Botany

Thieving honeybees offer a glimpse of the evolutionary origins of flowers

Richard Sima

HONEYBEES are championed as valuable pollinators, but sometimes they steal pollen without helping the plant that makes it. Now, a study of pollen theft by honeybees from a type of non-flowering plant is shedding light on why the very first flowers may have evolved.

Honeybees' reputation for diligent pollination is mostly well-deserved, but they aren't universally good for all plants. Tao Wan at the Fairy Lake Botanical Garden in Shenzhen, China, and his colleagues have discovered that, in the tropical rainforests on the Chinese island of Hainan, the Asian honeybee (*Apis cerana*) steals pollen from a plant called *Gnetum luofuense*. The bees keep all the pollen they collect from this plant for themselves, to the detriment of the plants that they take it from.

"We were totally surprised because this phenomenon has never been described before for this species," says Wan.

G. luofuense is a type of gymnosperm, a group of plants that also includes conifers, ginkgos and cycads. While gymnosperms do produce pollen, they don't make flowers or fruits, and most species are pollinated by the wind. Before this study, it wasn't known that honeybees visited *G. luofuense*.

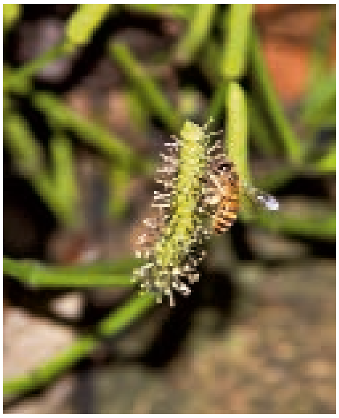
Wan's team found that honeybees frequently visited male *G. luofuense* plants at dusk and dawn to collect pollen. But the bees avoided female plants altogether, meaning that they didn't facilitate any pollination for this species (*Ecology*, doi.org/grzr).

Bees weren't the only visitors to the *G. luofuense* flowers – the team also observed visits from *Mecodina cineracea* moths, which attended both male and female plants, serving as effective pollinators. However, when honeybees were present, the team found that these moths carried 70 per cent less pollen and the plants produced fewer seeds.

These findings provide a glimpse of the time before flowering plants, known as angiosperms, came to dominate, roughly 90 to 125 million years ago. Before angiosperms, gymnosperms were the dominant type of plant life, but only around 1500 species remain today. In comparison, there are more than 350,000 species of angiosperms.

The emergence of new kinds of pollinators, such as bees around 130 million years ago, probably played a role in the origins and subsequent phenomenal success of flowering plants. Wan's team thinks that honeybees could have stolen pollen from now-extinct species of gymnosperms before flowers even existed. This could have disturbed the whole pollination systems of extinct gymnosperms, says Wan.

An Asian honeybee collects pollen from *Gnetum luofuense*



PROFESSOR YAN-BING GONG

Although honeybees also steal angiosperm pollen, flowers may have arisen as a way to better control the behaviour of thieving bees. Showy petals and sweet nectar, for example, can help ensure that a bee will visit female, as well as male, plants.

The team's study also suggests that pollen theft may be a more common problem for the surviving gymnosperm species than previously thought. Bees have also been observed collecting pollen from wind-pollinated conifers, ginkgos and cycads, but it is unknown whether these were pollination visits or acts of larceny.

"If you ask a person in the public to name a pollinator, they will think of honeybees," says Anna Hargreaves at McGill University in Canada. "And honeybees are supercool, but they can have this really negative effect on some plants." ▮

Physics

US lab reaches the cusp of ignition for nuclear fusion

A COLOSSAL laser system has created some of the most extreme conditions on Earth, bringing us one step closer to useful nuclear fusion power that would produce no hazardous waste.

Researchers at Lawrence Livermore National Laboratory's National Ignition Facility (NIF) in California have been attempting to jump-start fusion for decades.

NIF works by focusing 192 of the world's highest-energy lasers into a single powerful beam that shines on a small plastic sphere full of hydrogen. The intense heat makes the plastic explode, compressing the hydrogen inside. If the pressure is high enough, the hydrogen atoms will begin to fuse together, releasing a huge amount of energy.

On 8 August, NIF achieved its highest energy yield yet, putting out more than 1.3 megajoules of energy. That is 10 quadrillion watts of fusion power for 100 trillionths of a second. "That, in reality, is what it takes to boil a kettle," Jeremy Chittenden at Imperial College London told the New Scientist Weekly podcast. "So the amount of energy we would need to generate a power station would need to be hundreds or even thousands of times larger from every pulse."

Nevertheless, this yield is an improvement by a factor of eight over experiments conducted earlier this year, and puts NIF on the cusp of sparking fusion, the team said in a press release.

"What we're trying to achieve is a plasma state very much similar to the centre of the sun"

"It's literally held together for as long as it takes to explode," said Chittenden. "What we're trying to achieve is a plasma state very much similar to the centre of the sun… and we can't hold that pressure together for very long." The pressure of the hydrogen was orders of magnitude higher than what has previously been achieved in any lab, he said.

Not only is this a step towards clean nuclear power, it could also lead to experiments that help us understand the most extreme locations in the cosmos and the seconds after the big bang. ▮

Leah Crane