APIS UK JUNE/JULY 2009 EDITORIAL

The New Beekeeper

"Is Beekeeping the New Buzz?" "Urban Dwellers Urged to Take up Beekeeping," "BBKA Membership up 25%," "Beekeeping Courses Hugely Oversubscribed." These are just a few of the headlines covering the news media in the UK at the moment. It all sounds good and it must be true because I wrote a book on beekeeping and it sold out in 6 months! I even read of a new plastic hive designed especially for the urban bee keeper by that crowd that designed the little hen coop. Now that's innovation and may there be more of it. I really hope that this new enthusiasm for beekeeping can be sustained but I guess that could depend in part on the present beekeeping authorities (BBKA etc), the equipment suppliers and the UK beekeeping world as a whole and how they respond to the newcomers. If this is a new and modern trend then the response should be new and modern and up-to-date and a prime example of this is the plastic hive. I haven't had a look at one and so I don't know if it's any good or not in practice but it is an appropriate and welcome innovation and I hope it works. At least people are thinking and if it encourages city beekeepers then all to the good. Urban beekeeping is one of the futures There are many entrenched positions in beekeeping and many beekeepers that use old fashioned, inefficient and in fact useless procedures, so much so that I was nearly put off the craft when I first took it up – and many of these methods and beliefs are still around 16 years later! I sincerely hope that newcomers to the hobby won't similarly be put off.

Hard at it NZ style

Apis UK

Of course one way you can be sure of being up-to-date is to read Apis UK published by Northern Bee Books. We will always endeavour to keep you informed of the latest developments as far as the science of it all is concerned and in this issue we start off with a short pice on a new varroa trap that has been developed in the USA, then we take a look at a variety of subjects including an interesting piece on how the pollination equation may always work in the plant's favour; how plants invented Velcro a few million years before we did; we examine bee flight **and** that old favourite, bumble bee flight. We have an article on the horrific US bee losses and another on how there aren't really any losses and we look at some famous beekeepers including Scarlett Johansson. That is just a small sample of the interesting research outlined here. History and poetry have their corner and of course out tried and trusted recipe section will be welcomed by all (I hope).

If you know of a new beekeeper (especially if it's Scarlett Johansson), then do introduce them to Apis UK so that they too can keep up-to-date with this new phenomenon called "Beekeeping."

Best Regards

David Cramp
Editor

BEE DISEASES

NEW VARROA TRAP

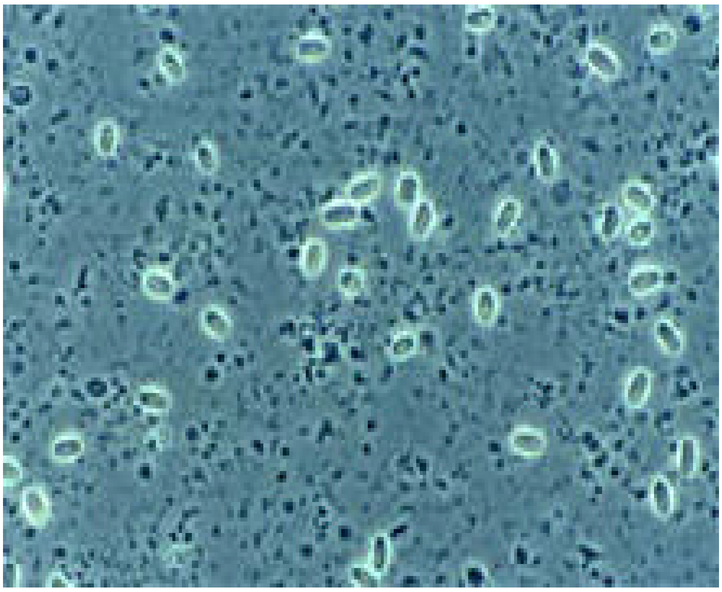
We all know about varroa mites and their effects on our colonies and we all know that the research into fighting this beast has been intense and fast moving for many years. Much good advice and help has come from good scientific research and now a new varroa trap has been developed in the USA using the varroa mites' major weakness - their reliance on semiochemicals to locate the hemolymph of adult bees and brood. Bee At the ARS Chemistry Research Unit in Gainesville, research leader Peter Teal and colleagues are testing a bait-and-kill approach using sticky boards and natural chemical attractants called semiochemicals. In nature, Varroa mites rely on these semiochemicals to locate—and then feed on—the bloodlike hemolymph of both adult honey bees and their brood. Severe infestations can decimate an affected hive within several months—and rob the beekeeper of profits from honey or pollinating services. But in this case, the mites encounter a more heady bouquet of honey bee odours that lure the parasites away from their intended hosts and onto the sticky boards, where they starve. In preliminary tests, 35 to 50 percent of mites dropped off the bees when exposed to the attractants. Free-roving mites found the semiochemicals even more attractive, according to Teal.

