

The Story of a Butterfly's Wings

What makes butterflies so fascinating from most people's perspective is the seemingly unlimited variety of colors and patterns they exhibit. The scales on the wings are what produce all of these patterns. Each scale is one single color. There are two types of coloration exhibited in butterfly wings.

- **Pigmented coloration** includes yellows, whites, blacks, browns, oranges, reds, and some greens and are the result of waste products of metabolism or are synthesized from plant pigments.
- **Structural coloration** occurs when the scales have physical structures such as ribs, ridges and valleys and air pockets that break up the color spectrum like a prism and include all iridescent blues, greens, whites, violets, pinks and reds.

The colors and patterns help the insect identify members of its own species and to help protect it from predators.

CAMOUFLAGE

The most ancient method of protecting oneself from predators after fleeing is probably hiding. When an organism is able to blend in with its surroundings or is able to look like another object it is said to exhibit **camouflage**. Caterpillars, chrysalises and adult butterflies all can exhibit examples of camouflage. Caterpillars often mimic twigs, stems or leaf edges. Owl butterfly caterpillars start off green and rest underneath the *Heliconia* leaf they are feeding on. As they grow they get to a stage where they are too big to effectively stay hidden under the leaf and they molt into a mottled brown coloration. At this point their behavior changes and they prefer to rest at the base of their host plant, which happens to be the same color as the caterpillar. One of the most unusual examples of caterpillar camouflage is the swallowtail, a species that mimics bird droppings.

Chrysalises are the masters of camouflage. Many chrysalids mimic broken twigs (swallowtails), even going as far as having jagged edges and lichen-colored areas. Dead or dying leaves are good models as well (owl butterfly). Some chrysalids even have twisted-shaped horns that distort their shape making them look more like dead, dried leaves (red cracker butterfly). Green leaves are abundant and so it is not surprising that there are several butterflies that form a chrysalis that are bright green (monarch).

Adult butterflies most often mimic dead leaves. The most famous examples are the Dead Leaf Butterflies and Leafwings. Some have extensions of the wings that exactly match the petiole (leaf stem) of a leaf and spots that look like blemishes, molds, and chewed holes! The Baby Blue Nymph is well camouflaged against green leaves, as is the Tailed Jay. The cracker butterflies normally rest with the wings out flat and are mottled to look like bark. They increase this camouflage further by resting head down on trunks, which reduces their shadow.

DISRUPTIVE

Some butterflies utilize a technique like that exhibited by zebras. In these species the pattern consists of spots and stripes which breakup the shape of the butterfly. This is termed **disruptive coloration**. A predator is unable to distinguish the body from the wings or determine whether it is actually anything edible or not. Even though these insects are boldly marked they essentially blend into the background. One species exhibiting this wing pattern is the Mosaic Butterfly, which has the habit of landing head down on tree trunks.



EYESPOTS

One of the most often encountered examples of modified color patterns are those that incorporate **eyespot**s as a defense. The owl and morpho butterflies have eyespots on the lower surface of the wings, which act to deter predators. Most animals instinctively avoid staring since this is considered a form of aggression and therefore eyespots can act as a deterrent. In addition, predators such as birds tend to attack the head region of their prey and aim for the eyes. At most the butterfly loses a piece of wing and is able to escape. Other species that habitually leave their wings open have the eyespots on the upper surface of the wings; many of the pansies and buckeyes exhibit this pattern.

STARTLE OR FLASH COLORATION

Startle or flash coloration is utilized by butterflies that normally use camouflage when at rest. For example, the Dead Leaf, is well camouflaged but if a lizard were to accidentally come upon the butterfly a quick flash of bright orange and blue startles the animal long enough for the butterfly to escape. Eyespots can act to startle a predator as well if the predator is not expecting to see them appear while walking across what seems to be just bark or leaves. The Io Moth and Polyphemus Moth (found in the US) use this method.

WARNING

Warning colors include reds, oranges, yellows, whites, blacks and combinations of these colors. Many butterflies have evolved to feed on plants that have noxious or poisonous chemicals incorporated in their leaves and stems. The caterpillars are able to store these chemicals for protection from predators and pass this protection on to the adults. These specially colored insects, like longwings and monarchs, make no attempt to hide and actually advertise their distastefulness by flying slowly and landing out in the open. They do not usually try to escape when caught and their bodies tend to be tougher so that they can survive an attack. Usually the insect tastes bad, which is enough to make most predators spit them out.

MIMICRY

Some beautiful and tasty butterflies happen to look like species that are inedible. This is termed **mimicry** and was discovered in 1869 in the rainforests of Brazil. Henry Bates was a naturalist and an avid collector of beetles. While collecting in the Amazon region he noticed that some species belonging to genera that were considered edible mimicked in pattern and behavior a species that belonged to poisonous genera. **Batesian mimicry** is widespread but is especially abundant in South and Central America. Probably the most well known example of Batesian mimicry is that exhibited by the Viceroy (not poisonous), on the Monarch (poisonous). Another form of mimicry **Mullerian mimicry** describes inedible species of butterflies that are not related but have a similar pattern suggesting they are not edible. The more butterflies that look alike and are poisonous, the easier it is to survive. A predator only has to learn one pattern to avoid.