Apis-UK The Electronic Beekeeping Newsletter

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Late again! I know but probably better late than never and we are now on a new war footing with a resolve to keep you informed on time in the future which means every month except December. Watch this space.

Apis UK is well known for keeping beekeepers well informed of some of the ground breaking science of their craft and this month's edition is no exception. We take a good look at various aspects of pollination as well as learning about bee sociality from an unusual angle. We cover some research news that has only come to light today (25 Oct) which tells us that bees can count – up to four, so now we are dealing with a creature with a tiny brain that can communicate, learn, navigate, and count. I never cease to be amazed. It was years before I could count beyond four, and maths is still my weak point.

Our recipe this month is in fact two recipes as I have decided to branch out into dogs with a pet recipe from America (where else?) and a really easy and surprising recipe for humans. Please try them both and let me know what you think. When I tried the dog one, I and my family ate most of it!

Our poem comes from that tragic poet Sylvia Plath whose writings are probably some of the most powerful literature of the century and our Historical Note deals with the propagation of the species and the drone bee's hand in it all. All in all I think you will find this edition varied and interesting.

Most of you in the UK will of course know about the petition sent to HM government and the reply from Number 10 but in case you didn't, we have included it in this edition. Standing apart from the UK scene as I do in New Zealand and previously in Spain, it often seems that the NBU and Defra take a lot of flack generally and I guess that some of this may be deserved but I do recall being in HM services and when something went wrong or wasn't done, the press would often have the headlines (as they still do), 'military commanders should hang their heads in shame', and the call for resignations would become a shriek from the ignorant. What utter nonsense isn't it? Every military commander and I would hope every one in the NBU/Defra would love to do more and ensure that nothing goes wrong and that every disease is researched to within an inch of its life, but one can only do so much with tuppence. I urge you to look to the treasury, not to the people doing their best with very little. (Remember that they can't complain or slag off the government).

In the meantime as we rush up to Christmas, do think about the bee keeping charities. We all know who they are and they consist of people working freely for people who have nothing. They deserve our support especially in these difficult times.

Keep in touch and we'll be back next month

Jobbing Beekeepers in New Zealand

Regards

David Cramp. Editor

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The Petition:

Many beekeepers will have signed the petition shown below so just to keep everyone up to date including those who didn't there was a petition sent to Number 10, here are the details and HM Government's response.

"We the undersigned petition the Prime Minister to fund scientific research into maintaining UK Bee stocks."

Details of Petition:

"The British Beekeeping Association has requested £8m for the government to fund 5 years research into Colony Collapse Disorder. The government has stated that no funds exist within the existing farming research budget. Kept honey bees provide a significant percentage of pollination to food crops, fruit orchards and of course provide honey. Colony Collapse Disorder is a disease which has affected hives in the US and has been reported in France, Germany and Italy. Its entry into the UK is most likely inevitable. This fundamental research needs to be performed in order to protect the country bees before it arrives. As in almost all cases, being prepared for something reduces its impact for a fraction of the cost compared to being unprepared. Currently only £1.35m per annum is available to the National Bee Unit (part of Defra), this funds all its statutory activities as well as research. If there is no money in the farm research budget, then money should be made available from contingency funds."

Central Science Laboratory, York

The Response by HM Government:
Honey bees are important pollinators of crops and wild flowers and make an important contribution to sustainable agriculture and the environment. Defra recognises the importance of a strong bee health programme in England to protect these benefits and takes very seriously any biosecurity threat to the sustainability of the apiculture sector.

The Department has not reduced its expenditure with the National Bee Unit (NBU) and funding for this year remains at the same level as in recent years. In the 2007/8 financial year, Defra and the Welsh Assembly Government are providing the NBU with funding of £1,518,000.   There is an ongoing review of expenditure on all Defra programmes, including bee health, and it is not possible to give long term commitments on the continuation of funding into the distant future for any particular programme. In addition, work is underway to develop a bee health strategy. This is being discussed with all sectors of the industry and should help establish priorities and clarify the roles and responsibilities of government and the industry.   The strategy will also determine whether the current approach to disease control is the most effective use of resources or whether alternative approaches might yield better results in terms of disease protection, including any response to potential new threats. That review will include consideration of resource implications and the role that industry has to play in working in partnership with government. In the event of any resultant proposals to change the provision of the NBU's inspection services, there will be further consultation.

In addition, the budget for Bee Health R&D in 2007/08 is £192,000, which is comparable to previous years. The R&D programme underpins bee health policy and covers work on all exotic and statutory pests and diseases of bees. This year the programme is focusing on the development of a system for the monitoring and surveillance of Small Hive Beetle (Aethina tumida (Murray)) and assessing the effectiveness of the shook swarm technique for the control of European Foul Brood. In addition, a 3 year PhD studentship studying bee viruses will start this year. Defra is also collaborating with other funders in order to optimise the outcome of the research programme and the inaugural meeting of the Research Funders Forum will take place early in November.

Defra is aware of the press reports about the serious situation in the USA in respect of cases of abnormally high levels of colony loss described as Colony Collapse Disorder. However, despite continuing press speculation, we do not have evidence to suggest that there is something similar happening in the UK. Scientists and inspectors at the

NBU are monitoring the situation and are in contact with experts in the USA and in Europe to learn about developments.

It is not unusual for some colonies to be found dead or absent at the end of winter. If beekeepers report such cases in England and Wales to the NBU they are routinely investigated. The very limited number of cases of high losses for which there is no ready explanation is being investigated in depth by the NBU and bee inspectors. The figures from inspections strongly indicate that colony losses in 2007 will not be significantly higher than the 11.1% recorded in 2006, reflecting the upward trend since 2001. The NBU's research and apiary assessments suggest these losses are primarily due to Varroa and inappropriate control. Uncontrolled mite populations can lead to an increase in the associated secondary pathogens like viruses or Nosema.

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New Research Focuses on Anti Varroa Fungi

Bees world wide are suffering a serious decline and despite our current limited understanding of that decline, most beekeepers and scientists believe that varroa is one of the causes – if the chief one. Biological control technologies (the use of one organism to control another) could offer a way of moving pest management strategies away from a reliance on these synthetic pesticides and many alternatives have been researched and tried in many countries, but no natural insect or other enemies of varroa species have been identified on the varroa or on their bee hosts.

