Bees: man's best friend, provider and protector

Move over, Rover - this is the age of the sniffer bee. Reese Halter reports on a marvel of nature that has a crucial part to play in our diet, health and security.

Bees have been around for 110 million years or so, but it was only a couple of thousand years ago that we started to grasp their potential for helping humanity Photo: GETTY

By Reese Halter

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For the past few years, the news has been filled with a drumbeat of doom over the fate of the honey bee. Thanks largely to a mysterious phenomenon known as Colony Collapse Disorder (CCD), the number of hives has been falling, with catastrophic implications for the species, and for our agricultural system. England's hives have been vanishing faster than anywhere else in Europe, with more than half dying out over the past 20 years.

So last week's announcement that honey production is booming in the UK, as amateur beekeepers flock to the honey bee's rescue by setting up their own hives, is especially cheering. For the honey bee is not just an essential part of the pollination system: it is a marvel of nature, not to mention one of the most sophisticated creatures on the planet.

Bees have been around for 110 million years or so, but it was only a couple of thousand years ago that we started to grasp their potential for helping humanity. The ancient Mayans were among the first, harnessing the stingless Middle American honey bee for agriculture. Their shamans revered the creatures, believing that each one had a soul.

Later studies have confirmed this intuitive respect for their intelligence. The Nobel laureate Karl von Frisch (1886-1982) dedicated his life to deciphering how honey bees communicate, discovering that by dancing, vertically, in the dark, they signal the exact location of nectar, pollen, water and tree resin, or other important information.

He also found that bees can count to five, and trained them to visit feeding stations at specific periods of the day. Bees, he found, have a memory for time and space, using landmarks such as trees, rock formations or barns to help guide themselves. This system – and the ability to count – is employed when deciding on where to build a new hive. Scouts seek out various options, then propose a vote: 15 is the crucial number for a quorum.

Bees also rely heavily on scent to perform daily activities. A worker bee's head has two antennae loaded with 3,000 sensory organs. Its ability to distinguish more than 170 odours in the wild is vital for smelling nectar, pollen, water, tree resin and pheromones.

It turns out that people and bees share a number of similarities. We both like to dance and to travel; to protect the Queen; and enjoy sugar, caffeine and nicotine. And, of course, we both like flowers. Today, some 20,000 species of bees are recognised pollinators, contributing to the health and wellbeing of the majority of the 235,000 species of flowering plants on the planet. Since one species of Italian honey bee, *Apis mellifera*, was conscripted to pollinate foods, cotton, alfalfa and clover for the beef and dairy industries 150 years ago, it has helped to generate more than £200 billion per year worldwide.

Yet the honey bee's importance goes far beyond agriculture. For example, there's the lucrative, burgeoning business of api-therapy. This field of pharmaceutical science uses the anti-inflammatory properties of melittin and adolapin in bee venom, along with apamin, to improve the nerve transmission, bringing relief to sufferers of multiple sclerosis, rheumatoid arthritis, fibromyalgia, tendonitis and other debilitating autoimmune diseases.

For 15 years, scientists have been training bees to help us in other ways. The work on conditioned reflexes by another Nobel laureate, Ivan Pavlov, has taught bees to respond to more than 60 odours, ranging from methamphetamine to TNT, enriched uranium to tuberculosis. In order to identify a scent, the chemicals are mixed into a sugary liquid that bees are rewarded with, laced with a hit of caffeine. The process is repeated up to five times, at which point the bees associate the smell with the food. Thereafter, when a bee encounters a desirable scent, its reflexes cause it to extend its proboscis or tongue to lap up the nectar – a reflex that scientists are easily able to measure.

Inevitably, this has caught the attention of the security industry. Soon, bees could be deployed in war zones, airports, stations, ports, sports arenas, food service companies and medical offices. The economics certainly make sense: whereas sniffer dogs are accurate about 71 per cent of the time, and require at least

three months' training, honey bees are accurate 98 per cent of the time, and require less than 10 minutes' training. Moreover, they can detect explosives or narcotics in the presence of potentially interfering agents, such as lotions, motor oil or insect repellent. And after a couple days of sniffing duty, they can be returned, unharmed, to the hive.

Such applications would be particularly useful in the fight against terrorism – including the kind of bomb plots uncovered over the past few days. The Baghdad Police College uses 48 German and Belgian Shepherds and Labrador sniffer dogs, each costing £4,000. Sniffer bees would come at a fraction of the cost.

Bees also out-perform most technological solutions. Recently, both Gatwick and Heathrow have installed full-body scanners, at a cost of £100,000 per device. Yet if Abdul Farouk Abdulmutallab, the young Nigerian Muslim who concealed explosives in his underpants in an attempt to blow up a passenger jet, had been full-body-scanned, there would have been only a
50 to 60 per cent chance of detecting those explosives.

With more than 85,000 commercial flights across the globe every day, those are unacceptable odds. A British company, Inscentinel Ltd, has developed an ingenious device that uses bees to sniff out narcotics, home-made fertiliser bombs, plastic explosives and 60 or so other dangerous substances. Three bees are placed inside a shoe box-sized "sniffer box". Air is sucked in via tubes and wafted gently over the bees. If they detect explosives or narcotics they all stick out their tongues, sending an alarm to
the operator.

There are also humanitarian uses for sniffer bees. The Red Cross estimates that between 80 million and 120 million landmines exist in 70 countries, maiming 22,000 people (mostly children) each year. A system devised by the University of Montana counters this by fitting honey bees with miniature microchips. As the bees fly around, the electrostatic charge from their bodies attracts TNT residue, the explosive component from landmines. Once they return to the hive, this can be detected, and a scan of the chip will reveal the appropriate location.

These techniques could also be applied to the health system. Honey bees are already being used as early detectors of lung and skin cancers, diabetes and TB, as well as to monitor fertility cycles and confirm pregnancies. Patients breathe into a glass diagnostic tool; when the trained bees detect any of the diseases or hormones, they move towards the tubes that lead closer to the breath.

Given these benefits, it is tragic that hundreds of billions of honey bees are dying worldwide due to CCD, which many scientists blame on a group of pesticides called neonictinoids. The humble honey bee must be saved at all costs – for what other creature can foil terrorists and drug lords, save us from horrid diseases, and still contribute towards a delicious and nutritious breakfast?

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