



Summer 2011

Furness Flyer

A Newsletter for Furness Beekeeper Members.

Photograph: David Walmsley

Front Page
A swarm with a view

I used this photograph in the 2009 issue and hope that you do not mind it being used again.

It was taken at 'Brown Robin' overlooking the Kent estuary at Grange

For me it epitomises summer bee keeping

Letter from the Chairman (Summer 2011)

...and it's still raining! Was that fortnight of decent weather our summer once again? The Met Office have been consulting their high tech weather-predicting system as usual (yes, the colony of rabbits in the meadow and the piece of string that is either wet, dry or being blown at right angles) and have confidently predicted that we will, indeed, have weather again this summer.

This time last year I was extolling the virtues of the fantastic climate in which we live. Swarms were literally growing on trees and everything was almost drought-ridden. In stark contrast we now have the odd beekeeper with a bit of honey, a few swarms (usually turning up very inconveniently), rain and generally an Apiary at Gleaston that probably won't produce either splits or honey. But it is still early days, isn't it?

Well, the Convention was enthusiastically-attended again, and very good I thought. The speakers certainly left me with a few new ideas and Richard Kenyon did a roaring trade. If you consider that in 2000 we had around 40 members and only ever attended the Rose Show (yes, I will be mentioning that again later) once the Convention was over we have certainly stretched ourselves since.

Plumbgarth's was a wash-out yet again, weather-wise. But as the day was unsuitable for the live bee show, despite it being ready to go, the gazebo was inhabited by a less-buzzy colony of beekeepers who managed to stay dry.

With St Mary's Hospice at Haverthwaite, The Rose Show, North Lonsdale Show and Rusland Valley Horticultural Show all to

come - along with a few more we will be asked to squeeze in - we've a busy summer ahead.

The Apiary has been busy, but manageable numbers have turned up so far. We didn't lose any colonies over the winter, but they are still quite small. For those who want bees this year, the message is we will do our best. But unfortunately we cannot magically produce nuclei, and we need some decent weather. The current price from Thornes is £48 for a Queen and £220 for a six-frame nucleus this year...but their order book for nuclei is closed at the moment!

We also have an inspection hive populated (and supplied bees for the observation hive at Gleaston Mill) which will again be doing the rounds at schools and scouting events when required. I hope to get another one going - but nothing suitable has turned up at my door yet!

Right - The Lakeland Rose Show...if you have any honey or wax products you'd like to exhibit at the show I really think you should make the effort. This is a declining event, and FBKA used to have a large number of competitors. It doesn't matter if you don't win, it does matter that we are not really represented any more - despite sponsoring quite a few of the classes. This is especially sad considering the number of members we now have.

Beginners classes went well again, and the Intermediate classes were fantastically full with over forty present for both. I do hope to see a lot of you during the course of the beekeeping season, as I'll be at most of the events. Thanks to those who have volunteered so far to help out.

Have a lovely summer...Mike Luke -

Diary Dates

Sunday 26th June from 04.00pm Barbecue at Orchard Cottage, Coniston

David and Jean have very kindly agreed to hold the barbecue at their home
Please ring Dave or Jean to let them know by the June 20th if you are able to go so that they can judge the amount of food to prepare beforehand.

Sat/Sun9/10th July The Lakeland Rose/Honey Show.



The Rose Show is one of our major events and in recent years has been held as a joint meeting with Kendal Beekeepers. The live bee show has been a popular attraction with the general public and the observation hive is very popular too.

Members have the opportunity to sell their own honey and honey based baking at the show, with a small percentage going to club funds. This does not make a lot of money for the club, but it helps to pay for the marquee and cover expenses.

The Rose Show is also a honey show, so please note the enclosed schedule and have a go. There is now a trophy for best beginner, so no excuses!!

Sunday 26 July from 10.30 Mike and Ally Luke The Old Barn

Next Ness Ulverston

Have very kindly agreed to host a meeting at their home; look at the bees and have some tea.

Sunday 7th August from 02.30pm

Chris and Russ Sandham
14 Redmayne Avenue
Barrow in Furness

Have very kindly agreed to host a meeting at their home; look at the bees and have some tea.

