

Tools and their use

We looked at some animals, like the weaver birds - and their use of built-in tools to perform some remarkably complex tasks, which even humans would find a challenge. Animals perform their complex operations by instinct, that is to say the operations are programmed into the DNA, so a barn swallow cannot be trained to build a nest with grass. But people, like tradesmen - whether carpenter, plumber or electrician must be taught the principles of their craft and then be trained in the application of it in some form of apprenticeship. In the use of tools there lies a wide chasm between man and the animals, with not one species to be found - alive or dead - in between.

Insects make good use of their built-in tools for finding a mate and locating food. Bees and butterflies use scent and sight when searching for nectar. While the whine of a mosquito annoys mankind, it is that song which leads the male to find his lady-love. He responds only to the humming frequency given by a female of the same species and will fly in the direction of the sound to mate with her. His special tools are a set of large bushy antennae which vibrate in unison with the female's wing-beats. When one antenna vibrates more strongly than the other, he is programmed to turn towards it until the vibration is equal, and then flies straight ahead to meet up with his girl.

A beetle called a firefly uses quite a different method to find a mate. The female happens to have her own tool, a built-in lamp, surprisingly bright, which she can turn on or off at will - the larvae and adult males produce only a faint glow. Each species of firefly needs its own 'call-signal' to avoid being confused with other species. It may differ from others in the colour or pattern of its light, in the timing of light pulses and whether it displays in flight or after climbing a blade of grass. When ready, she uncovers her lamp and lights it up. The male's eyes are specially sensitive to the greenish glow and flies to find his flightless mate with no difficulty. However, at least one firefly can make the signals of other species work to its advantage. The female *Photuris versicolor* can impersonate the female of another firefly called *Photinus* by mimicking the pattern of flashes that a genuine *Photinus* would use to attract a male. When a hopeful male *Photinus* arrives expecting to find a mate, the female *Photuris* turns on him and eats him!

The male *Euploea*, a tropical forest butterfly, has special tools for bringing a mate to him. He forages on damaged parts of plants for alkaloids which are chemical precursors to produce pheromones. Once a female is in the vicinity the males glide around and with the help of a couple of yellow brush like organs extending out from the tip of the abdomen they disperse the scent in the air. The female has a sensitive organ of smell, and follows the air current to find her suitor.

The *Sirex* woodwasp, a forest pest, has a highly specialized tool for laying its eggs. Females use their saw-like ovipositor (egg-laying tube) to cut holes 12 mm (nearly ½ inch) into the wood of the host tree. Several holes are drilled into the outer sapwood. Up to three eggs are laid per hole through an extremely fine tube inserted into the drilled hole. The spores of a symbiotic white-rot fungus, which are fed on by the larvae, with a toxic mucus, are injected into the sapwood. The fungus and the mucus act together to kill the tree and create a suitable environment for developing larvae.

Each of these built-in insect tools are part of complex systems which include fine-tuned sound recognition, colour and time-pulse identification and symbiosis with a specific fungus.