Moreover, the extra dose of semiochemicals wafting through hives didn't appear to significantly interfere with the honey bees' normal behaviour or activity. The team hopes ARS' patenting of the Varroa mite attractants will encourage an industrial partner to develop the technology further.

Adapted from materials provided by USDA/Agricultural Research Service

NOSEMA CERANAE GENOME SEQUENCED

Most beekeepers may know that Nosema ceranae is one of many pathogens suspected of contributing to the current bee population decline, termed colony collapse disorder (CCD). The beast has been the subject of valuable research in Spain from 2006 and now scientists in the USA have sequenced the genome.



Nosema ceranae exposed

In 2006, CCD began devastating commercial beekeeping operations in the USA, with some beekeepers reporting losses of up to 90 percent, according to the USDA.

Researchers believe CCD may be the result of a combination of pathogens, parasites and stress factors, but the cause remains elusive.

The microsporidian Nosema is a fungus-related microbe that produces spores that bees consume when they forage. Infection spreads from their digestive tract to other tissues. Within weeks, colonies are either wiped out or lose much of their strength. Nosema apis was the leading cause of microsporidia infections among domestic bee colonies until recently when N. ceranae jumped from Asian honey bees to the European honey bees used commercially in the United States.

Sequencing the genome should help scientists trace the parasite's migration patterns, determine how it became dominant, and help resolve the spread of infection by enabling the development of diagnostic tests and treatments.

Reference:

Cornman et al. Genomic Analyses of the Microsporidian Nosema ceranae, an Emergent Pathogen of Honey Bees. PLoS Pathogens, 2009; 5 (6):

BEEKEEPING UP IN THE UK

The UK news is full of the popularity of beekeeping and the plight of the bees, which of course is a good thing all round especially the rise in the number of people applying for beekeeping courses and joining the BBKA, SBKA and WBKA. Also, the average age of beekeepers is dropping – another welcome sign. Let's have a look at some famous beekeepers, some new and some not so new.

Scarlett Johansson - The actress developed an interest in beekeeping after Samuel L Jackson gave her a hive full of bees as a wedding present.

Bill Turnbull (right) - the BBC newsreader has four hives and is patron of the Bees for Development Trust

Vince Cable (below) - the Lib Dem Treasury spokesman is a beekeeping enthusiast who has led campaigns for more research

Ronnie Corbett (right) - the comedian has kept bees since the late 1970s, and has hives at his second home in East Lothian

Nicholas Lyndhurst (Rodney) - left) - the Only Fools and Horses actor keeps bees at his home in West Sussex

Paul Theroux (right) - The American travel writer and novelist has dozens of beehives at his home on Hawaii. "I've been interested in the subject ever since I read about Sherlock Holmes, who retired to Sussex and tended bees," he says.

Sir Edmund Hillary (left) – The most famous beekeeper known. Sir Ed was a commercial beekeeper.

Sherlock Holmes (right) retired 'to tend his bees in the country.' (I'm not sure whether Basil Rathbone was also a beekeeper or not)! **Ed.**

HONEY

A NEW TEST FOR ADULTERATED HONEY

Researchers in France are reporting development of a simple test for distinguishing 100 percent natural honeys from adulterated or impure versions that they say are increasingly being foisted off on consumers.

Bernard Herbreteau and colleagues point out that the high price of honey and its limited supply has led some beekeepers and food processors to fraudulently make and sell impure honey doped with inexpensive sweeteners, such as corn syrup. These knock-offs are almost physically and chemically indistinguishable from the real thing. Scientists need a better way to identify adulterated honey, the researchers say.

Herbreteau and colleagues describe a new, highly sensitive test that uses a special type of chromatography to separate and identify complex sugars (polysaccharides) on their characteristic chemical fingerprints. To test their method, the scientists obtained three different varieties of pure honey from a single beekeeper and then prepared adulterated samples of the honeys by adding 1 percent corn syrup. They showed that the new technique accurately distinguished the impure honeys from the pure versions based on differences in their sugar content.

Reference:

Megherbi et al. Polysaccharides as a Marker for Detection of Corn Sugar Syrup Addition in Honey. Journal of Agricultural and Food Chemistry, 2009; 57 (6):

A NEW AND FAST METHOD TO DETECT ANTIBIOTICS IN HONEY

A team of chemists from the University of Almería in Spain (UAL) has developed a method to simultaneously detect the presence of 17 antibiotics in honey within less than 10 minutes. The researchers have shown that traces of antibiotics used to treat diseases among bees can be found in some commercial honey brands.

“The method we have developed means we can simultaneously detect various kinds of antibiotic residues (macrolides, tetracyclines, quinolones and sulfonamides) in honey,” says Antonia Garrido, lead author of the study and the researcher in charge of the UAL’s Contaminants Analytical Chemistry Research Group. In order to develop this method, the results of which have been published recently in the Journal of Agricultural and Food Chemistry, the researchers employed ultra performance liquid chromatography, a technique that makes it possible to separate the components of a sample, together with mass spectrometry, which permits the simultaneous identification of up to 17 antibiotics.