Also to have a look at a sundial which was carved by David Allonby who is retired from Burlington slate and calved the biggest sundial in Europe which is at Holker Hall. It was designed by Robert Sylvester who is a member of British Sundial Society and spends his spare time cataloging all the sundials in Cumbria

Both David and Robert will be at Chris's Park on Furness General Hospital Carpark (no ticket needed) pass portacabin and park in first row facing public footpath facing a large hawthorn hedge. Look for gate set back in the hedge.

Each year I appeal for people to support members by attending at least some the meetings; if you have some time to help even for half a day at the Rose Show?

**If you can help, or have something you would like to sell, please let me know
On 01539 721501**

Please try and support our club and attend our events.

Some Bee Facts

A single honey bee weighs about 80 mg That means there are about 12,500 in a kilogram, 5500 in a pound. The average nectar load of a foraging honeybee is about 40mg (Half its bodyweight) but it can carry up to 70 mg. The average speed of a foraging bee in flight is about 15 mph, but it can achieve about 25mph for short periods. Though bees can maintain the temperature in the hive even in very cold periods individual bees are constrained in their activities by the outside temperature. The minimum air temperature for foraging is about 13-14°C but short winter cleansing flights can be undertaken when the air temperature is as low as 8-10°C. However, if a bee's body temperature falls below 10°C, its muscles stop working and the bee becomes comatose.

Water, Pollen and Propolis

POLLEN,

Whereas nectar is gathered at every opportunity, the collection of pollen is much more conservative. When reserves reach an optimal level, the number of foragers engaged in its collection are reduced. As pollen contains the proteins necessary for glandular development, it is, by necessity, the food of young bees. Older bees also eat a little but the amount is minimal. About twenty kilograms takes care of the colony's annual requirement

(That's a staggering 44lb or the equivalent of twenty two 2 lb bags of sugar !!)

WATER

Water is not stored it is only collected when required. In winter and early spring, moisture is needed to dilute stored honey. Nurse bees consume it in order to generate brood food and it is also used as a coolant when the temperature of the nest rises above an acceptable level

PROPOLIS

Gums and resins from plants and trees make up the major constituents of propolis. As it contains chemicals that act as antibacterial agents, propolis offers considerable protection from fungal-growths, yeasts, moulds etc.

Amongst its other uses is the filling of cracks, waterproofing the ceiling and walls of the nest (a microscopic film) and reducing the size of entrances.

Mice or other small creatures that enter the nest will be attacked and killed. Being too large to move, they are normally encased in a coating of propolis, which acts as an airtight seal. A colony (depending on the race, state of the nest etc.) will collect about a hundred grams of the gums and resins annually.

The forager's normal load of nectar or water is carried in the honey stomach and averages about thirty milligrams. Loads of pollen or propolis average about fifteen milligrams and these are carried in the corbicula.

A STICKY END FOR GERMS

For centuries honey was used as an antiseptic to treat wounds - the ancient Egyptians are known to have relied on its healing properties, and several millennia later honey saved the life of Prince Hal, later Henry V.

At the Battle of Shrewsbury an arrow flew into the prince's face. The first challenge for the surgeon was to remove the arrowhead; equally important was to prevent life threatening infection. The surgeons records show that honey was inserted into the wound, which was then dressed with barley and honey mixed with turpentine. After 20 days the wound was free of infection.

Honey's healing properties have recently been rediscovered. Four years ago Aaron Phipps, then aged 15, collapsed while getting ready for school; an hour later he was on a life support system in hospital. He had meningitis C and meningococcal septicaemia, and within two months the infection had affected both legs so badly they had to be amputated. When his wounds failed to heal after nine months of using conventional dressings, his nurses resorted to using gauze impregnated with honey. He was home within ten weeks.

Many similar successes have been documented and although research is still at an early stage it has indicated that honey has considerable potential in treating scrapes and wounds that nothing else will heal. In a study reported in the European Journal of Medical Research, honey outperformed antiseptic and antibiotics in the treatment of infected post operative wounds after Caesarian sections and hysterectomies, healing

22 out of 26 wounds where as routine treatment healed 50 per cent

Perhaps most exciting is honey's potential to fight the deadly 'superbugs' afflicting hospitals. Laboratory studies have suggested that while conventional antibiotic drugs are ineffective against bacteria such as MRSA, honey appears to have some effect. Researchers at the University of Wales Institute, Cardiff, have eradicated MRSA bacteria from infected wounds using honey.