Rothamsted Research and Warwick University find new varroa enemies

Now Defra-funded studies by researchers at the University of Warwick's plant research group Warwick HRI, and Rothamsted Research has found some new natural enemies of varroa from other hosts.

The university researchers under Dr Dave Chandler examined 50 different types of fungi that afflict other insects (known as entomopathogenic fungi) to see if they would kill varroa. They needed to find fungi that were effective killers of varroa, had a low impact on the bees, and worked in the warm and dry conditions typically found in bee hives. Of the original 50 fungi they are now focusing on four that best match those three requirements."

The team now hope to secure additional funding to further examine the effectiveness of these four fungi and to begin to consider the best ways of applying this weapon across the hive. A number of approaches are being considered including having fungal footbaths at the main entrances to hives. However the complex environment within bee hives means that more devious means of application may be needed.

Dr Chandler hosted the Society for Invertebrate Pathology international conference at the University of Warwick which started on 4th August, where a special session is was held on honey bee health. The session brought together some the world's leading experts in bee colony collapse disorder to discuss the full range of its possible underlying causes.

Bumble Bee Decisions

A very interesting study by scientist from Queen Mary, University of London, showed that Bumblebees can learn to avoid camouflaged predators by sacrificing foraging speed for predator detection.

Learning to avoid the enemy

Bumble bees will slow down and look for monsters like this.

One of the bumblebee's main predators is the crab spider. Crab spiders hunt pollinating insects like bees and butterflies by lying in wait on flowers, and are particularly difficult for their prey to spot because they can change their colour to blend in with their surroundings

Dr Tom Ings and Professor Lars Chittka from Queen Mary's School of Biological and Chemical Sciences in London wanted to discover whether bumblebees could learn to avoid these crab spiders. Their study, funded by the NERC and published in the journal **Current Biology**, shows how a run in with a spider affected the bees' foraging patterns.

Dr Ings and his team allowed a colony of bumblebees (Bombus terrestris) to forage in a meadow of artificial flowers in a 'flight arena' which contained 'robotic' crab spiders. Some of the spiders were well hidden, others were highly visible. Whenever a bee landed on a flower which contained a robot spider, the spider 'caught' the bee by trapping it briefly between two foam pincers, before then setting it free to continue foraging.

The team used 3D tracking software to follow the bees' movements, and found that the bees which were caught by a camouflaged spider slowed down their subsequent inspection flights. Although they lost valuable foraging time by slowing down, they were more likely to accurately detect whether there was a hidden crab spider present.

In addition, the bees which had already been caught a few times the day before by the hidden spiders behaved as if they saw spiders where there were none i.e. they rejected foraging opportunities on safe flowers, 'just in case' and were more wary than bees which had been caught by the more conspicuous spiders. Surprisingly, their findings suggest that there is no apparent benefit to the spider in being camouflaged, at least in terms of prey capture rates. Spider camouflage didn't increase the chances of a bumblebee being captured, or reduce the rate at which the bees learnt to avoid predators. But our results did show that the bees which encountered camouflaged spiders were worse off in terms of reduced foraging efficiency. Dr Ings presented his full findings on 3 September 2008 to the British Ecological Society's Annual Meeting at Imperial College, London.

Insect Pollination Worldwide Estimated At € 153 billion (U.S. $217 Billion) in 2005

Scientists from the French research organisations INRA and CNRS and a UFZ German scientist found that the worldwide economic value of the pollination service provided by insect pollinators, mainly honey bees, was €153 billion in 2005 for the main crops that feed the world. This figure amounted to 9.5% of the total value of the world agricultural food production. The study also determined that pollinator disappearance would translate into a consumer surplus loss estimated between €190 to €310 billion. The results of this study on the economic valuation of the vulnerability of world agriculture confronted with pollinator decline are published in the journal, **'Ecological Economics'** and show some other interesting facts concerning pollination economics as well.

According to the study, the decline of pollinators would have main effects on three main crop categories (following FAO terminology); fruits and vegetable were especially affected with a loss estimated at €50 billion each, followed by edible oilseed crops with €39 billion.

Among biodiversity concerns, the decline of pollinators has become a major issue, but its impact remains an open question. In particular, the economic value of the pollination service they provide had not been assessed on solid ground to date. Based upon the figures of the literature review published in 2007 on pollinator dependence of the main crops used for food, the study uses FAO and original data to calculate the value of the pollinator contribution to the food production in the world. As stated above, the total economic value of pollination worldwide amounted to €153 billion in 2005, which represented 9.5% of the value of the world agricultural production used for human food that year. Three main crop categories (following FAO terminology) were particularly concerned; fruits and vegetable were especially affected with a loss estimated at €50 billion each, followed by edible oilseed crops with €39 billion. The impact on stimulants (coffee, cocoa…), nuts and spices was less, at least in economic terms.

The scientists also found that the average value of crops that depend on insect pollinators for their production was on average much higher than that of the crops not pollinated by insects, such as cereals or sugar cane (€760 and €150 per metric ton, respectively). The vulnerability ratio was defined as the ratio of the economic value of insect pollination divided by the total crop production value. This ratio varied considerably among crop categories with a maximum of 39% for stimulants (coffee and cocoa are insect-pollinated), 31% for nuts and 23% for fruits. There was a positive correlation between the value of a crop category per production unit and its ratio of vulnerability; the higher the dependence on insect pollinators, the higher the price per metric ton. From the standpoint of the stability of world food production, the results indicate that for three crop categories – namely fruits, vegetables and stimulants – the situation would be considerably altered following the complete loss of insect pollinators because world production would no longer be enough to fulfil the needs at their current levels. Net importers, like the European Community, would especially be affected. This study is not a forecast, however, as the estimated values do not take into account all the strategic responses that producers and all segments of the food chain could use if faced with such a loss. Furthermore, these figures consider a total loss of pollinators rather than a gradual decline and, while a few studies that show a linear relationship between pollinator density and production, this must be confirmed. The consequence of pollinator decline on the well being of consumers, taken here in its economic sense, was calculated based on different price elasticities of demand. The price elasticity represents the effects of price change on consumer purchase, that is, the percent drop in the amount purchased following a price increase of 1%. In the study, researchers assumed that a realistic value for the price-elasticities would be between -0.8 and -1.5 (for a value of -0.8, the consumer would buy 0.8% less of the product when its price increases by 1%). Under these hypotheses, the loss of consumer surplus would be between €190 and €310 billion in 2005.

