Wicked deceptions

By Suzanne Curry

In ancient times,
Greek philosopher Aristotle
claimed that humans
are the best mimics
in all the animal world.
But other animals
can be powerful mimics,
and plants have
powers of imitation too...

Suzanne Curry shows us
how subtle and sometimes
deadly they can be.

The gregarious myna bird is one of the best-known examples of a creature with remarkable imitative ability: the power to mimic the calls of animals, other birds, and humans. Mimicry, however, is much more than this.

Generally, it is defined as the close external resemblance, as if from imitation or simulation, of an animal or plant to some different animal, plant or surrounding object, especially to serve as protection or concealment. Mimicry is essentially deception by trickery.

Although there are several forms of mimicry - and many scientists believe that Western Australian flora and fauna provide numerous examples - they fall within three commonly recognized headings.

Top left:
A male specimen of the native bee (*Leioproctus pappus*). One can easily imagine how they would 'disappear' when stationary on a smokebush.
Photo - T.F. Houston

Top right:
Flowering branchlet of a smokebush (*Conospermum stoechadis*) showing the 'woolliness' which the native bee mimics.
Photo - T.F. Houston

Albany pitcher plant (*Cephalotus follicularis*) showing the remarkable pitcher leaf, which forms a brightly coloured jug-like structure.
Photo - P. Armstrong ▲

This beautiful pygmy drosera (*Drosera paleacea*) is only 2 cm in diameter. The red glistening tentacles of the modified leaves are enticing traps for small insects.
Photo - A. Lowrie ▲

Previous page:
Caladenia barbarossa is one of the dragon orchids whose flower takes on the appearance of a female flower wasp.
Photo - Babs & Bert Wells

Right top and bottom: ▶
A bee fly alights on the triggerplant (*Stylidium scandens*). The floral column or 'trigger' is activated and stamps the fly with pollen on its upper body.
Photos - J. Lochman

BATESIAN MIMICRY

In 1862, the English naturalist Henry Walter Bates published the results of his observations on the butterflies of the Amazon forests. His important conclusion was that there were brightly coloured, apparently unpalatable butterflies flying together with strikingly similar yet unrelated species of palatable butterflies. This phenomenon of the resemblance of a palatable 'mimic' to an unpalatable 'model' is now known as Batesian mimicry. Essentially, Batesian mimicry takes place when one organism obtains a one-sided advantage by imitating another organism, usually more numerous than itself.

Native bees of the genus *Leioproctus* may demonstrate a variation of Batesian mimicry, in this case of a plant by an animal. Some species of these bees mimic the 'woolliness' of the smokebush (plant genus *Conospermum*). The bees have dense white hairs which obscure their black heads, bodies and legs, whitish compound eyes and whitish wing membranes. The hairs of their antennae closely resemble the dark apices of the floral bracts, leaf-like structures which surround the flowers. When settled on the inflorescences (flowering shoots) of the smokebush the bees become almost invisible. Their ability to mimic the plant provides them with excellent camouflage from predators. They obtain pollen and nectar from *Conospermum* and are not known to visit other genera.

The flowers of the well-known donkey orchids (*Diuris* spp.) bear remarkable similarity to the flowers of the native peas known as lamb poisons (*Isotropis* spp.) that they mimic. Successive visits to the orchid flowers by bees in search of nectar and honey - which the orchid does not produce - results in cross-pollination of the orchid. This pollination mechanism, known as floral mimicry, is also a further example of Batesian mimicry.

Several members of the genus *Caladenia*, better known as dragon orchids, provide extraordinary examples of Batesian mimicry. The flowers are highly modified to look and smell remarkably like flightless female flower wasps. The deceived male wasp alights on the flower in an attempt to fly away with the 'female'. The probing action catapults the male wasp into the pollen-bearing column of the orchid. If the wasp carries pollen from another similar orchid, successful cross-pollination can occur.