“The development of these multi-residue methods is very useful, since it makes it possible to detect the various groups of antibiotics within a sample, and with just one analysis”, stresses Garrido. In addition, the chromatography analysis takes less than 10 minutes, “which means it could be routinely used in laboratories.”

The researcher points out that European legislation today establishes a “zero tolerance” policy when it comes to the presence of antibiotic residues in honey, and the analytical methods devised by the study help to identify these compounds at the lowest levels possible. The technique developed by the chemists at the UAL means they can be identified at concentrations of between 0.1 and 1 microgram per kilo of honey, depending upon the type of antibiotic.

Antibiotic residues in honey

The researchers have applied their analytical method to 16 honey samples, 11 of which were taken from supermarkets while five were collected from various private beekeepers throughout Granada and Almería. The results of the study show that three of the samples contained traces of the antibiotics used to treat diseases among bees.

One of the commercial samples contained 8.6 micrograms of erythromycin per kilo of honey, while traces of sarafloxacin were found in another. This antibiotic, along with residues of tylosin, sulfadimidine and sulfachlorpyridazine, were also found in the honey from one bee farm, which was informed about the results. Garrido stresses that the low concentrations of antibiotics detected “do not represent a direct risk to the consumer,” but warns that excessive or undue use of these veterinary products could have an affect on food security.

Reference:

José Luis Martínez Vidal, María del Mar Aguilera-Luiz, Roberto Romero-González y Antonia Garrido Frenich. Multiclass Analysis of Antibiotic Residues in Honey by Ultraperformance Liquid Chromatography−Tandem Mass Spectrometry. Journal of Agricultural and Food Chemistry, 2009; 57 (5): 1760

BEE NUMBERS

ARE THERE ENOUGH BEES AROUND?

Each month, we hear more and more stories about the lack of honey bees and the general lack of pollinators. Well are our bees disappearing and declining generally or is it all a bit of a myth. Argentinean researchers believe that it may well be and believe that availability of bees globally is rising but that demand for them is rising even faster. Their research is reported on line in the May 7th edition of Current Biology. So what do they say exactly?

First of all, most agricultural crop production does not depend on pollinators. On top of that, while honey bees may be dwindling in some parts of the world, the number of domesticated bees world-wide is actually on the rise, their new report shows.

"The honey bee decline observed in the USA and in other European countries including Great Britain, which has been attributed in part to parasitic mites and more recently to colony collapse disorder, could be misguiding us to think that this is a global phenomenon," said Marcelo Aizen of Universidad Nacional del Comahue in Argentina. "We found here that is not the case." By analyzing data from the Food and Agriculture Organization of the United Nations for temporal trends in the number of commercial bee hives, they found that the global stock of domesticated honey bees has increased by about 45 percent over the last five decades. That increase has primarily been driven by an increased demand for honey from a growing human population, rather than an increased need for pollinators, he added.

But the news isn't all good: The data also show that the demand for crops that rely on insects for pollination has more than tripled over the last half century, suggesting that the global capacity for pollination may still be under considerable stress. These crops include "luxury" agriculture items, now common in any supermarket, like plums, raspberries, and cherries, as well as mangos, guavas, Brazil nuts, and cashew nuts.

"We were particularly astonished when we found that the fraction of agricultural production that depends on pollinators, which includes all of these luxury agriculture items, started growing at a faster pace since the fall of communism in the former USSR and Eastern Europe, and at a much higher rate than the larger fraction of agricultural production that does not depend on pollinators, including wheat and rice, which just follow human population growth," Aizen said. "Although the primary cause of the accelerating increase of pollinator-dependent crops seems to be economic and political – not biological – their rapid expansion has the potential to trigger future pollination problems for both these crops and native species in neighbouring areas." The associated increase in demand for agricultural land could also hasten the destruction of habitat that now supports hundreds or thousands of species of wild pollinators, which would in turn cause a drop in crop yield, he said. "Most importantly, decreasing yield by these pollinator-dependent crops surely would imply rising market prices, which undoubtedly would constitute a further incentive for their cultivation," Aizen said. "This situation would create a positive feedback circuit that could promote more habitat destruction and further deterioration of pollination services. The good news is that less-intensively managed agro-ecosystems that preserve patches of natural and semi-natural habitats and uncultivated field edges can sustain abundant and diverse communities of wild pollinators."

HONEY BEE COLONY LOSSES IN THE U.S. ALMOST 30% FROM ALL CAUSES (Sept 2008 To Apr 2009)

Figures from the Agricultural Research Service (ARS) Bee Research Laboratory in Beltsville, Md. ARS in the USA have released these figures but say that there is a slight bit of encouragement in the fact that this is less than the overall losses of about 36 percent from 2007 to 2008, and about 32 percent from 2006 to 2007, that have been reported in similar surveys. While the drop in losses is encouraging, losses of this magnitude are economically unsustainable for commercial beekeeping say the researchers. The survey was conducted by Pettis; Dennis vanEngelsdorp, president of AIA; and Jerry Hayes, AIA past president. About 26 percent of apiaries surveyed reported that some of their colonies died of colony collapse disorder (CCD), down from 36 percent of apiaries in 2007-2008. CCD is characterized by the sudden, complete absence of honey bees in a colony. The cause of CCD is still unknown.