These results highlight that the complete loss of insect pollinators, particularly that of honey bees and wild bees which are the main crop pollinators, would not lead to the catastrophic disappearing of world agriculture, but would nevertheless result in substantial economic losses even though the figures consider only the crops which are directly used for human food. The adaptive strategies of economic actors – such as re-allocation of land among crops and use of substitutes in the food industry – would likely limit somewhat the consequences of pollinator loss. Yet researchers did not take into account the impact of pollination shortage onto seeds used for planting, which is very important for many vegetable crops as well as forage crops and thereby the whole cattle industry, non-food crops and, perhaps most importantly, the wild flowers and all the ecosystemic services that the natural flora provides to agriculture and to society as a whole.

The information in this article was adapted from materials provided by Helmholtz Association of German Research Centres.

Feeling a bit off colour?

Bumble-bees go 'off colour' and can't remember which flowers have the most nectar when they are feeling under the weather, a new study from the University of Leicester reveals.

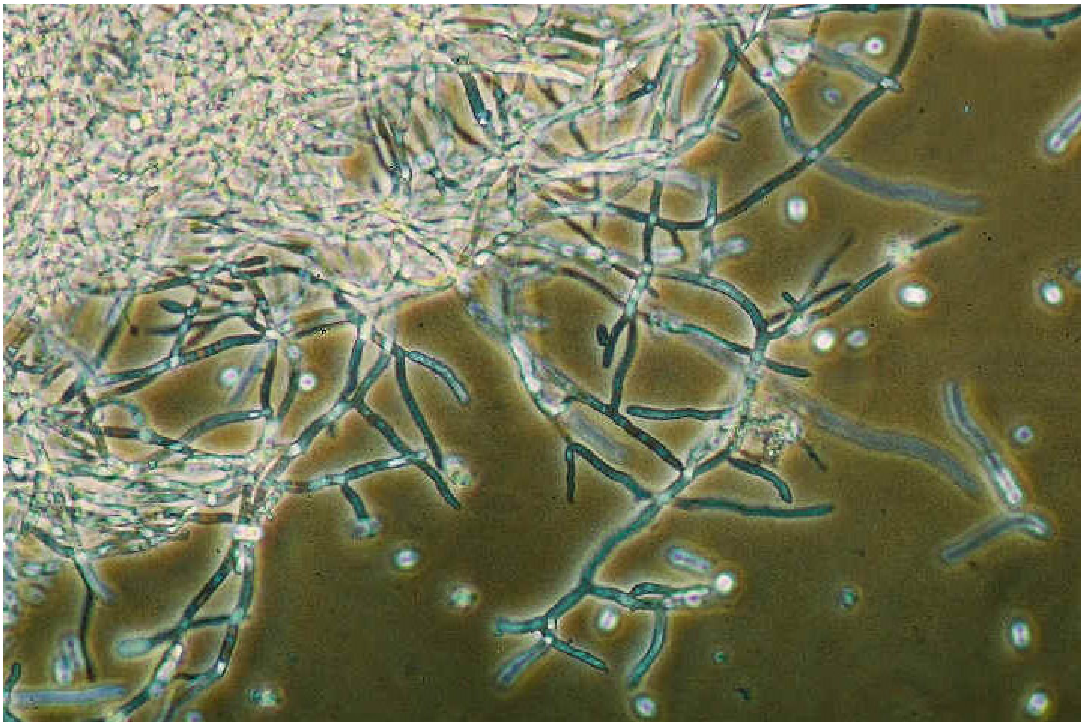
Is this the right one?

The behaviour of the bumbling bees reveals that, like humans who are ill, bees are often not at their most astute and clever when they feel poorly.
Researchers found that disease can influence different behaviours including foraging, mate choice, and predator avoidance. Several recent papers have shown reduced learning abilities in infected insects. However, it is difficult to separate the effects of the immune response from the direct effects of the parasite. That was the purpose of this study.

Bees were divided into a control group and a group that were injected with lipopolysaccharide, a substance that stimulated an immune response without a need for the bee to be infected with a disease. Bees were offered the choice of blue and yellow artificial flowers only one type of which contained sugar water.
An individual's flight was recorded over ninety visits to these flowers.
Eventually the bees spent almost all of their time going to the rewarding flowers, but it took the immune stimulated bees longer to reach this point.
The scientists realised that this work has two important applications. Firstly, there is a lot of interest in the connections between the immune system and the nervous system in human biology. This research was the first to show that these interactions also exist in the much more experimentally tractable insects.
Secondly, there is concern about both the decline in wild bumble-bee species and the effects of disease on the honeybee industry. It has been shown that learning is vitally important to how well a colony prospers. This effect of immunity on learning highlights a previously unconsidered effect of disease on colony success.
Future work will look at the basis of this neuro-immune interaction. Is it due to the immune system using up some resource required to form memories or is it due to the damaging effects of the immune response on the nervous system?

The research was conducted in the Department of Biology, in collaboration with the Department of Genetics, at the University of Leicester.

More Research on Fungus V Varroa from the USA



Metarhizium anisopliae Could this be an answer?

A natural fungus could be a non-chemical alternative for beekeepers looking for ways to control the parasitic varroa mite, according to Agricultural Research Service scientists in Weslaco, Texas.

For several years, scientists in the ARS Beneficial Insects Research Unit at Weslaco have been looking for a natural organism that's harmless to bees but kills the mites.

New, non-chemical controls are needed because the mite has developed resistance to the only approved chemicals--fluvalinate and coumaphos--now used against varroa. So the researchers looked at various organisms, tried different dosages and application methods, and conducted toxicity tests. Finally, they selected strains of the fungus Metarhizium anisopliae that proved highly pathogenic to the mites.

This potent fungus, which also kills termites, doesn't harm bees or affect queen reproduction. To test the fungus, the scientists coated plastic strips with dry fungal spores and placed them inside the hives. Since bees naturally attack anything entering their hives, they tried to chew the strips, thereby spreading the spores to the whole colony.

In field trials, once the strips treated with M. anisopliae were inside the hives, several bees quickly made contact with the spores. Within 5 to 10 minutes, all the bees in the hive were exposed to the fungus, and most of the mites on the bees died within three to five days. The fungus provided excellent control of varroa without impeding colony development or population size. **Tests showed that Metarhizium was as effective as fluvalinate, even 42 days after application.**

The scientific team is now fine-tuning the strategy for transfer to producers.