Hakea trifurcata is a remarkable species in that it produces three different leaf types: needle-like, three-pronged, and flat and broad. These flattened leaves, which are produced only on mature plants, look remarkably like the fruit. Dr Byron Lamont of Curtin University has suggested that the production of the flattened leaves serves as a protection for the fruit from grain-eating insects such as moths. Female moths damage *Hakea* plants by laying their larvae in the fruit. These moths, which lay at night, become confused between the fruit and the flattened leaves. By having leaves which mimic the fruit, the plant is able to protect a greater number of its fruit from being damaged. It is interesting that these fruit remain green (like the leaves) for an unusually long time. This possible case of Batesian mimicry is rather interesting, as the mimicry is occurring between vegetative and reproductive organs of a single species.

MUELLERIAN MIMICRY

Bates also noticed that occasionally two inedible unrelated butterfly species were amazingly similar in appearance. This resemblance of two species in order to gain protection is based on the idea that the greater the number of individuals that look the same, the lower the losses for each species. This was explained in 1878 by German zoologist Fritz Mueller and has become known as Muellerian mimicry. Generally, Muellerian mimicry occurs when a number of species of similar characters and behaviour and of comparable abundance have evolved to their mutual advantage. The species are both 'mimic' and 'model'.

A few species of triggerplants (*Stylidium* spp.) and the related genus *Levenhookia* provide a possible example of Muellerian mimicry. A common floral shape is used to orientate the insect pollinators to the plant's particular advantage. Dense carpets of ephemeral triggerplants can be found growing in seasonally wet patches. In some carpets, several species, such as *Stylidium ecorne, S. rosea-alatum* and *Levenhookia leptantha,* grow together. These three species have irregular floral parts with two of the four lobes distinctly longer than the others. This asymmetry may serve to orient insect pollinators which visit the flowers for nectar. In these plants, the male and female floral parts are united into a column which carries the pollen-bearing anthers and stigma at its tip. In *Stylidium*, this column is the 'trigger' and is bent down between and below the petals. When the trigger is activated by probing insects, it suddenly jerks up and over to 'stamp' the insect with pollen. It is interesting that the orientation of the trigger varies for each species. Thus the insects passing through the plants will be stamped on different parts of their body by the different species. Perhaps this is an adaptation to minimise interspecific cross-pollination. Because these species mimic each other, they benefit by sharing common pollinators.

PECKHAMIAN OR AGGRESSIVE MIMICRY

Some predators stalk their prey by mimicking an otherwise harmless species, much like a wolf in sheep's clothing. This concept of aggressive mimicry was introduced by E.G. Peckham and has become known as Peckhamian or aggressive mimicry. It differs from the previous categories in that the mimic is the predator.

The Albany pitcher plant, *Cephalotus follicularis* - the only pitcher plant known in Western Australia - seems to provide a good example of aggressive mimicry. It has two kinds of leaves. The conventional leaf is oval shaped, green, fleshy and on a stalk. The pitcher leaf is often brightly coloured with hues of red and purple, forms a jug-like structure and rests on the ground. These 'trap leaves' serve as dummy flowers, bearing flower-like markings and a lid-like flap which has the appearance of a flower. Inside the pitcher, below the glossy rim, is a white, downward-sloping ridge containing numerous nectar glands. This deception attracts ants, insects and beetles which, in their attempt to reach the nectar, fall into the pitcher where they are broken down and absorbed by the plant.

Sundews (*Drosera* spp.) may be another example of aggressive mimicry. The shoots of many sundews, which bear numerous leaves, mimic flowering shoots. The leaves themselves mimic flowers, especially those of the Myrtaceae family (e.g. *Leptospermum* spp., commonly known as tea tree). These leaves are often circular, the leaf blade shining yellowish green like certain nectar-bearing flowers and with fine hairy tentacles tipped with sticky red glands. These tentacles, radiating from the centre, mimic stamens. They are active traps because they move to enfold their prey. The glands at the tips of the tentacles secrete a glistening digestive juice - a wicked deception to the insect pollinators that visit these plants in search of nectar. The insects alight on the leaf and within seconds are enfolded in the sensitive tentacles. Over a period of days the soluble matter of the prey is reduced to a fluid that is absorbed by the plant. It is interesting to note that one group of insects, commonly known as assassin bugs, appear immune to this deception. They are specific to the sundews and their coloration mimics sundew leaves. They provide themselves with food by pirating the prey caught in the leaves.