They are also investigating evidence that honey hastens healing by stimulating the cells that promote new tissue formation. Honey works partly because the sugar content draws moisture from the wound, which then inhibits bacterial growth. Researchers have found that it also produces the sterilising compound hydrogen peroxide in constant amounts at small, non toxic levels.

The type of honey that seems to be most effective is from the leptospermum species of plants, usually known as manuka or Jelly bush honey and is produced from the manukbush in Australia and New Zealand.

It has been postulated that it has something to do with a chemical derived from the plant from which (the honey was made' says Dr Rose Cooper, a principal researcher at the University of Wales Institute. 'But nothing we have found so far accounts for the high levels of antibacterial activity in manuka honey.'

An article encouraging people to look after bees - not just honeybees - in their garden, no matter what size it is

Make room for bees

Anna Chambers



Although the estate where I work as gardener and beekeeper measures a respectable eighty acres, the suburban terrestrial handkerchief where I live can be better measured by numbers of paving slabs. For many people gardens are getting smaller and neighbours closer. Land is sold off and built on with little thought for the wildlife living there. Although many people are interested in nature there are always reasons why they cannot interact with it. To those people who say "No bees in my garden!" I offer the challenge "Why not?" The replies come flooding in - "My garden's too small", "I have small children/grandchildren", "I'm allergic to stings", and so on. In wartime Britain the tiniest back yard raised its own food and, today, I know of would-be smallholder's, confined to London city living, that have turned from convention to house ducks and vegetables at the bottom of their gardens.

But where is the line drawn between one type of livestock and another? They are happy to provide shelter for ducks in their small back garden, but would they be quite so happy to provide a home for bees? The parody is that they want their crops to be pollinated, but refuse to entertain the idea of keeping bees. The notion of bees as troublemakers is so firmly set in our minds that we seem to have completely forgotten their value. In a way beekeepers have acted as curator, provider and doctor to bees, moulding them to become dependent on our help and goodwill for their very existence. At the same time others turn their backs on them. It is vitally important that people recognise the benefits of bees and pay more attention to them, for without bees there would be no crops, and without crops no sustenance.

Where do bees come from?

In the spring and summer, when forage is at its height, smallholder's and city gardeners alike grow fruit and vegetables in their bid for self-sustenance and well being. Yet what would happen to the humble runner bean without bees? How many of us have sprayed the bright red flowers with a solution of sugar water to attract bees to pollinate our crops, and how many have stopped to think where these crucial bees come from? Bees travel miles to forage if a particular supply is "in season" and, in gardens and city parks, there is something in season all year round. On a still, clear winter's day towns and cities can be several degrees warmer than the surrounding countryside. The snow melts earlier and flowers bloom for longer. This balmy city-winter encourages earlier journeys out of the hive or nest and the bees are rewarded in the parks and smallest of suburban gardens with winter flowering (and incidentally wonderfully fragranced)

Mahonias, Christmas box and Daphne- plants that are much less seen in the wilds of the arable countryside. Soon to follow are the early crocuses that city councils fill their beds with - a lifeline for the bees, and an early bonus for the suburban beekeeper. The answer to the question "Where do bees come from?" is "They are all around us". Yet despite the bountiful forage in the more urban parts of this country, the numbers of bees here are declining as their natural nesting sites disappear and we rebuff these persecuted refugees.

Legally Speaking

Perhaps I am preaching to the converted and you all want bees in your garden but are afraid of your neighbours' reactions. Although there are no laws saying you cannot keep bees in your garden, there are laws referring to a person's enjoyment of their own property. If your neighbour cites your bees as detrimental to his/her enjoyment of the garden then you may quickly find yourself at odds with both your neighbour and the council. It is better to avoid this situation to begin with. Above all, common sense should prevail. So the belief is set that, despite the wealth of plants available in them, gardens, whatever their size, are becoming too small for bees - more as a result of people's prejudices than the size of the gardens. However with a minimum of effort there are ways of keeping bees in the garden - and your neighbours need never find out...