As this was an interview-based survey, it is not possible to differentiate between verifiable cases of CCD and colonies lost as the result of other causes that share the "absence of dead bees" as a symptom. However, among beekeepers that reported any colonies collapsing without the presence of dead bees, each lost an average of 32 percent of their colonies in 2008-2009, while apiaries that did not lose any bees with symptoms of CCD each lost an average of 26 percent of their colonies.

To strengthen the beekeeping industry, ARS recently began a five-year area wide research program to improve honey bee health, survivorship and pollination. Honey bee pollination is critical to agriculture, adding more than $15 billion to the value of American crops each year.

The survey checked on about 20 percent of the country's 2.3 million colonies. A complete analysis of the survey data will be published later this year. For those interested, an abstract of the data is available on line at:
http://maarec.cas.psu.edu/pdfs/PrelimLosses2009.pdf .

Adapted from materials provided by USDA/Agricultural Research Service.

BEE FLIGHT

BEES IN THE WIND

In some fascinating research carried out by scientists at Harvard University, it appears that in order to remain stable in windy conditions, bees trade energy for safety by extending their hind legs to brace themselves against the wind. But this approach comes at a steep cost, increasing aerodynamic drag and the power required for flight by roughly 30 percent, and cutting into the bees' flight performance.

"Wind is a universal part of life for all flying animals," says Stacey Combes, assistant professor of organismic and evolutionary biology in Harvard University's Faculty of Arts and Sciences. "Yet we know remarkably little about how animals navigate windy conditions and unpredictable airflows, since most studies of animal flight have taken place in simplified environments, such as in still air or perfect laminar flows. Our work shows clearly that the effect of environmental turbulence on flight stability is an important and previously unrecognized determinant of flight performance." Together with Robert Dudley of the University of California, Berkeley, and the Smithsonian Tropical Research Institute, Combes studied 10 species of wild orchid bees that fly at high speeds for tens of kilometres each day seeking food and other resources. Males of these species are especially motivated to collect aromatic scents in pouches on their oversized hind legs, which are then used in mating displays that attract females.

Because male orchid bees are so strongly attracted by scents, they will readily traverse severe conditions, such as those created when Combes and Dudley set up powerful air jets in the bees' Panamanian jungle habitats. Using high-speed video, the scientists measured the bees' maximum flight speed as they were buffeted by varying levels of environmental turbulence. In every case, the bees displayed a side-to-side rolling motion at high flight speeds, negotiating the turbulence by extending their rear legs while in flight. "This increases the bees' moment of inertia and reduces rolling," Combes says, "much like a spinning ice skater who extends her arms to slow down." This rolling increased with flight speed until the bees were rolled to one side or the other roughly 80 percent of the time, at which point the bees would become unstable and either crash to the ground or be blown from the airstream. Bees were able to reach higher speeds when flying in lower levels of turbulence, altered through the use of different types of screens to deflect air flow in the air jet.

While Combes and Dudley only studied 10 species of euglossine bees, Combes says that this stabilizing behaviour is likely to be seen across Hymenoptera, the order of insects that includes bees, wasps, ants, and sawflies, and that turbulent airflow may decrease the flight performance of many other flying insects as well.

Reference:

Stacey A. Combes, Robert Dudley. Turbulence-driven instabilities limit insect flight performance. Proceedings of the National Academy of Sciences, 2009;

ANOTHER BUMBLE BEE FLIGHT THEORY

We have all heard the various theories as to how bumble bees can or can't fly, well now researchers from the University of Oxford have found that 'yes they can fly brute force rather than aerodynamic efficiency is the key to bumblebee flight.

In recent years scientists have modelled how insect wings interact with the air around them to generate lift by using computational models that are relatively simple, often simplifying the motion or shape of the wings. In this research, the team of scientists decided to go back to the insect itself and use smoke, a wind tunnel and high-speed cameras to observe in detail how real bumblebee wings work in free flight They found that bumblebee flight is surprisingly inefficient – aerodynamically-speaking it's as if the insect is 'split in half' as not only do its left and right wings flap independently but the airflow around them never joins up to help it slip through the air more easily.

Brute force and ignorance, but it still flies

Such an extreme aerodynamic separation between left and right sets the bumblebee [Bombus terrestris] apart from most other flying animals. Their observations show that, instead of the aerodynamic finesse found in most other insects, bumblebees have a adopted a brute force approach powered by a huge thorax and fuelled by energy-rich nectar, said the researchers. \This approach may be due to its particularly wide body shape, or it could have evolved to make bumblebees more manoeuvrable in the air at the cost of a less efficient flying style.