SUBTLE DECEIVERS

Plants' powers of mimicry appear to equal those of animals, even if less overtly so. One fine example is that which appears between species of *Pimelea* and *Darwinia*. Normally, the flower structures of these two genera are quite dissimilar. Furthermore, whereas *Darwinia* is generally bird-pollinated, *Pimelea* is generally insect-pollinated. However, in the case of *Pimelea physodes* and *Darwinia macrostegia* a striking similarity between the flower heads can be seen. In both, these nodding heads are surrounded by large overlapping bracts which serve to lure pollinating birds to the flowers. These bird-adapted blossoms of *Pimelea physodes* are unique in the genus. What is more, they occur in the general area of the greatest concentration of *Darwinia* species. Taken together, these observations strongly suggest that an unusual form of Batesian mimicry exists.

The study of mimicry gives us important insights into the course of evolution. In particular, it can illustrate the direction evolution has taken. In cases where humans carry out artificial breeding, we can even see something of the way in which mimetic selection occurs. Whether we consider mimicry as a phenomenon in itself, or as a means to deepen our understanding of evolutionary processes, we can but marvel at nature's work. ◘

An assassin bug nymph (*Cyrtopeltis* sp.) feeding on a cranefly. The green body with red spots mimics the *Drosera* perfectly.
Photo - J.C. Taylor ▲▲

Darwinia macrostegia.
Photo - P. Armstrong ▲

Suzanne Curry is a technical officer at CALM's WA Herbarium in Como. She can be contacted on (09) 367 0492.

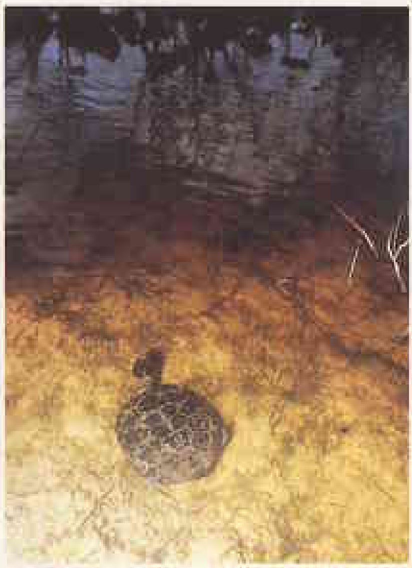
LANDSCOPE

VOLUME SIX NO. 4 - WINTER EDITION 1991

Cloud-capped Bluff Knoll, majestically brooding sentinel of the Stirling Range. Does it hold a secret in its stony heart - perhaps the answer to the missing mammal mystery? See story on page 9.

Mulga and fire - at best an uneasy relationship - sometimes symbiotic, sometimes disastrous. Find out when and where on page 20.

The Kimberley's rugged grandeur is deceptively fragile. Additional reserves managed by CALM help protect the region's delicate, complex and diverse ecosystems. See page 35.



*A western swamp tortoise (*Pseudemydura umbrina*). Could this be one of the last to be photographed? Not if CALM's ten-year recovery plan succeeds. See page 28 for details.*

An uncommon dragon, Caimaniops amphiboluriodes *inhabits mulga shrubs. Many other dragon lizards prefer harsher habitats such as rock-piles and salt lake beds. See page 51.*

FEATURES

REGULARS

COVER

*Central netted dragon (*Ctenophorus inermis*), one of the more than 60 species of dragon lizard that inhabit the arid and semi-arid parts of Australia. The acute eyesight and swiftness of dragon lizards are essential in order to avoid predators and to capture food. See page 51.*

Illustrated by Philippa Nikulinsky

Managing Editor: Ron Kawalilak
Editor: Ray Bailey
Contributing Editors: Verna Costello, David Gough, Tanyia Maxted, Carolyn Thomson
Designers: Sue Marais, Stacey Strickland
Finished art: Sandra Mitchell
Advertising: Estelle de San Miguel ☎ (09) 389 8644 Fax: 389 8296
Illustration: Sandra Mitchell
Colour Separation by Prepress Services
Printed in Western Australia by Lamb Print

Published by Dr S Shea, Executive Director
Department of Conservation and Land Management,
50 Hayman Road, Como, Western Australia 6152.