Secret Bees

The best known approach to beekeeping is of course the traditional, proactive, hands-on one where beehives are kept for personal benefit - for crop pollination, for honey and for other hive products. This approach, whilst thoroughly enjoyable and obsessive, is the one most likely to cause offence with your neighbours if undertaken carelessly, and to take up most of your spare time and money. Another approach is a collaborative one, keeping the bees for their benefit as well as the benefit of the plants in your garden. Less bee "keeping" and more bee "inviting", I suppose. This approach will generally go unnoticed and unquestioned by neighbours and, unaware, they will reap the rewards in the form of a bumper harvest. I always find the excuse "Mine's a wildlife garden" works wonders. Once upon a time untidy gardens were seen as the sign of a lazy gardener, a couch potato with little interest in the outdoors. These days the wild garden has some-



thing of a contemporary chic about it, associating the owner with all the virtues of an experienced environmentalist. Natural nesting sites include an unmown grassy hummock and a forgotten pile of wood - anything, in fact, that you would not find in a perfectly manicured garden and a great excuse to put down your garden tools.

A man-made bumblebee nesting box can be hidden away in a corner under a shrub and solitary bee tubes positioned on a wall. Now you just need to encourage bees into your garden through the range of plants you grow and Hey Presto! Bees in your garden! - a



source of entertainment and an invaluable lesson for children, grandchildren and adults alike. Open cup shaped flowers are the bees' favourites including the many forms of the quaint old- English Campanulas, or Bell Flowers. Foxgloves and Hollyhocks are also desirable, and the most lazy of forage is available in the form of Sedum, the Ice Plant, which offers a bumper plateful of early autumn forage - masses of tiny flowers in one enormous head that bees can wander across with minimal effort.

Bees do not set out to sting when they leave the nest - honeybees are aggressive when trying to protect their precious stores of honey in the hive, but not when they are out alone foraging on flowers. I have handled bumblebee nests and closely observed solitary bee nests with no aggression from my subjects.

Recycled Refugees

Still not convinced? Then why not try an ornamental beehive-shaped compost bin (or any shaped compost bin, but I find the look of the ornamental ones rather pleasing and they give the impression of owning a beehive where a beehive would not normally be suitable). This way you will be doing your bit to recycle and save the environment, and you will furnish yourself with a renewable source of rich compost. The improvements to your soil will give you better crops and provide fresh earth for the tiny red mason bee's mud nest. She, in turn, will thank you by pollinating your crops. Bumblebees will enjoy the warmth of the rotting compost as a nesting site, and they too will pollinate freely. With this small gesture some of our persecuted refugees can at last settle into a new home. An untidy corner, artificial nesting sites, bee-friendly plants and a compost bin - there is always room to encourage bees into the garden. With the exception perhaps of the top of a high-rise city block (and no doubt there are tales to contradict this exception), even the tiniest of window boxes can provide forage and a bee nesting tube can be attached undetected. Being something of a nosey-parker, when I walk my local suburban footpaths, criss-crossing back streets and alleyways, I often glimpse into other people's gardens. Some are immaculate and showy, others ignored and overgrown. In most of them there is colour year round as some gardeners attempt to brighten up their own terrestrial handkerchiefs whilst others allow the floriferous weeds to grow. It is this continual abundance of forage that makes our gardens so attractive and important to our bees - little creatures that should not be shunned. From a beehive to a solitary bee tube on the wall, from herbaceous borders to floral window boxes - no garden is ever too small for bees.

Anna Chambers 2005

Beginners Pages

Pollen



Pollen supplies the protein part of the bees diet.

Without pollen no brood can be raised, but whether if it is necessary for adult bees is uncertain

Pollen gathering on a hyacinth

Colonies can be wintered satisfactorily on honey alone, or on sugar syrup alone, but when brood raising time comes, there must be pollen or no brood will be raised. The loss of large numbers of bee colonies in the Spring of 1988 is believed to have been due to shortages of stored pollen during the preceding year. So far, no really satisfactory substitute has been found, though there are some apparently satisfactory pollen supplements which can be used in the Spring, or in times of shortage.

The bulk of pollen is collected in the spring and early summer. What is not required for immediate use is stored in the combs in worker cells. Each cell is filled to rather more than half its depth, and if it is not used before winter, it will be covered over with honey and sealed, thus preserving the pollen for use when fresh pollen is not available.

Bees get pollen from a variety of sources. From some plants they get much pollen and little or no nectar. They do not gather pollen and nectar at the same time, except for that which adheres to their bodies when getting nectar.

From buttercup they gather pollen by entering the flower, but they get nectar by prising apart the petals near the base. From wild hyacinth also they get pollen

from the mouth of the bell, but for nectar they work from outside the flower, prising apart the petals near the base of the flower.