Professor Adrian Thomas of Oxford's Department of Zoology, co-author of the report, said: "a bumblebee is a tanker-truck, its job is to transport nectar and pollen back to the hive. Efficiency is unlikely to be important for that way of life."

Observing insects in free – as opposed to tethered – flight is a considerable challenge. The Oxford team trained bumblebees to commute from their hive to harvest pollen from cut flowers at one end of a wind tunnel. They then used the wind tunnel to blow streams of smoke passed the flying bees, to reveal vortices in the air, and recorded the results with high-speed cameras taking up to 2000 images per second. From these images the team were able to visualise the airflow over flapping bumblebee wings.

The old myth that "bumblebees shouldn't be able to fly" was based on calculations using the aerodynamic theory of 1918-19, just 15 years after the Wright brothers made the first powered flight. These early theories suggested that bumblebee wings were too small to create sufficient lift but since then scientists have made huge advances in understanding aerodynamics and how different kinds of airflow can generate lift.

Reference:

Richard James Bomphrey, Graham K. Taylor and Adrian L. R. Thomas. Smoke visualization of free-flying bumblebees indicates independent leading-edge vortices on each wing pair. Experiments in Fluids, 2009; 46 (5): 811

BEES AND PLANTS

THE POLLINATION FIGHT BACK

In some recent research that will be of interest to all beekeepers, **ETH Zurich*** scientists tested whether the pollen of certain flowers contains toxins that give bees an upset stomach and protect the plants from the diligent pollen gatherers.

Bees and flowers are of course a harmonious interdependency, mostly with equal benefits for both. The insects obtain nectar and pollen, pollinate the flower and ensure the plant's propagation. A win- win situation for all concerned including other animals and humans who eat the fruit/crops. Scientists in ETH Zurich's applied entomology group, however, now see this relationship somewhat more soberly. Bees – besides the honey bee there are over 600 species of wild bees in Switzerland – are herbivores that have specialized in high-protein pollen as their staple diet in the course of evolution. Bees need an enormous amount of pollen – often the entire pollen content of several hundred flowers just to produce one single offspring. And that can be a considerable disadvantage for plants, stress the researchers. Every grain of pollen that disappears in a bee's brood cell is really one potential seed less. The more the bees gather pollen randomly from many different plant species and families, the greater the danger that it will not reach its destination – the stigma of the right type of flower – and fertilize it. Moreover, pollen production also uses up a lot of the plants' energy. It is therefore in the plants' interest to reduce the number of pollen eaters in order to prevent too much pollen being taken. Flowering plants have therefore developed special forms of flower in the course of time to make gathering pollen more difficult for bees – such as the keel flowers of the pea. However, certain kinds of bees have in turn adapted their bodies especially to suit such flower shapes.

Poison keeps bees at bay

Andreas Müller's team of researchers has now discovered a new mechanism that plants use to ward off pollen eaters. To their surprise, they found that a number of bees belonging to the genus Colletes specialize in the aster family; generalists within the same genus that gather pollen randomly, however, steer clear of this plant family although it is rich in species. Furthermore, the aster family – unlike members of the Fabaceae family such as peas – makes it easy for the guests to gather the pollen.

The notion of defending pollen chemically therefore seemed the obvious explanation. "Plants often stop themselves from being eaten by insects by storing toxins in leaves. Why should pollen be any different?" ask the researchers, who described this idea as the "aster paradox" in a recent scientific publication.

The insect researchers at ETH Zurich began a series of experiments to test their theory. For example, for his ETH-Zurich-medal winning doctoral thesis, Christophe Praz fed the larvae of specialized bees with pollen from the aster family, which was not part of their normal diet. Although the larvae ate the wrong food for up to 30 days, they did not grow. Not one species managed to develop from a larva into a bee – apart from the specialist bees for this plant family.

Is aster pollen inedible?

Claudio Sedivy, a PhD student in the applied entomology group, is now collaborating with chemist Rafal Piskorski and the student Claude Hüsser to test whether pollen from members of the aster family contains toxins and whether the corresponding bees have adapted their metabolism especially in order to use the pollen.

With their research, the ETH Zurich scientists are entering unknown territory. The evolutionary research appears to have ignored this aspect of floral biology, as the research team points out: "The chemical protection of pollen must have had an enormous impact on the evolution of the relationships between insects and flowers."

Adapted from materials provided by ETH Zurich.
***ETH Zurich is the study, research and work place of 20,000 people from 80 nations. About 370 professors in 16 departments teach mainly in the engineering sciences and architecture, system-oriented sciences, mathematics and natural sciences areas and carry out research that is highly valued worldwide.**

THE ORCHID AND THE HONEY BEE PHEROMONE

The ‘femme fatal’ of orchids has been found. Most beekeepers will know that the far eastern hornets can decimate a honey bee colony. The hornet will sit at the entrance to the hive gradually decapitating any guard bee that goes against it. Once all of the guards are out of the way, the hornet will eat the brood and bang goes the colony. Far Eastern honey bees have been known to ball the hornet. They surround the hornet, raise the temperature of the ball to a degree or two more than the hornet can stand – but which they can- and the hornet is killed. But now, researchers from the German University of Ulm have found another natural trap for this fearsome beast can be destroyed and of course it involves the use of scent!

