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[Butterflies Can Evolve New Colors Amazingly Fast](#)



Posted by [Christine Dell'Amore](#) of [National Geographic](#) in [Weird & Wild](#) on August 4, 2014

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Butterflies can evolve new colors rapidly and simply by tweaking the structures of their wings, a new study says.

A team of researchers who bred a species of brown African butterfly in the lab were shocked to discover that the offspring could turn purple in just six generations, or about a year. (See: "[Pictures: Butterfly Wing Colors Imaged in 3-D.](#)")



The butterfly *Bicyclus anynana* before it was bred to turn purple. Photograph courtesy of Antónia Monteiro.

Scientists have long known that butterflies are sensitive to changes in their environment and can evolve new colors if it suits them. But until now, no one knew how the fragile [insects](#) were able to pull this off.

Such a speedy evolution is "amazing," said study co-author [Hui Cao](#), a physicist at Yale University. "Within one year they look purple—I could not believe it, to be honest."

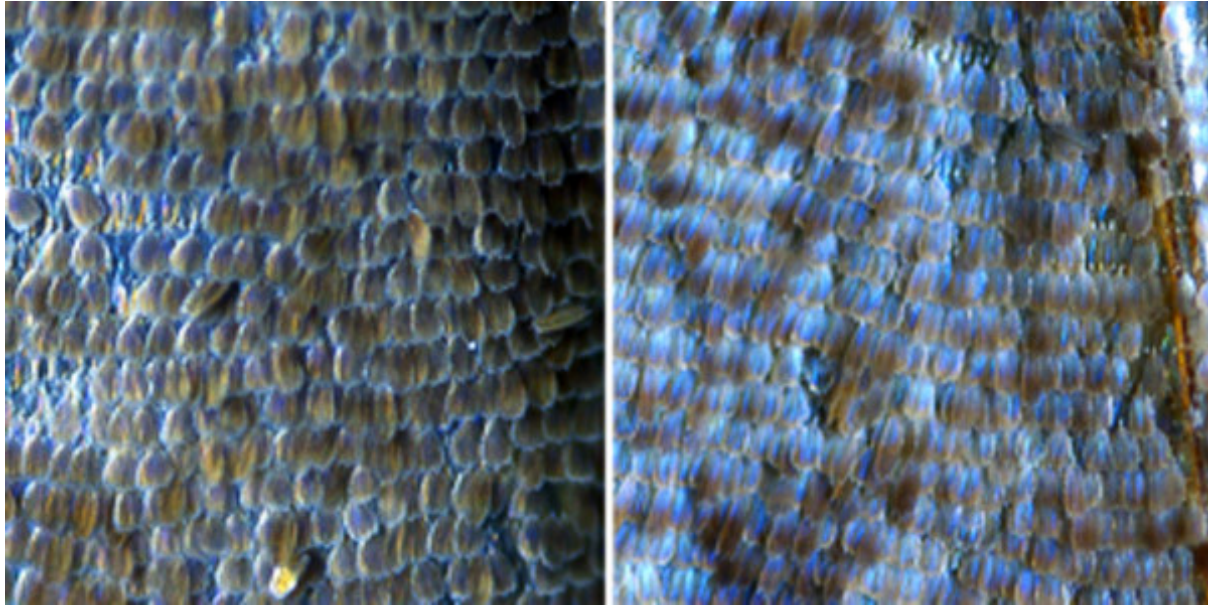
True Colors

In the laboratory, the team bred the butterfly *Bicyclus anynana*, which lives for about two months. They used microscopes to determine which individual butterflies' wings best reflected light of the wavelength that produces purple. ([See: National Geographic's gallery of purple colors in nature.](#))

Then they mated these butterflies several times, mimicking evolution. Eventually, the butterflies that emerged had wings that appeared purple, according to the study, published August 4 in the [Proceedings of the National Academy of](#)

Sciences.

When the scientists examined these purple wings under the microscope, they discovered that each scale had evolved to have the specific thickness that allowed it to reflect violet light. In other words, the wing scales had become perfect for reflecting purple. ([Watch video: “Growing Up Butterfly.”](#))



After six generations of breeding, *B. anynana* developed scales in its wings that reflected purple (right to left). Photograph courtesy of Antónia Monteiro

The team then compared *B. anynana* and two distantly related species of butterfly in the same genus that had naturally evolved to be purple. They discovered that the same mechanism they’d observed in the lab had been at work in nature: All three species had wing scales of the same thickness.

A Butterfly of a Different Color

There are only two ways an animal can change its color: by altering its pigment, which requires the body to do some heavy lifting, or by tweaking the structure of its wings or other body parts that reflect light, Cao noted. (See: [“Glowing Butterflies Outshine LEDs.”](#))

By changing their wings, butterflies had chosen the easier route. “That’s why they can evolve much faster and easier to really adapt to environmental change,” Cao said.

Scientists not involved with the study noted that the research advances science by showing both the speed and function of color evolution in butterflies.

“This paper nicely shows that underlying structural colors can evolve faster than pigment,” said [Mark Scriber](#), professor emeritus in entomology at Michigan State University in East Lansing. “How quickly the response is to selection [for purple] was probably the most amazing thing.”

Butterfly expert [Andrei Sourakov](#) added by email, “This study contributes significantly to our understanding of an important trait frequently found in butterflies—iridescent coloration.”

Sourakov, of the Florida Museum of Natural History, suspects that many butterflies have evolved ways to change colors fast but using different mechanisms: “Nature has a way of achieving similar goals in multiple ways.”

Why So Colorful?

The reason butterflies sport colorful wings likely has to do with communicating with other butterflies or avoiding predators.

Scriber said that, among other things, specific colors may help male and female butterflies identify each other in an environment full of other insects.

Cao noted that brown butterflies often live in dense forests, where they blend into the surroundings, and purple butterflies live in the open, where their dazzling flashes may confuse predators. (Related: "[People Can Hallucinate Color at Will.](#)")

Learning “how the butterfly tunes their optical properties gives us inspiration to mimic them,” she added.

For instance, she said, such research may help engineers build electronic devices, such as e-readers, that can switch colors quickly and efficiently.

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