The pollen is collected in receptacles on the hind legs of the bees, usually called "pollen baskets". Queens and drones do not have pollen baskets. On the legs of the bees the loads of pollen show a variety of colours according to the sources from which it was collected. When these are known, we may be able to say which plants the bees are working.

The following is a list of pollens from plants found in Cumbria

Willow: yellow
Snowdrop: light green
Lupin: dark orange
Sycamore: yellow-green
Gooseberry: light green
Wallflower: greenish
Dandelion: orange
Redcurrant: light green
Willow herb: saxe blue
Broom: orange
Strawberry: dark brown
Bramble: greenish white
White clover; brown
Hawthorn: green
Bell heather: light grey
Crocus: yellow
Horse chestnut: carmine
Ling heather, pink grey
Daisy: yellow
Wild hyacinth: blue green
Nasturtium: orange
Oilseed Rape: yellow
Sloe: brown green
Ivy: grey

FILL THOSE SUPERS

Let us hope for a good harvest to make up for the unseasonable weather conditions we have encountered this spring. Hopefully we will be successful in preventing swarming, and if so our bee stocks should be very strong and ready to collect the last drop of nectar from the flowers during the next six weeks or so.

PLENTY OF STORAGE

Once the nectar starts to flow, we should not experience any further incidence of swarming, as the bees will turn to gathering the honey crop while the opportunity is present. All we have got to do now is to keep the colonies supplied with plenty of storage space in the form of supers. Should we experience a rise in temperatures 18 to 20°C during the month of May we can expect an early flow.

ANTICIPATING THE HONEY FLOW

For the majority of Northern beekeepers the weather prevailing over the six weeks (mid June to end of July) will control the 2005 honey crop. Let us suppose for instance that we only get ten to fifteen days of warm sunny weather during the above period, we can be assured of a good crop, provided of course that our stocks are in good condition and disease free.

DON'T KEEP LOOKING!

We have got to remember to allow the bees as little disturbance and no lengthy examinations of the brood chamber during these critical sunny days. Research has shown that frequent examinations during the nectar flow period tend to reduce honey production by up to 50. Storage space must be provided before

it is required. We have got to remember that in a heavy flow a strong colony will distribute nectar over the comb area of a shallow super in one fine day. Should this empty super not be available in the hive at that time then the bees are restricted for space.

During a heavy honey flow a shallow super can be filled in two or three days. A super is required when the brood chamber is nearly filled with bees. Another sign that the bees require extra space is new white wax built between the frames and under the crown board

GOOD JUDGEMENT

The idea of supering is to give ample space to house the bees themselves and to provide space for nectar ripening and the storage of honey. Should the honey flow be expected to end soon, then it is better to leave the bees to finish off what they have got. Empty supers can then be removed so that the bees can concentrate on finishing off ripening the honey in the supers that are filled. Good judgment in supering is more an art than a science.

JUDICIOUS HANDLING OF BEES

All the above operations require handling the bees. One of the greatest assets a beekeeper can have is the ability to handle bees judiciously and to recognise the conditions under which it can best be done. Vicious strains of bees do exist but can usually be reasonably well handled by a competent beekeeper. On the other hand a normally quiet colony can become troublesome throughout the season due to persistent bad handling. When handling bees, use slow deliberate movements. Sudden jerky motions attract the attention of the guard bees. Judicious use of the hive tool does much to reduce the wrenching and snapping of propolised combs, which also tends to upset the colony.

HUNGRY BEES IN SUMMER

This article was written some years ago about starvation in Summer but the message is the same this year and every year. Ed.

A couple of weeks ago, I got an E-mail from Ian Molyneux, our Regional Bee Inspector, warning about the risk of starvation. Apparently, several colonies in the county have died out because they've run out of food. The shortage of food has also been evident during regular apiary visits.

The weather in May has been so bad in many areas that the bees have been consuming much more honey than they could collect. If they didn't have sufficient surplus stores to start with, they would simply starve to death. And it doesn't take very long!

The colonies most at risk are those where you have taken the honey off early for extraction. Similarly, artificial swarms set up during May can rapidly run short of stores. However, even colonies that had a full super of honey earlier in the year can succumb.

In the later stages of starvation, the bees will take the brood food from uncapped cells. Then they will uncap the sealed brood and consume that too. Finally, the bees will all die in the characteristic posture of lying headfirst in the cells in which they have been desperately trying to find traces of food to keep them alive.