Dendrobium sinense doing its work

Easily fooled! Vespa bicolor

Orchids are famous for their deceptions. Most of those with nothing of value to offer their pollinators lure them instead with the scents of more rewarding flowers or potential mates. Now, a report published online on August 6th in Current Biology, a Cell Press publication, shows that a species of orchid, which lives on the Chinese island of Hainan, fools its hornet pollinator by issuing a chemical that honeybees use to send an alarm.

The discovery explains why the hornets, which capture honeybees to serve as food for their larvae, have been observed to literally pounce on the reward-less Dendrobium sinense flowers.

The compound the orchids produce, so-called Z-11-eicosen-1-ol, is a rarity even in the insect world, said researchers Manfred Ayasse and Jennifer Brodmann of the University of Ulm in Germany. It has never before been described in any plant.

“Of course, we are aware of the fascinating other examples of how orchids attract their pollinators,” Ayasse said. “However, we did not expect to find such a new form of deception.”

The researchers knew from earlier studies by their Chinese collaborators that there was something going on between D. sinense and the hornet Vespa bicolour. Hornets were the most frequent visitors of those orchids by far. And rather than landing and pausing on the flowers, as would be typical behaviour for pollinators, the hornets instead pounced on the red centre of the flower, much as though they were attacking prey.

In the current study, they found that hornets were more apt to tackle orchids with their natural scent or dummy honeybees impregnated with the floral scent than they were odourless bee dummies.

An examination of the floral extract turned up Z-11-eicosen-1-ol as one of few compounds that might be detected by the antennae of worker hornets. The chemical was known from other studies to be a major compound of honeybees’ alarm pheromone and an essential component for prey recognition in hunting wasps. Behavioural experiments of hornets in the lab confirmed the predatory insect’s attraction to the orchid flower’s scent and to Z-11-eicosen-1-ol alone. People might take a note from these orchids about how to manipulate Vespa hornets to their own ends, according to the researchers. “Various species of Vespa are problems to beekeepers, because they plunder the hives,” Ayasse said. “Besides this, their ravages of fruit crops make hornets a serious pest to man. Our results could be used to develop environmentally responsible traps for pest hornets.”

Note: (*Z*)-11-Eicosen-1-ol was identified by GC-MS and microchemical methods as a major volatile component, ca. 5 μg per insect, secreted by the sting apparatus of the worker honey bee. When presented on moving lures at the hive entrance, (*Z*)-11-eicosen-1-ol, like isopentyl acetate already known as an alarm pheromone, elicited stinging, and together these two compounds were as active as the natural pheromone from the sting. On stationary lures, (*Z*)-11-eicosen-1-ol prolonged the effectiveness of isopentyl acetate.

INVENTIONS

KEEPING OUT GHENGIS

A fence made out of beehives wired together has been shown to significantly reduce crop raids by elephants, Oxford University scientists report.

The fence is constructed of log beehives suspended on poles beneath tiny thatched roofs (to keep off the sun). The hives are connected by eight metre lengths of fencing wire. Elephants avoid the hives and will attempt to push through the wire but this causes the hives to swing violently causing the elephants to fear an attack of angry bees.

The results of a pilot study in Kenya, published in the African Journal of Ecology, show that a farm protected by the beehive fence had 86 per cent fewer successful crop raids by elephants and 150 per cent fewer raiding elephants than a control farm without the fence.

The Beehive Fence

(Credit: Copyright Oxford University/Lucy King)

The reduction occurred despite the fact that none of the hives were occupied at the time suggesting that elephants remember painful past encounters with African honeybees and avoid the sights and smells associated with them. 'Our previous research has shown that elephants are scared away by recordings of the buzzing of angry bees,' said Lucy King of Oxford University's Department of Zoology who led the project in collaboration with the charity Save the Elephants. 'We designed the beehive fence as an affordable and practical way of applying this knowledge to create a barrier that the elephants would be afraid to cross.'

'The reaction from the farmers involved in our pilot study has been very positive,' said Lucy King. 'Our beehive fence design has been shown to be robust enough to survive elephant raids and cheap enough for farmers to construct themselves – especially as it also gives protection against cattle rustlers and, when occupied by colonies of African honeybees, will give the farmers two or three honey harvests a year that they can sell to offset the cost of building the fence.'

During the six-week pilot study the team used GPS to track one particularly notorious elephant raider dubbed **'Genghis Khan'**. Genghis was spotted raiding by several farmers and was observed amongst a herd of eighteen bull elephants returning from crop raids and his GPS movements were shown to closely match the routes of the raiding groups.

Despite their thick hides adult elephants can be stung around their eyes or up their trunks, whilst calves could potentially be killed by a swarm of stinging bees as they have yet to develop this thick protective skin. Lucy King said: 'We hope that these results will encourage farmers in other areas losing crops to elephant raiders to build their own beehive fences and help to reduce the conflict between humans and elephants that can lead to the tragedy of animals being shot, as well as farmers suffering devastating losses to the crops that are their livelihood.'