Editors Note
I have seen already a variation of this fungus on sale for use against various pests and is on sale in the USA as Met52. (Note, this is not for use in bee hives).

Honey as a treatment for chronic rhinosinusitis
Most beekeepers already knew that honey has got antibacterial properties and many honeys especially manuka and buckwheat honey are very powerful in this respect but this research shows amother application for this wonderful substance

Honey is very effective in killing bacteria in all its forms, especially the drug-resistant biofilms that make treating chronic rhinosinusitis difficult, according to research presented during the 2008 American Academy of Otolaryngology-Head and Neck Surgery Foundation (AAO-HNSF) Annual Meeting & OTO EXPO, in Chicago, IL

The study, authored by Canadian researchers at the University of Ottawa, found that in eleven isolates of three separate biofilms (Pseudomonas aeruginosa, and methicicillin-resistant and -suseptible Staphylococcus aureus), honey was significantly more effective in killing both planktonic and biofilm-grown forms of the bacteria, compared with the rate of bactericide by antibiotics commonly used against the bacteria.

Given the historical uses of honey in some cultures as a homeopathic treatment for bad wound infections, the authors conclude that their findings may hold important clinical implications in the treatment of refractory chronic rhinosinusitis, with topical treatment a possibility.

Honey is very effective in killing bacteria in all its forms, especially the drug -resistant biofilms that make treating chronic rhinosinusitis difficult

Chronic rhinosinusitis affects approximately 31 million people each year in the United States alone, costing over $4 billion in direct health expenditures and lost workplace productivity. It is among the three most common chronic diseases in all of North America.

Reference: Effectiveness of Honey on S. aureus and P. aeruginosa Biofilms. Authors: Talal Alandejani, MD (presenter); Joseph G. Marsan, MD; Wendy Ferris, BSc, MLT, MSc; Robert Slinger; Frank Chan, PhD. Date: September 23, 2008.

And honey for burns

And new Research from the University of Auckland in New Zealand provides us with further research on the healing properties of honey.

Researchers from the university have shown that honey may reduce healing times in patients suffering mild to moderate burn wounds. A systematic review by Cochrane Researchers concluded that honey might be useful as an alternative to traditional wound dressings in treating burns.

"We're treating these results with caution, but it looks like honey can help speed up healing in some burns," says lead researcher Dr Andrew Jull, of the Clinical Trials Research Unit at the University of Auckland, New Zealand.

Honey has been used in wound treatment since ancient times. The mechanism of action is unclear. While honey may help the body remove dead tissue and provide a favourable environment for the growth of new, healthy tissue, current interest in medicinal honey focuses largely on its antibacterial effects.

The review brings together data from 19 clinical trials involving 2554 patients with a range of different wounds. Honey was more effective in reducing healing time compared to some gauze and film dressings that are often used to treat moderate burns. However, the researchers were unable to show any clear benefits for the healing of grazes, lacerations, surgical wounds and leg ulcers.

The researchers don't advise using honey to treat other types of wounds. "Health services should invest in treatments that have been shown to work," says Dr Jull. "But, we will keep monitoring new research to try and establish the effect of honey."

Scientists from Auckland University have studies the use of honey for burns

Bees Can Mediate Escape of Genetically Engineered Material Over Several Kilometers

A study by scientists from the Nairobi-headquartered international research centre icipe, in collaboration with the French Institut de Recherche pour le Développement (IRD) has established that bees have the potential to mediate the escape of transgenes (genetically engineered material) from crops to their wild relatives over several kilometres.

The findings, which were published in the Proceedings of the National Academy of Sciences of 9th September, bear significant implications for the introduction of genetically modified crops in Africa and elsewhere.

Isolation by distance may not be feasible. (Whoever thought it would?)

The research, which was partly funded by USAID and the Rockefeller Foundation, was triggered by the planned release of insect-resistant genetically engineered cowpea in Africa, where cowpea’s wild relative, Vigna unguiculata var. spontanea, is widely distributed. For the first time with insect pollinators, the scientists used radio tracking to determine the movements of the carpenter bee Xylocopa flavorufa and their implications for long-distance pollen flow.

“Bees can visit flowers as far as six kilometres away from their nest. From complete flight records in which bees visited wild and domesticated plant populations, we concluded that bees can mediate gene flow, and potentially allow transgenes to escape over several kilometres,” explains icipe scientist Remy S. Pasquet.

He adds that for genetically engineered cowpea in Africa, these results indicate that although pollen movement beyond a few hundred meters has a low probability, strict isolation by distance may not be feasible.

This research therefore confirms the widely held hypothesis that deploying genetically engineered cowpea in sub-Saharan Africa may mean that an escape of the transgene to the wild cowpea relative is inevitable.

Adapted from materials provided by ICIPE -- African Insect Science for Food and Health

Food and Pheromones
Scientists from Queen Mary College, University of London have found that bumblebees choose whether to search for food according to how well stocked their larders are.

"Just checking the larder"

When bumblebees return to the nest from a successful foraging mission, they produce a pheromone which encourages their nest mates to also go out and find food. Scientists had originally thought that these pheromones elicited a standard response from all bees. But new research from Queen Mary's School of Biological and Chemical Sciences has shown that bees' response to the pheromone changes according to their situation.

Drs Mathieu Molet and Nigel Raine of the college have shown that worker bees are much more likely to respond to the pheromone and leave the nest in search of food, if the colony has little or no food reserves left.

They found that it was a likely scenario that as flying around all day to find nectar and pollen from flowers is hard work, it makes sense that bees are more likely to respond to the pheromone when honey reserves are low.

Writing in the journal Behavioral Ecology and Sociobiology, the Natural Environment Research Council funded team explain how they used radio-frequency identification (RFID) to automatically record the activity of bees in the lab.

Different colonies of bumblebees (Bombus terrestris) were stocked with different levels of food reserves (honeypots). Artificial foraging pheromones were applied to the bees, and they were monitored over 16,000 'foraging bouts'. The response to the pheromones was stronger in colonies with less food - with more worker bees becoming active, and more foraging bouts being performed. The team's findings suggest that the pheromone can modulate a bumblebee's foraging activity - preventing needless energy expenditure and exposure to risk when food stores are already high. This discovery could have a very practical outcome for growers. In future, such artificial pheromones could also be used to increase the effectiveness of bumblebee colonies pollinating commercial crops, such as tomatoes.