In the early part of this process, the queen stops laying and, because she is not being constantly fed by her attendants, she is slimmer and much more in an acting role until then and more mobile than usual. In this condition, she's very difficult to find unless she's marked, so it's easy to as-

a stalling colony has become queenless. However, in most cases, after a good dose of sugar syrup from a rapid feeder, the queen will start laying again and patches of eggs can be found in the brood chamber.

VIGILANCE

It's too late to do anything about any endangered colonies this year because they will have either already perished or have recovered thanks to the last few weeks of warmer weather and increased nectar flows.

However, it should serve as a reminder that constant vigilance is required, even in midsummer.

DAVID CUSHMAN

Although few of our members will have known him personally, I think it right to record the passing of one of the giants of beekeeping.

Dave died on 22 February after suffering from ill health for many years.

He led a varied career, but his passion for bee breeding and the Native Dark European Bee led to him becoming an internationally respected authority on the subject.

He served as a trustee for BIBBA.

When his health deteriorated and he was unable to keep bees any longer, he turned his attention to the Internet where he was a popular contributor to beekeeping lists. Perhaps his greatest achievement has been his website www.dave-cushman.net with around 1500 pages devoted to beekeeping and bee breeding, as well as pages covering some of his other interests.

I am very pleased to learn that the web site will not disappear but will be kept on by others.

I often use it to clear up a question that I am not sure about and can recommend it to all.

Is Natural beekeeping Bee friendly?

“These barefoot beekeepers have developed alternative approaches which emphasise small-scale, low cost chemical-free beekeeping with simple equipment and locally adapted bee populations. These bee friendly methods result in lower honey harvests, but stronger and healthier bee populations. David Heaf, author of *The Bee-friendly Beekeeper*, explains that although there have been no scientifically conducted studies on natural beekeeping, he has not heard of any report of so called colony collapse disorder from any natural beekeepers”.

Really? No scientific studies? What about the small cell research? What about the work by Engelsdorp et al which looked at the level of chemical and pesticide contamination in honeybee colonies? What about Seeley's work in the Arnot Forest? What about organic beekeeper Dee Lusby's problems with CCD?

I noted with interest this comment from Phil Chandler - the Barefoot Beekeeper - on www.biobees.com last October in a thread discussing treatment with lard patties:

"I have been treading this tightrope for ten years now, and I have been wiped out twice. I can't afford to have no bees in the spring if I am to do any useful research next year. "

Interesting. On the point of getting 'wiped out' for a third time, yet the journalists are fed stories about this approach producing "stronger and healthier bee populations". Who's kidding whom here?

Jonathan Getty, Irish Beekeeping List
(from the Notts newsletter)

Why feed swarms ? Read On

Wax scales Those from the lowest abdominal segment are smaller than the others, but on average each scale is about 1/8" across and about 1/250" thick Often laminated scales are found, consisting of up to four or five scales on top of each other, which accounts for the wide differences between their average weights as found by different workers. Roche gave a figure of 560,000 in 1968 and Robinson (1972- U S A) even more. A reasonable approximation would be 500,000 per lb. This figure is consistent with the dimensions quoted and the known density of beeswax.

Doing it by numbers Accepting Cheshire's figures of one pound of wax producing 35,000 cells to store 22lb honey, and reckoning 500,000 wax scales to the pound, one can form some idea of the production effort involved. If each wax-working bee produced one batch of 8 scales every 12 hours, then it would take about 10 000 bees three days to produce one pound of wax (equivalent to 7 National deep frames of comb) and to produce this they would need to consume at least six pounds of honey or syrup.

An average swarm of 20,000 bees, weighing 4 to 5 lb, would not be carrying with them more than 4 to 5 lb honey at the most, so do not expect too much of a swarm in poor weather. In good weather with a steady honey flow, this same swarm, with 10 000 foragers, 10,000 housebees and no brood commitment for the first few days could easily draw out a full box of combs and store a food reserve in the first week A swarm twice the size could do this and fill a super in the same time.

In poor weather the paramount importance of feeding a swarm is evident.

MAGNETIC BEES

Each honeybee hive produces about 29 kg of honey per year. To help them make this honey, the bees talk to each other - and just recently, some scientists have learnt to speak this language!

The story begins back in 1923, when Karl von Frisch from the University of Munich in Germany, published his first paper on the language of the honeybees. He reckoned that they "spoke" with each other by dancing the dance!