Adapted from materials provided by University of Oxford

HOW DO BEES HOLD ONTO FLOWERS – especially when they are upside down?

How does she do it?

When bees collect nectar, how do they hold onto the flower? Cambridge University scientists have shown that it is down to small cone-shaped cells on the petals that act like ‘velcro’ on the bees’ feet.

New research shows that bumblebees can recognise the texture of petal surfaces by touch alone. More importantly, they choose to land on petals with conical cells that make it easier to grip, rather than on flat, smooth surfaces. With this extra grip, they can extract nectar from the flower more efficiently. In the natural world, bees can take visual or olfactory cues without needing to land on the flower itself. Their ability to identify conical-celled surfaces by touch would therefore seem to be of limited use in terms of flower recognition. The researchers, led by Beverley Glover, wondered whether the conical cells play a different role by providing better grip on an otherwise slippery plant surface, thereby making nectar collection easier for the bees. To test this, the researchers used artificial flowers cast from epoxy resin, half with conical cells and half with flat surfaces. When these casts were horizontal, the bees showed no preference, visiting each type roughly half the time. However, once the angle of the cast increased, so did the bees’ preference for the conical cells. When these casts were vertical, the bees visited the conical-celled ones over 60% of the time.

The researchers, who were funded by the Natural Environment Research Council (NERC), were able to visualise why the bees preferred conical cells. Using high-speed video photography they saw that when bees attempted to land on the flat-celled epoxy petals they would scramble for grip, rather like a climber struggling to find a foothold on an ice-covered cliff. However, on the conical-celled casts the bees were always able to find grip, stop beating their wings and feed on the flower.

The next step was to establish whether bees in the natural world actually preferred real flowers with conical cells. To test this, the researchers used snapdragon plants, which have conical petal cells, and mutant snapdragons, lacking such cells. When the flowers were horizontal and required little handling the bees would visit the conical-celled flowers 50% of the time. However when the flowers were vertical and required complex handling the bees learnt to recognise the conical-celled flowers and landed on them 74% of the time.

Around 80% of flowers have these conical cells and the researchers believe that all pollinators that land on flowers (such as butterflies, flies and other kinds of bee) may have a preference for petals with a rough surface. Beverley Glover said: “For bees to maintain their balance and hold onto a flower is no easy task, especially in windy or wet conditions. It’s great to see that evolution has come up with the simple solution of equipping flowers with a Velcro-like surface that bees can get a grip on”.

Reference:

Heather M. Whitney, Lars Chittka, Toby J.A. Bruce, and Beverley J. Glover. Conical Epidermal Cells Allow Bees to Grip Flowers and Increase Foraging Efficiency. Current Biology, 2009;

BEES

HONEY BEES AND NUMBERS

Research led by the head of visual neuroscience at University of Queensland’s (UQ) Queensland Brain Institute (QBI) has demonstrated honey bees are capable of routinely counting up to four.

Professor Mandyam Srinivasan and a colleague from Sweden discovered a new insight into honey bee cognition after developing a series of experiments based on sugar-water incentives.

Now how many is that again?

The researchers began by asking whether bees can learn to ‘count’ the number of landmarks that they encounter on the way to a food source. Individually marked bees were trained to receive a reward of sugar solution after they had flown past a specific number of regularly spaced yellow stripes during their flight through a narrow tunnel. Depending upon the experiment, this number was one, two, three or four. After training, the bees were individually tested by removing the food reward, and observing their searching behaviour in the tunnel to determine which landmark they had associated most strongly with the reward during the training.”

When the research team randomly introduced random objects that were outside the bees’ range of experience, the bees’ ability to count to four did not appear to be hampered.

The team say that bees trained in this way are able to count novel objects, which they have never previously encountered. Their findings provide evidence that bees are capable of counting objects on the way to a food source.

In all probability, this counting is performed sequentially, and required the ability to maintain a running tally of the number of events, incrementing the tally by one each time an event occurs

FEEDING SUGAR BOOSTS BEES’ PRODUCTIVITY

Feeding bees sugar can encourage them to pollinate more crops.
Feeding sugar to bees encourages them to collect pollen, rather than nectar, increasing the level of crop pollination vital for agricultural success.

Scientists at Plant & Food Research (New Zealand) are working with commercial partners to develop methods that encourage pollination by bees, a process required to ensure the generation of fruit.

The research team have discovered that feeding bees a sugar solution every two days cause bees to shift their behaviour from collecting nectar to collecting pollen. During this collection process, more pollen is transferred between plants, creating a more efficient pollination process for growers.