This article was adapted from materials provided by Queen Mary College, University of London.

Honey bees can learn to count – up to four!
An Australian and a Swedish researcher say they have proved honey bees are more intelligent than previously thought and not only can they communicate using a highly developed language but they can also count.

A researcher from the University of Queensland put five markers inside a tunnel and placed nectar in one of them, Australian Broadcasting Corporation (ABC) radio reported.

Honey bees placed in the tunnel flew to the marker with the food, and would still fly to the same marker stripe when the food was removed.

"We find that if you train them to the third stripe, they will look subsequently in the third stripe," researcher Mandyam Srinivasan said.

"If you train them to the fourth stripe, they will look the fourth stripe and so on. But their ability to count seems to go only up to four. They can't count beyond four.

"The more we look at these creatures that have a brain the size of a sesame seed, the more astonished we are. They really have a lot of the capacities that we so-called higher human beings possess."

The research was carried out jointly with Swedish researcher Marie Dacke.

Four bees. Any more could prove a problem!

Another Bee Disease Mystery
Despite or current advanced level of understanding regarding bees and bee diseases, it is still evident that we still have a lot to learn and this has been shown by the current problems with bees, especially in the USA. However, some recent very interesting research has indicated that scientists are one step closer to understanding the recent demise of billions of honey bees after making an important discovery about the transmission of a common bee virus. Deformed wing virus (DWV) is passed between adult bees and to their developing brood by a parasitic mite

called Varroa destructor when it feeds. But as usual, any new piece of research sparks off more questions than it has answered and this is just the case here because research published in the July 2008 issue of the Journal of General Virology suggests that the virus does not replicate in Varroa, highlighting the need for further investigation.

How does Varroa Transmit the Virus?

Deformed wing virus has been linked to the collapse of honey bee colonies in Britain. In recent years the prevalence of the virus has increased globally in colonies infested with Varroa. It is widely accepted that the virus replicates in the mite and is then transmitted to bees when it bites. However, researchers at Rothamsted Research and the University of Nottingham have found that the virus does not replicate in the mite, suggesting an alternative means of transmission.

"Experiments and field observations have shown that V. destructor is able to transmit several different unrelated honey bee viruses, like acute bee paralysis virus and Kashmir bee virus as well as deformed wing virus," said Professor Teresa Santillan-Galicia from Rothamsted Research. "But we still don't know exactly how these viruses are passed from the mite to the bee."

The researchers wanted to find out whether the virus replicates in the mite and if so where this occurs, to understand how the virus is transmitted. They used a process called immunohistochemistry which involves using antibodies which bind to specific surface proteins, enabling the virus particles to be located. There was no evidence of virus replication within the cells of the mite; the virus was found only in the lumen of the gut, suggesting it was merely eaten.
"The presence of deformed wing virus in large amounts in mite faeces suggests it is picked up during feeding on an infected bee," said Professor Santillan-Galicia. "However, one important question remains -- how is the virus transmitted to bees?"

One possibility is that the mouthparts of the mite could become contaminated with the virus during feeding, but this is an unlikely answer. Varroa mites cannot regurgitate their gut contents as there is a membrane in the oesophagus that acts as a non-return valve, so they could not pass the virus on this way either. Unfortunately, not enough is known about the anatomy of the mite, or their feeding mechanism, to suggest other routes of transmission.

"It is likely that the amount of virus acquired by the mite plays an important role in the interaction between deformed wing virus and the Varroa mite," said Professor Santillan-Galicia. "Full understanding of the interaction between deformed wing virus and the Varroa mite will provide basic information for the future development of more sustainable control strategies against the mite and the virus. Our work provides elements of understanding but further research in this area is needed."

The Guidance of 'Streaker Bees'

It's one of the hallmarks of spring: a swarm of bees on the move. But how a swarm locates a new nest site when less than 5% of the community know the way remains a mystery. Curious to find out how swarms cooperate and are guided to their new homes, Tom Seeley, a neurobiologist from Cornell University, and engineers Kevin Schultz and Kevin Passino from The Ohio State University teamed up to find out how swarms are guided to their new home.

The two theories

There are two most likely theories on how swarms find the way.

- In the 'subtle guide' theory, a small number of scout bees, which had been involved in selecting the new nest site, guide the swarm by flying unobtrusively in its midst; near neighbours adjust their flight path to avoid colliding with the guides while more distant insects align themselves to the guides' general direction.
- In the 'streaker bee' hypothesis, bees follow a few conspicuous guides that fly through the top half of the swarm at high speed.

Seeley already had still photographs of the streaks left by high-speed bees flying through a swarm's upper layers, but what Seeley needed was movie footage of a swarm on the move to see if the swarm was following high-velocity streakers or being unobtrusively directed by guides. The researchers decided to film swarming bees with high-definition movie cameras to find out how they were directed to their final destination.

An apparently aimless bee swarm! But are they?

But filming diffuse swarms spread along a 12·m length with each individual on her own apparently random course is easier said than done. For a start you have to locate your camera somewhere along the swarm's flight path, which is impossible to predict in most environments. The team overcame this problem by relocating to Appledore Island, which has virtually no high vegetation for swarms to settle on. By transporting large colonies of bees, complete with queen, to the island, the team could get the insects to swarm from a stake to the only available nesting site; a comfortable nesting box. Situating the camera on the most direct route between the two sites, the team successfully filmed several swarms' chaotic progress at high resolution.

Following the filming, the scientists analysed over 3500 frames from a swarm fly-by to build up a picture of the insects' flight directions and vertical position. After months of bee-clicking, Schultz was able to find patterns in the insects' progress. For example, bees in the top of the swarm tended to fly faster and generally aimed towards the nest, with bees concentrated in the middle third of the top layer showing the strongest preference to head towards the nest.

The scientists were surprised at how random the bees' trajectories were in the bottom half of the swarm, 'they were going in every direction,' he says, but the bees that were flying towards the new nest generally flew faster than bees that were heading in other directions; they appeared to latch onto the high-speed streakers. All of which suggests that the swarm was following high-speed streaker bees to their new location.