Suppose a honeybee has found a flowerbed rich in nectar and pollen. She flies back, into the hive, and tells her fellow workers about the flowers - by dancing. If the flowers are within 100 metres of the hive, she flies in circles. Soon, her fellow workers leave the hive, and fly in ever-enlarging circles until they find the flowers.

But if the flowers are further away (up to three kilometres away), she dances a different dance inside the nest. She flies in a straight line, while wagging her rear end, and then flies a curved line to the beginning of the straight line, and does it all again. If her straight line points vertically up, then the other bees leave the nest, and fly in the direction of the Sun. And if the straight line points 60° to the right of vertical, the other bees fly in a direction 60° to the right of the Sun. And the speed of her wagging bottom tells the other bees the distance to the flowers - the faster the waggle, the closer the food!

Karl von Frisch received a Nobel Prize for this theory in 1973. But his theory didn't go far enough. Most beehives are pretty dark inside, and like us, honeybees can't see very well in the dark. So how can they see each other do the dance? In the 60s, other scientists discovered that dancing honeybees emitted a sound from their wings, vibrating at 220 beats per second.

They were singing a song with their wings. And honeybees do have a sort-of-ear on the second joint of their antennae. It seemed reasonable that bees could hear this song, but how do you prove it?

In the late 80s, Wolfgang Kirchner and William Towne proved it with a robot honeybee. It had razor blades for wings, and tiny computer-controlled motors to make it dance. It could sing the song with its razor blade wings, and dance the dance via its electric motors. Real honeybees would ignore their robot razor blade honeybee if it just danced the dance, or just sang the song. But when it did both the song and the dance, the real honeybee would obey it. The scientists could actually talk to the animals! They could get their robot honeybee to send the real honeybees out of the nest in any direction they wanted! So by using a song-and dance routine, the bees can tell each other the best place to eat out. But once they've picked up their nectar and pollen, how do they find their way back to the hive? Honeybees have another trick - tiny compasses, in their tummies, that sense the Earth's magnetic field.

Now under the right conditions, magnetic fields can effect humans. Susan Blackmore wrote about her experiences in the New Scientist, after a neuroscientist had blasted her brain with intense magnetic fields in his laboratory. She felt nothing for the first ten minutes. Then, even though she knew that she was reclining perfectly still in a chair, she felt as though she was swaying on a hammock. Almost immediately afterwards, even though she knew that there was nobody near her, she could feel "two hands grabbing her shoulders and pulling her upwards." As the magnetic fields continued to act on her brain, she could "feel" something grab one of her legs and try to pull it up the wall - although her eyes told

her nothing was happening! And then the magnetic fields began to act on her emotions. She suddenly felt very angry - but she didn't know what she was angry about, nor at whom she was angry. This anger lasted only ten seconds, but as it faded, she was suddenly beset with a very intense attack of fear. Again, she was not scared of anyone or anything, but she was very afraid.

Now the human brain is very complicated, and we don't know why intense magnetic fields can cause such dramatic changes. But we do have a better idea of what's going on in honeybees. There are a few different types of magnetic materials. One is a type of iron oxide called magnetite, which is naturally magnetic, and we know that lots of creatures have tiny magnets of magnetite in their bodies. But there's another type of iron oxide which is paramagnetic.

Paramagnetic materials are themselves not magnetic, but, they are pulled by magnetic fields. So a non-magnetic paper clip made of soft iron is actually paramagnetic, because it can be pulled by a magnet.

According to researchers Hsu and Li of the National Tsing Hua University in Taiwan, honeybees have tiny paramagnetic particles in their bodies. These particles are inside cells inside the bees' tummy. Depending on whether they are lined up side-by-side, or end-to-end, the paramagnetic particles can, as the external magnetic field changes, swell or shrink. But the particles are attached to the "walls" of the cells that they are in, so as they change shape, so do the cell walls. And nerves, attached to the outside of these cells, carry signals up to the honeybee's brain. So the magnetic cells in the bees tummy are like tiny onboard compasses. This is the first time scientists have actually followed the "line of information" in a living animal, from the mag-

nets to its brain. Now honeybees are told how to leave the nest and where to go by the buzzing wings and wagging dance of another honeybee. And, by using the paramagnetic particles of iron oxide, these honey bees can avoid getting lost on the way home, and iron out their problems with a little magnetic navigation.



