



## Out of sight...

### ... the stunning transformation of the chrysalis

Living at a pace that is much different from our own, the life of the butterfly is filled with fascinating milestones. Let's take a moment to look at the mysterious chrysalis, for which time seems to stand still. Filled with mystery, it slowly transforms and takes on unexpected shapes. Let's discover its secrets together...

#### The butterfly: A four-part life cycle

- The **egg** – Left by the butterfly on a host plant that it will use as food when it reaches the caterpillar stage
- The **caterpillar** – Stage for gaining energy and moulting several times
- The **chrysalis** – Stage of significant but barely noticeable changes
- The **butterfly** – Adult stage of the life cycle. Its goal is to reproduce

#### From caterpillar to butterfly: A stunning transformation

##### The preparations

At the end of its final stage, the caterpillar stops feeding and empties the contents of its digestive system completely. It then searches for the best place for its transformation, usually underneath a leaf or on a stem, and ideally protected from predators and weather conditions. Once the spot has been chosen, the caterpillar weaves a silk cushion and attaches it to the end of its abdomen. When it is in place, it remains this way until its final moulting—a preparation that can last 2 to 3 days.

##### The big moment

The caterpillar's exoskeleton then cracks along the thoracic segments. After a few contortions, it slides toward the end of the abdomen and the chrysalis is unveiled. At this time, it is soft, fragile and vulnerable, but it quickly hardens. On average, this stage lasts about ten days, but this can vary greatly (from one week to several months) from one species to another, especially when the insect faces seasonal changes.

##### Immobile, but alive and well

When observing a chrysalis, it is hard to believe that it is a living being. Completely immobile, its body is undergoing a complex transformation. Changes in the caterpillar's body had already begun, but now a chrysalis, the metamorphosis accelerates. The flight muscles, digestive system, heart and reproductive system are developing and reorganizing themselves. This metamorphosis is caused and controlled by hormones that activate the development of cells already present in young caterpillars.

##### Leaf or bud?

Depending on the family, the chrysalis adopts different positions: some are suspended, others keep their head out thanks to a silk belt supporting them. In this stage, the insect does not feed nor expel any waste. It continues to breathe through small perforations—stigmata—in the exoskeleton. Parts of the adult butterfly's body in development—such as the wings, eyes, head and abdomen—can often be made out through the chrysalis.



### Surviving to become a butterfly

To go unnoticed, protect itself and survive during its vulnerable stage, the chrysalis comes in a variety of sizes, shapes, textures and colours depending on its species. Some take on a colour or shape reminiscent of an element in nature for better camouflage in the vegetation (green leaf, tree bark, bud). For others, a repulsive aspect (plant debris, bird excrement, pines) or bright, lively colours keep predators at bay.

- **Polymorphism** – Predation is one of the leading causes of death of the chrysalis. To camouflage itself, its appearance and colours enable it to blend into the environment, which varies depending on the light of the seasons and the type of vegetation. In green vegetation, green chrysalis is better, whereas brown chrysalis goes unnoticed in dry vegetation.
- **Sound and movement** – Even though it is fixed in place and cannot move to another location, the chrysalis does move in a surprising way: its sudden movements can stun curious observers! Another fact: The chrysalis of certain species of gossamer-winged butterflies produces a whistling sound when it feels a threat!
- **Toxicity** – Effective against small vertebrates (e.g. birds), this means of defence is relatively widespread among butterflies: if the toxicity comes from the hostess plant from which the caterpillar fed, the chrysalis and butterfly will retain it.
- **Burial** – Certain species hide underground, which also protects them from the winter freeze.
- **Roommates** – Some species of the gossamer-winged butterfly family are protected by ants. In exchange for the honeydew it secretes through specialized glands, the caterpillar transforms into a chrysalis in the ant's nest, where it remains until the butterfly emerges.

### What about the cocoon?

The chrysalis and the cocoon are very different. The cocoon is a silk envelope that sometimes covers the chrysalis. However, it is not always present, as only moth caterpillars weave this envelope around themselves.

- Hawk moths, however, are different: the caterpillar buries itself in the ground at the naked chrysalis stage and remains there until the next stage.
- The Urodids, a moth family from the Amazon, has a spectacular cocoon that looks like a weaved basket with a small funnel opening at the bottom. It is suspended from a silk thread.

### The chrysalis: a universal symbol

In different cultures and religions around the world, the life cycle of the butterfly represents change and rebirth, and the chrysalis stage is crucial. In America, the chrysalis is a symbol of possibility (the potential to go from ugliness to beauty, from submission to freedom) and of new achievements. It is that moment when we internally incorporate the idea of changing—a moment of latency and of incubation of a project before it takes shape. In central Congo, the chrysalis represents death, and the human soul takes flight in the form of a butterfly. In Asia, the chrysalis is synonymous with spiritual transformation. Symbolizing resurrection and the possibilities of being, it is the stage between material state (caterpillar) and celestial life (butterfly).