Social Behaviour in Some Bees Encouraged by Parasites The development of sociality in bees has long been one of the most studied aspects of these fascinating creatures and the honey bee is probably the most studied of all, but there are thousands of other bee species out there all showing different degrees of sociality and in a fascinating piece of research, scientists have found that in at least one case, parasites may actually be helping in this. A tiny parasitic fly is affecting the social behavior of a nocturnal bee, helping to determine which individuals become queens and which become workers.

Megalopta genalis

A fly of the Chloropidae family

The finding by researchers from the University of Washington and the Smithsonian Tropical Research Institute is the first documented example of a parasite having a positive affect on the social behavior of its host. This is accomplished by cleptoparasitism – in this case fly larvae stealing food from the developing immature bees. The researchers found that smaller bees that emerge in a nest are dominated by their mothers. These small bees are more likely to stay and act as helping workers, while larger bees tend to depart and start new nests as egg-laying queens. Bees that emerge from cells, or brood chambers, that also house flies are smaller than their nest mates from fly-free cells. The flies may encourage worker behavior in some bees.

"We often think of parasitism in terms of it affecting an animal's fitness, its survival or its ability to reproduce," said Sean O'Donnell, a UW associate professor of psychology and co-author of the paper appearing in the current issue of the Journal of Insect Behavior. "Here the parasite is not living inside another animal, but is still stealing resources from the host.

"We think these fly parasites are not affecting the lifespan of the bees, and the bees' mothers benefit by having a helper, or worker, stay around to protect the nest, increasing survivability."

O'Donnell and his colleagues studied two closely related tropical social bees, Megalopta genalis and Megalopta ecuadoria, and a family of very small parasitic flies called Chloropidae.

The bees are important pollinators of night-blooming plants and the female bees can nest alone or live in small colonies. A colony is typically made up of two to four individuals – a queen and her offspring.

Behavioral observations showed that non-reproductive foragers and guards are significantly smaller than the queen bee in a nest, although the relative size of individual bees varied from nest to nest. This is where the flies apparently fit in and are affecting the bees' behavior. The bees nest in hollowed twigs and sticks and the flies flick their eggs into the entrance to the bee nests. Some of these eggs randomly fall into cells, or chambers, prepared by the bees, each to hold a larva and pollen that the larva eats. The cells are then sealed, so if a cell does contain fly eggs the young flies are competing with the bee larva for a limited amount of food.

There is a natural size variation in bees and this is based in part on the amount of food available in the cell. A fly or flies in a cell reducing the amount of food could be a potentially important factor. It seems that the more flies in a cell the smaller the bee is. The key here is relative body size compared to nest mates. The larger individuals become queens because they are not dominated.

The researchers were able to culture the bees and flies from individual cells and counted as many as 15 of the tiny flies in a single cell. Some cells did not contain flies.

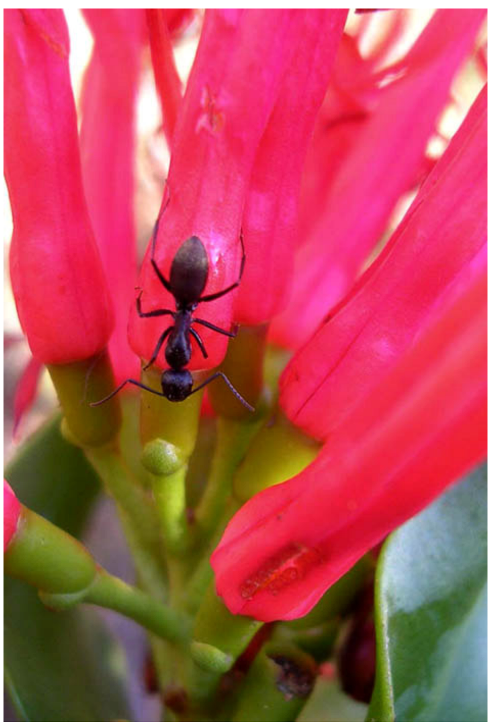
"This study is a counterintuitive take on parasitic infection. It encourages us to look for complicated ecological relationships between different species. Parasitism may encourage sociality in some situations. Here it is promoting social behavior.

Adapted from materials provided by University of Washington.

How Plants Control their Pollinators

Have you ever wondered how plants control who and what comes to take their nectar or how they prevent pollinators from just stealing the nectar without helping in the pollination process? Well millions of years of evolution have enabled plants to sort this problem out and scientists from the Max Planck Institute for Chemical Ecology in Jena, Germany have discovered just how they manage it. This piece of research is fairly long and complex but stick with it because yet again nature is shown off to its best.

Obviously, animals "personally" bring their gametes together seeking out sexual partners, mating, fertilizing, and reproducing. Plants, however, are sessile organisms and require the help of a third party, the pollinator, which can be a bird, mouse or insect that transport pollen to receptive stigmas frequently over large distances.



The colours and shapes of flowers as well as their volatile signals and nectar attract and reward the pollinators for their efforts. But not all flower visitors are pollinators, as many come only to steal nectar without transporting pollen or eat

The research scientists have discovered that the chemistry of floral scents and nectar enforces good pollinator behaviour and allows plants to optimize their ability to exchange gametes with each other. In a paper published in the journal Science, the scientists report the results from field experiments with genetically modified wild tobacco plants that show that particular components of the floral fragrance attracted pollinators, while bitter-tasting and poisonous components of floral nectar enforced modest drinking behaviour.

Apart from sugars, the floral nectar of tobacco also contains nicotine, which is bitter and used to deter nectar thieves or herbivores. But given the right timing and dose, nicotine in the nectar and the attractant, benzyl acetone, released at night as part of the floral scent, ensure that the visits of pollinators such as hummingbirds and hawk moths optimize the tobacco plant's ability to exchange gametes and produce out crossed seeds. Prior to these field tests, the researchers showed that the amount of nicotine in the floral nectar of wild tobacco influenced pollination by the tobacco hornworm Manduca sexta and two hummingbird species.

To understand the floral biochemistry and plants' ecological interactions with their mobile visitors, the researchers generated four different lines of genetically modified wild tobacco (Nicotiana attenuata). Apart from control plants that had received only a blind copy of the transgenic DNA fragment, transgenic lines were created (by means of RNA interference) that were unable to produce either **nicotine** or **benzyl acetone**; the latter has a sweet odour we know from cocoa beans and is similar to the smell of jasmine and strawberry. A fourth line of transgenic plants could produce neither nicotine nor benzyl acetone.

