

Chiropterophily

The highlight of the National Bat Conference for **Jude Hirstwood** was a talk on how plants had evolved to make them more attractive to echolocating bats

You may remember from school that plants have ways of attracting insects to pollinate them. Some produce wonderful scents, others are brightly coloured and some have additional markings to guide the plant to where the nectar is these are often only visible in the ultra violet range of the spectrum which bees (and bats) can detect. Some even go as far as mimicking female insects so that male insects will copulate with the flower and get pollinated along the way.

Ophrys apifera (Bee Orchid) –



Moth pollinated flowers tend to be white so they show up better in the dark or produce strong scents.

But has it ever occurred to you if the plants that are pollinated by bats have mechanisms to attract them?

There are over a thousand species of bat which pollinate flowers and it is now being realized that plants have evolved specialized mechanisms to attract them.

Nectar feeding bats are usually slow flying and can be as manoeuvrable as a humming bird, hovering as they remove the nectar from the flower.

Bats are active at night, so the scent ploy will work. Studies have shown that bat pollinated flowers have sulphur containing scents. Flowers are usually dull white, green or purple (though bats do not see in colour) which bats are attracted to, and remain closed during the day.

Many are inflorescences (i.e. there a number of flowers on the same stalk) Bats have good spatial memories and can remember the location of a flower and return over several days.

In some cases when an individual flower is complete it changes its shape so the bat does not waste time visiting a fertilized flower

The flowers produce large quantities of dilute nectar



which encourages bats to return for more.

But is there more a flower can do? Well yes, now you ask... The microbats, unlike the megabats, use echolocation to find their way into the search out flowers in the cluttered environment which is your average tropical forest. Though plants have evolved mechanisms to place them where they are easily found – on the ends of stems, underneath stems, at the top of the canopy or flowering when there are few leaves on the plant. Bat-pollinated cacti produce flowers at their top and delay the production of spines in this region until after pollination has occurred.

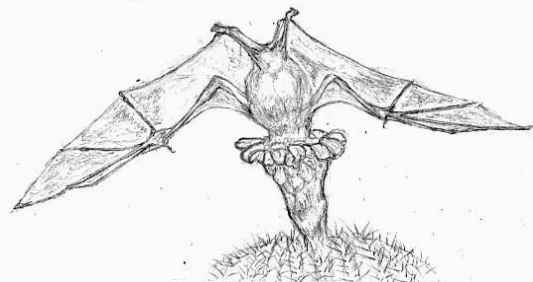


Illustration from www.batplants.co.uk

Dagmar and Otto von Helversen discovered that the Central American vine *Mucuna* attracts bats by using its flower petals like tiny satellite dishes to bounce the animals' sonar signals back at them. The vine is believed to be the first plant species found to do this. Researchers found that each blossom of the *Mucuna* vine contains a special petal with a concave acoustical "mirror".



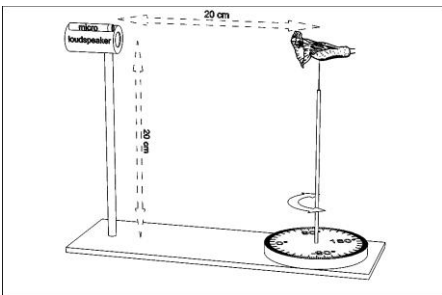
Mucuna The Common long-tongued bat (*Glossophaga commissarisi*) is a pollinator of *Mucuna gigantea* in the New World Tropics. The petal directs signals back toward any nectar-feeding bat that chirps in its direction. The von Helversens tested their theory by removing the acoustic guide petals from some blossoms and stuffing

others with cotton pads. They found that 20 percent or less of those blossoms were visited by bats, compared with about 75 percent of the untouched flowers.

Other plants help the bats to home in on the nectar by having acoustic versions of honey guides. The flowers are often bell shaped and there are slight differences in the bell's structure *Markia neurantha*



They constructed an artificial bat and measured the echoes received from different angles from the flower.



The strength of the echo from a flower depends on your position relative to it. It is greatest when you are directly in front of it.

But there is more to it than that (ain't it always the way)

The bat hears a slightly different echolocation echo at a slightly different time in each ear and can use this to calculate its relative position (This is known in the trade as binaural echo disparity.)

At which point my minimal grasp of physics lets me down so I can't go into more detail. However I will put links to the relevant papers on the website for those with greater expertise. At this point in the lecture my brain was stretched to the limit and though I probably understood it for as long as a second, as soon as I moved my head, all I was left with was a realisation that it was a wonderful mechanism which was far too clever for me.

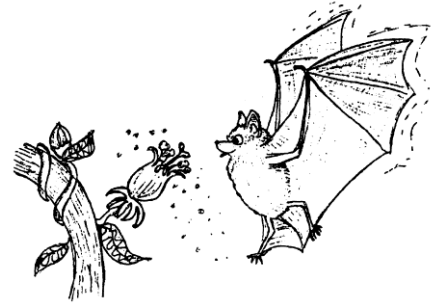


Illustration Joan Childs

In researching this article I found some lovely photos of bats pollinating flowers, but they won't reproduce in black and white. But do please check them out in Chiroptivia 3 on the website

Recap Corner



You met this chap in an earlier edition of the newsletter, but some things are worth repeating

The nectar bat *Anoura fistulata* was discovered in the cloud forests of the Andes of Ecuador, where it lives with two other glossophagines, *A. caudifer* and *A. geoffroyi*. They have exceptionally long tongues. *A. fistulata* has a tongue which is 150% of its body length (This relative tongue protrusion is greater than that seen in any other mammal, and is second only to the chameleon among the vertebrates and an ingenious way of storing their tongue when it's not in use. (*Nature* Vol 447 Dec 2006)