

INSECTS THAT MIMIC REPTILES

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The phenomenon of mimicry has been marked by controversy ever since its inception, long before the publication in 1858 by Charles Darwin and Alfred Russel Wallace of their joint paper on the theory of evolution by natural selection. As far as reptiles are concerned, the concept of 'mertensian' mimicry among coral snakes has provoked especial disagreement. This hypothesis has been summarized by Wolfgang Wickler (1968) as follows: in the past, herpetologists have sometimes rejected mimicry as an explanation of the conspicuous colouration of coral snakes on the ground that, if a predator were to attack so deadly an adversary, it would almost certainly be killed. According to R. Mertens, however, harmless 'false' coral snakes are typical batesian mimics of the moderately venomous forms, while the deadly elapids are mimics of the same mildly poisonous species. (Batesian mimics are protected from predators because they resemble distinctive species with warning colouration). Since most predatory vertebrates are territorial, and drive rivals away from their feeding places, it would be better for coral snakes to teach them severe lessons so that they were avoided in future, rather than to kill them outright, as the territory would then probably be occupied by another inexperienced enemy. According to Harvey Pough (1988), however, uncertainty about the probability of envenomation of a predator by a snake, and of the toxicity of different snake venoms, preclude complete evaluation of the hypothesis of mertensian mimicry. Indeed, coral snakes may actually be avoided mainly because they are unpalatable. Scavenging birds in Costa Rica, which quickly consume other snakes killed on the roads, apparently leave dead coral snakes undisturbed.

Another topic of disagreement concerns the apparent mimicry of reptiles by insects. For instance, as their name suggests, dragonflies of the genus *Ophiogomphus* resemble snakes: they twist their abdomens over their heads so that they look like miniature cobras. Again, the larvae and occasionally, the pupae of butterflies and moths of the families Papilionidae, Sphingidae, Geometridae, Noctuidae, Oxytenidae and Notodontidae may have snake-like markings and show movements reminiscent of those of snakes. In a recent book, *Predation and Defence amongst Reptiles* (1994), I have cited a number of examples (see Fig. 1). When disturbed, the larva of the South American *Leucorhampha ornatus*, which is normally cryptic and resembles a broken twig, turns over and exhibits its ventral surface. The thoracic segments are simultaneously puffed out laterally to display a pair of dummy 'eyes' so that the whole larva looks like the head and neck of a snake (Fig 1a). Then it begins to sway from side to side, as though about to strike. Vine snakes (*Oxybelis* spp.) are mimicked by third and fourth instar larvae of the Neotropical hawk moth *Hemeroplanes triptolemus* (Fig. 1b), whereas the last instar is said to mimic the pit-viper *Bothrops schlegelii*.

Examples are also to be found among British caterpillars, such as those of the elephant hawk (*Deilephila elpenor*) and the small elephant hawk (*D. porcellus*). These withdraw their head and thorax when disturbed, so that the first abdominal segment, which bears eye-like markings, looks like the head of a snake or lizard (Fig. 1c). Not only larvae, but pupae also may present abstract mimicry of snakes as, for instance, does the chrysalis of the butterfly *Dynastor darius* (Nymphalidae) in Panama (Fig 1d). Snake-mimicking

caterpillars are also found in places where there are no tree-dwelling vipers, or even no vipers at all. Yet such caterpillars appear neither more nor less snake-like than do those of species that live sympatrically with arboreal vipers. Perhaps, therefore, these displays are simply deimatic. (Deimatic, or intimidating behaviour, serves to warn off potential predators. It can be pure bluff or may precede retaliatory behaviour, as when a cobra spreads its hood before striking).

In tropical South American bugs (*Laternaria* spp.) (Fulgoridae) the anterior part of the head is extended into a large hollow structure (Fig. 1e) which bears a marked resemblance to the head of an alligator or caiman. One consideration which prevents this resemblance being accepted as a simple case of batesian mimicry is the enormous disparity in size between the two animals. If the display is purely deimatic, however, then the resemblance must be fortuitous. The same argument applies to the extraordinary resemblance of some butterfly pupae of the genus *Spalgis* to monkeys' faces. One oriental species is said to look like the common macaque of the region, while a related African species bears some similarity to the face of a chimpanzee. It is not inconceivable that, just as a man may recoil in horror from a piece of rope that he mistakes for a snake, so may a bird that gets a fleeting impression of an alligator or of a monkey be startled sufficiently to move away without investigating any further.