After a series of control experiments in the field showed that the genetic modifications per se did not influence growth, flower formation, nectar production, or the frequency of outcrossing, the scientists ran a series of three tests:

First, measurements of floral nectar showed that its volume was only half the size in transgenic plants which were impaired in nicotine production, compared to control plants and the lines that could not produce benzyl acetone as an attractant.

Conclusion: Floral visitors are principally attracted by the scent, and they drink more nectar if it doesn't taste bitter. Using video cameras, the researchers confirmed this result: Both attractant-deficient lines were rarely visited by hummingbirds (e.g. Archilochus alexandri) and white-lined sphinx moths (Hyles lineata). When visitors took nectar from flowers which contained a natural amount of deterring nicotine, they stayed for a short time only, while they enjoyed the nicotine-free nectar of corresponding transgenic lines. Consequently, these flowers were visited for longer periods, especially by hummingbirds.

However, such observations do not prove that different visiting behaviours affect outcrossing and reproduction among plants. Therefore, two further analyses were performed, one focused on female fitness (production rate of seeds in the ovary), the other on male fitness (successful pollination of neighbouring plants).

To determine female fitness, the flowers of the four transgenic plant lines were emasculated by removing the anthers. This enabled the researchers to measure only animal-mediated fertilization success rates, because self-pollination was prevented – a method utilized by plant breeders. It could be shown that only the control plants were normally cross-pollinated by pollen of the surrounding wild-grown tobacco plants, whereas the transgenic nicotine- and benzyl acetone-deficient lines could only produce less than half of the seeds. The scientists measured the male fitness of the four transgenic lines by emasculating flowers of plants and subsequently determining the origin of pollen which had fertilized their seeds with DNA probes. This paternity test allowed scientists to identify which of the transgenic plant lines were most successful at passing their pollen along to neighbouring plants. Here it could also be shown that the control plants producing natural amounts of nicotine and benzyl acetone were the most potent ones; the big losers (almost five times less of cross-fertilized seeds) were the plants that produced neither nicotine nor benzyl acetone.

Interestingly, during the growing season, the male fertilization success switched from the attractant (benzyl acetone)-deficient to the nicotine-deficient plants. In other words, the influence of nicotine in the nectar on successful pollinator-mediated fertilization of tobacco plants decreased continuously, whereas the attractant became more and more important. These measurements were confirmed by video recordings which showed that early in the year, when hummingbirds visit tobacco, nicotine in the nectar causes them to drink less of the bitter nectar, and in turn visit other flowers, thus increasing pollen transfer. Later in the year, moths visit frequently, attracted by the odour of benzyl acetone. The bitter taste of the nectar doesn't seem to bother them.

The leader of the studies, Ian Baldwin, notes that just as the manufacturers of soft drinks protect their formulas and strive for constancy in order not to lose market share, altering their recipes only in response to the dictates of global sales, so plants evolve and incorporate ingredients into their nectar recipes in response to the dictates of their Darwinian fitness. "Nectar, which was thought to be nature's soft drink, may not be so soft after all," Baldwin says. Unlike animals, plants are sessile, and through chemistry, flowers can optimize visitors' behaviour.

The scientists also observed that nicotine in the nectar deters flower-eating insects which have a straightforward negative impact on reproduction. Odorant attractants lure not only pollinators but also herbivores. Tobacco plants seem to solve this dilemma by using nicotine as a deterrent.

The *Max Planck Institute for Chemical Ecology* was founded by the Max Planck Society in March 1996. The Thuringian town of Jena was selected because it is home to the Friedrich-Schiller-University and many other research centres, making it an attractive scientific location. The establisment of the new institute building on the Beutenberg Campus with immediate proximity to other biological and chemical institutes offers excellent potential for scientific co-operations and the establishment of networks.

The institute attracts researchers from all over the world. At the moment it hosts scientists from 24 different countries. Besides the five directors who are heads of the departments, more than 70 scientists and 50 PhD and graduate students do their research work here.

An important task of the institute is training young researchers in modern techniques of chemical ecology. We have established a special graduate program, the **International Max Planck Research School,** that offers the possibility for highly qualified young researchers to conduct their research in an international atmosphere.

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On the Breeding of Bees, and of the Drone

This writing is taken from Sir John Moore in 1707 and shows the then confusion surrounding the propagation of the species. It could also have confused many youngsters if they had been told this when learning about the birds and the bees!

There is a great contest among philosophical bee masters how bees are generated: some are of the opinion that they never generate, but receive and bring home their seed from flowers; others say that they have amongst 'em both sexes, yet do not agree which are the males and which the females.

The drone is a gross stingless bee. That spendeth his time in idleness; yet there is such a necessary use of him that without him the bee cannot be: it is the opinion of some that he is made of a honey bee, which is even as likely as that of a dwarf, having his guts pulled out should become a giant. The truth is, the drone is the same species with the honey bee but of a different sex and by whose masculine virtue and natural heat the honey bee secretly conceiveth and beginneth their breeding at the *sun's entrance into Pisces when they first gather on the flowers; but their chief time is Aires, Taurus and Gemini, which months yield ambrosia in great plenty and virtue. The bees will be sure to serve themselves first, their first generation being always female.*

RECIPIES OF THE MONTH Back to top

This month we bring you two delicious and very easy recipes which although simple and quick, will amaze your friend – and your dogs! The first is for humans and the second is for your dogs although I don't really see why humans shouldn't eat them as well.

Honey & Gorgonzola Mushrooms

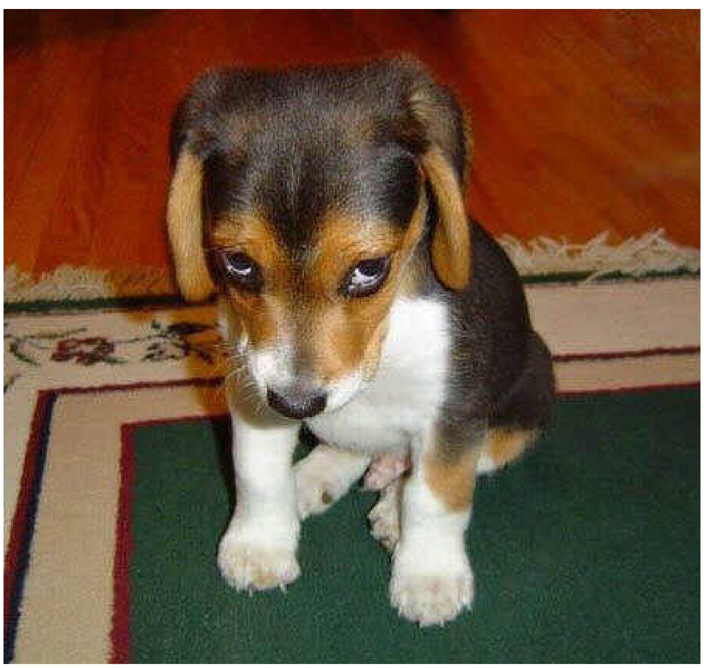
Grease an ovenproof pan and preheat oven to 180C.