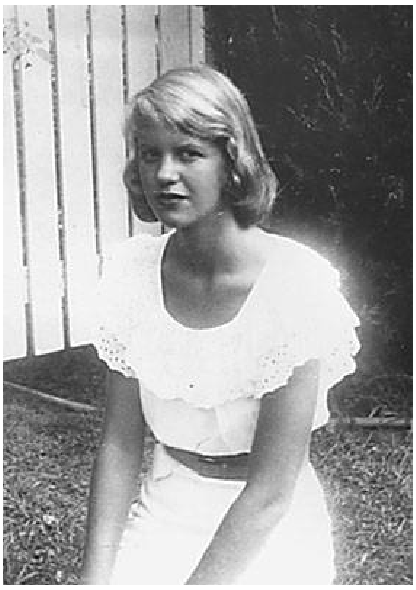
“Bees will normally collect nectar to feed the hive,” says Dr Mark Goodwin. “Many growers have bee hives in their fields to assist in pollination, and ideally would like to encourage them to transfer pollen, rather than focusing on nectar collection. By feeding them sugar, the bees in the hive are too busy using the sugar to receive nectar from the workers. This gives the signal that nectar is not needed, so the workers switch to collecting pollen, increasing the amount transferred between plants.”

Many of New Zealand’s key crops are dependent on pollination by bees to generate fruit, including apple, kiwifruit, avocado, feijoa and berries. Bees are also widely used to pollinate greenhouse tomatoes.

The Beekeeper's Daughter

by: Sylvia Plath (1932 – 1963)

A garden of mouthings. Purple, scarlet-speckled, black
The great corollas dilate, peeling back their silks.
Their musk encroaches, circle after circle,
A well of scents almost too dense to breathe in.
Hieratical in your frock coat, maestro of the bees,
You move among the many-breasted hives,



My heart under your foot, sister of a stone.

Trumpet-throats open to the beaks of birds.
The Golden Rain Tree drips its powders down.
In these little boudoirs streaked with orange and red
The anthers nod their heads, potent as kings
To father dynasties. The air is rich.
Here is a queenship no mother can contest ---

A fruit that's death to taste: dark flesh, dark parings.

In burrows narrow as a finger, solitary bees
Keep house among the grasses. Kneeling down

I set my eyes to a hole-mouth and meet an eye
Round, green, disconsolate as a tear.
Father, bridegroom, in this Easter egg
Under the coronal of sugar roses

The queen bee marries the winter of your year.

Sylvia Plath (October 27, 1932 – February 11, 1963) was an American poet, novelist, children's author, and short story author. Known primarily for her poetry, Plath also wrote a semi-autobiographical novel, *The Bell Jar*, under the pseudonym Victoria Lucas. The book's protagonist, Esther Greenwood, is a bright, ambitious student at Smith College who begins to experience a mental breakdown while interning for a fashion magazine in New York. The plot parallels Plath's experience interning at *Mademoiselle* magazine and subsequent mental breakdown and suicide attempt.

HISTORICAL NOTE

When bees were boys

“Bees arrange their own king for themselves. They create a popular state and although they are policed under a king, they are free. For the king does not merely hold the privilege of giving judgement, but he also excites a feeling of allegiance, both because the bees love him on the grounds that he was appointed by themselves and also because they honour him for being at he head of so great a swarm. The king does not become their leader by lot, for in casting lots there is the element of chance rather than of good judgement and often by the irrational misfortune of luck, somebody who is worse gets preferred to better men.”
Anon. 12th Century

It wasn’t until Jan Swammerdam in the Netherlands in the 1600s that the king discovered she was a queen and in the meantime Butler in England popularised this idea in his magnificent work ‘The Feminine Monarchy.’ 1634.

Jan Swammerdamm

QUOTE OF THE MONTH

"There are certain pursuits which, if not wholly poetic and true, do at least suggest a nobler and finer relation to nature than we know. The keeping of bees, for instance."

Henry David Thoreau (1817–1862), U.S. philosopher, author, naturalist.

RECIPE OF THE MONTH

This is an unusual recipe in that it uses both coffee and curry for flavouring. I found it on a website called group recipes and modified it slightly to my own taste and found it to be delicious. Try it.

Ingredients

- 2 cups strong coffee
- 1/3 cup brown sugar
- 2 large ripe pears, peeled, halved, seed pods and stems removed
- 3 Tbs. honey
- 1/2 tsp. curry powder
- Generous grind of freshly ground black pepper
- Mint sprigs for garnish

Directions

1. In medium skillet, bring coffee and brown sugar to a boil.
2. Slip four pear halves into sauce, and bring back to a boil. Turn heat down to slow simmer, and cover pan.
3. After 3 minutes, gently turn pears and continue poaching until tender but not pulpy. 8 to 15 minutes depending on ripeness of pears. Test tenderness with skewer.

4. Remove from heat, and let pears sit in hot poaching liquid, 10 minutes.
5. With slotted spoon or spatula, remove fruit from skillet, and place on two dessert plates. Cover and chill.
6. In small pan, heat honey, curry powder and pepper until honey is hot.
7. Cool honey sauce to room temperature.
8. To serve, drizzle honey sauce over pears

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