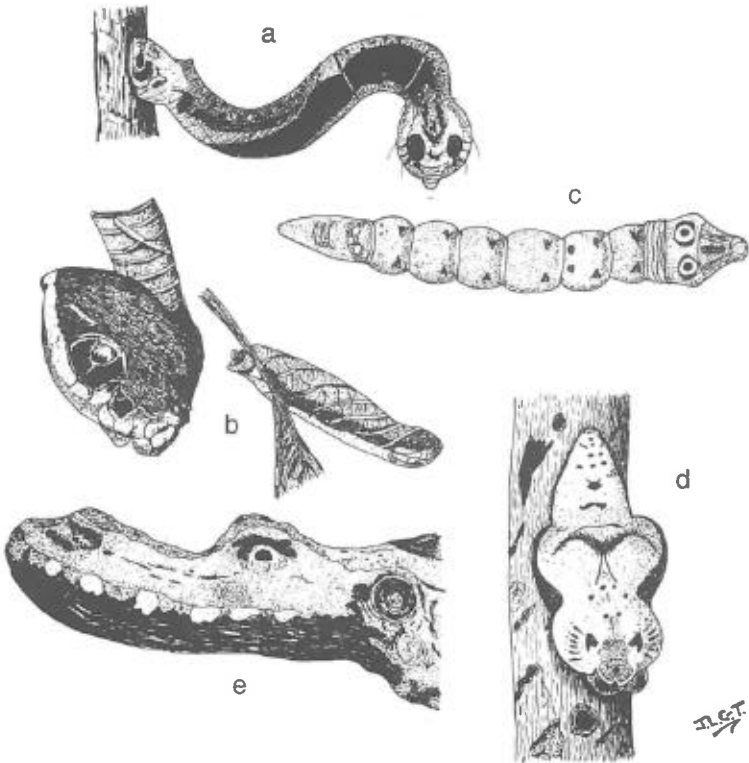


Fig. 1

Insects that display a general resemblance to reptiles. (a) *Leucothampha ornatus* (larva), (b) *Hemeroplanes triptolemus* (larva), (c) *Deilephila porcellus* (larva), (d) *Dynastor darius* (pupa), (e) *Laternaria lucifera* (head). (Not to scale).

(From Cloudsley-Thompson, 1994)

The apparent mimicry of reptiles by birds, insects, and other animals may, in fact, be merely deimatic display. For instance, the hisses of a chameleon, a painted snipe, or a wryneck, could be equally well interpreted either as snake mimicry or in terms of general bluff. A sudden hiss is startling without necessarily making one think of a snake! Both chameleons and kittens distend themselves and hiss savagely in harmless bluff, whereas the rattle of a rattlesnake is a genuine warning. Should the hiss of a grass snake be interpreted as deimatic, as mimicry of the hiss of a viper, or as warning of the evil-smelling defensive fluid that the snake can emit?

On the other hand, the head of a fulgorid bug could also be a case of true mimicry. A high proportion of insect-eating birds hunt by the method of 'rapid peering'. They peer at objects from several different angles in rapid succession because their binocular vision is so narrow as to be of little practical use for judging distance or estimating size. The perception of solidity and distance has, therefore, to be gained by evoking parallex. The apparent distance of a familiar object is determined by the size of its image on the retina of the eye: rapid peering means that, from time to time, a bird will suddenly have a close up frontal view of one of these bugs and mistake it for the head of a caiman. Under such circumstances, it would probably not wait to peer from a different angle to assess the size, but would immediately fly away (Hinton, 1973). Even if the bug is not mistaken for an alligator or caiman, the appearance of a row of formidable teeth, may, in itself, prove to be a deterrent to further investigation. Since other large bugs, such as cicadas, are relished by monkeys as well as by birds, there may have been heavy selection in favour of a crocodilian appearance. Without careful experimentation, it will not be possible to know which hypothesis is correct.

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