Remove the stalks of the mushrooms. Brush a little honey onto the gills of the mushrooms.

Crumble the cheese and place on top of the mushrooms.

Place into the oven a bake for 15- 20 minutes or until the cheese is melted and the mushrooms cooked.

And one for the Dogs (Obviously American as no one else would give these to dogs and also obvious from the use of cups as a measure)



Peanut Butter & Honey Biscuits

This recipe was sent to me as a web site by a friend. The website is: http://www.agirlandherdogs.com/19/recipes-1-peanut-butter-honey-biscuits-and-2-cranberry-pumpkin-treats/

A Girl and her Dogs – A tale of many tails.

If you try it out I'm sure the author would love to hear from you. Take a look at the site anyway. For pet lovers it's great fun!

3/4 cup of flour (wheat or white - I used wheat)

1 egg (or1/4 cup of Eggbeaters)

1 tbs honey (or molasses)

1 tsp of creamy peanut butter

1/4 cup of shortening

1 tsp of baking soda

1/4 teaspoon sea salt

1/4 cup rolled oats (wheat or regular - preferably quick cook)

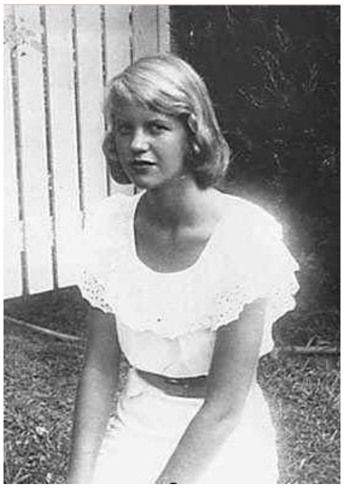
1/2 tsp vanilla

Heat honey & peanut butter until runny (about 20 seconds in the microwave). Mix all ingredients together and drop by the spoonful onto a lightly greased cookie sheet (or roll with rolling pin between 2 sheets of floured and/or greased wax paper and then cut into cookie shapes) and bake at 350 degrees F for 8 t0 10 minutes. The writer says it should make 40 - 50 small biscuits, but she had to double it to get that many. But these were their favorites! She goes on to say "Also, I added about a 1/4 cup of Reese's peanut butter chips to the mix and it came out great! I even melted some peanut butter, table cream and honey together and made a coating to spread on top (and then I added sprinkles!)"

POEM OF THE MONTH Back to top

For our poem this month we return to the amazing Sylvia Plath whose powerful writings astonished the literary world before her death by suicide in 1963.

The Arrival of the Bee Box



By Sylvia Plath 1932 - 1963

I ordered this, clean wood box
Square as a chair and almost too heavy to lift.
I would say it was the coffin of a midget
Or a square baby
Were there not such a din in it.

The box is locked, it is dangerous.
I have to live with it overnight
And I can't keep away from it.
There are no windows, so I can't see what is in there.
There is only a little grid, no exit.

I put my eye to the grid.
It is dark, dark,
With the swarmy feeling of African hands
Minute and shrunk for export,
Black on black, angrily clambering.

How can I let them out?
It is the noise that appalls me most of all,
The unintelligible syllables.
It is like a Roman mob,
Small, taken one by one, but my god, together!

I lay my ear to furious Latin.
I am not a Caesar.
I have simply ordered a box of maniacs.
They can be sent back.
They can die, I need feed them nothing, I am the owner.

I wonder how hungry they are.
I wonder if they would forget me
If I just undid the locks and stood back and turned into a tree.
There is the laburnum, its blond colonnades,
And the petticoats of the cherry.

They might ignore me immediately
In my moon suit and funeral veil.
I am no source of honey
So why should they turn on me?
Tomorrow I will be sweet God, I will set them free.

The box is only temporary.

Sylvia Plath
Sylvia Plath was an American writer whose best-known poems are noted for their personal imagery and intense focus. Sylvia Plath was born in Boston. Her father was a professor of biology at Boston University, and had specialized in bees. Plath wrote only two books before her suicide at the age of 31. Her posthumous ARIEL (1965) astonished the literary world with its power, and has become one of the best-selling volumes of poetry published in England and America in the 20th century. Plath was married to the English poet Ted Hughes whom she met whilst on a scholarship at Cambridge University. In one of her final poems she wrote*: ''Dying / is an art, like everything else. / I do it exceptionally well.''* (from 'Lady Lazarus'). Sylvia Plath died in London on February 11, 1963; she committed suicide. Her gravestone is in Yorkshire.

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Hello David,
I've been searching Google more lately as I've just had a website on preventing wasp stings launched & so what a surprise to see in your obituary about a lovely man by the surname of Anderson - to see mention of my Dad's hive barrow. Well - I just thought I must write immediately & not put this onto a list of "must do" that never happens.

I don't have any bees at present - a matter of some sadness - which must be put right maybe next spring. But I have my dad's hive tool & smoker & clothes.......& some of his honey still - in Freezer & jar - though he has been dead now 6 years.

The wasp site is www.waspsite.info

I'd so appreciate your comments on the website, or my Dad's barrow & if you feel the website is good - to get commentary from people who would know of my Dad.

Very best wishes, Sue McBean

QUOTE OF THE MONTH Back to top
Which well known character said this:

'A **bee** is never as busy as it seems; it's just that it can't buzz any slower."

DATES FOR YOUR DIARY Back to top

21/11/2008
Strengthening livelihoods by means of beekeeping - An introduction
Interested in beekeeping as a means to reduce poverty in developing countries?
Looking to find out more?

Join our One Day Training Programme on Friday 21 November 2008 at Wyastone, near Monmouth, Wales
The Day will be of relevance to individuals and NGO staff

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Bees for Development Safari Dates
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