon or apple-cider vinegar with honey to alleviate arthritis.

Our sportsmen have long recognised the value of honey in keeping them in good health, as well as supplying vital and continuing energy when used regularly. A dessertspoonful taken three times daily is a regular addition to the diet of champion footballers, swimmers, boxers, tennis champions and athletes. No wonder the ancient Greeks called honey "the nectar of the gods'.

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