BEETLES

WHAT MAKES THEM SHINE?

By Casi Fleischman

IRIDESCENCE

Iridescent coloration is a visual characteristic typically found on the exterior of animals. This color has a unique shine that changes based on lighting and viewing angle. Iridescence in the animal kingdom is not as uncommon as you might imagine. You can find reptiles, birds, insects, and fish to all share this characteristic quality to their exterior. A mammal (the Golden Mole), has also recently been discovered to have iridescence in the hairs of their coat. Some of the most well known creatures with this natural shine are beetles. Iridescence is not just found in one variety of beetle, it has been observed in several types of beetles from various climates around the world.

Why is this? Well, beetles (as well as several other animals) use the iridescence of their coat for many different reasons.

MATING

The shimmer of a beetle's elytra (their wing casing) plays an incredibly important role in the selection of a mate. The iridescence allows beetles to quickly identify the sex of another beetle. Typically, beetles that have iridescent coats do not vary dramatically from male to female, but the slight color change that is present is very obvious to the other gender. Scarabs (Phanaeus difformis) are good examples of this subtle change. Males tend to have a greenish-blue shine that looks orange when light is angled directly toward it, and females are purplish-blue and have a green shine to them.

PROTECTION

Having a shiny, colorful exterior is a big warning sign to predators. In the animal world, it typically means that you are toxic and not palatable. This is not always the case. Over the years of evolution, non-toxic beetles have adopted the stunning coloration of toxic beetles. Similarly to when animals have "fake eyes" and distracting patterns, the brief flashes caused by the iridescence on some beetles may also cause predators to be startled and deterred.

(Left) *Chrysochroa toulgoeti*, Matallic Wood-boring Beetle

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A *Lamprima adolphinae*, Greenish Bronze Stag Beetle with direct light (left) and side light with small filler card (right)

THERMOREGULATION

There are new research studies being done on the reflected UV light component of iridescent animals can regulate their internal temperature. There are still debates over whether or not the elytras of insects (like beetles) help keep them warm or keep them cold. Some researchers feel that the UV is reflected away from the body of insects and other animals, and some researchers feel like it is a mechanism of their body to absorb stray light to keep their bodies warm. However, there has been a fairly modern study by Shultz and Hadley in 1987, which tests this theory. They experimented with iridescent and non-iridescent Tiger beetles and found that there were no internal temperature differences when placed in similar environments.

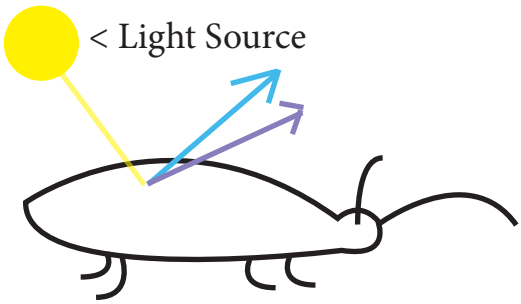
However, by contrast, the Hercules beetle is found to change color from iridescent green to black with a change in humidity.

THE SCIENCE

The actual shine itself comes from the diffraction of light from the small scales of the elytra. The light breaks apart into several wavelegnths when it is re-emitted. The directionality of light is what reveals the true beauty and intensity of a beetle's iridescence. In *Figure 1* (above) you can see that a heavier sidelight is making this bronze beetle appear green. This change is due to the increase of iridescent intensity based on the directionality of the light source. Insects and other animals are ver aware of this directionality of light and tend to use it to their advantage.

Underside of a *Chrysochroa toulgoeti,* Matallic Wood-boring Beetl

If they see a potential predator or mate, they will shift their body in such a way to show the receiver the shininess of their coat. An iridescent coat also allows beetles to reflect very short wavelengths of light ranging from blue to ultra-violet even without actually having a blue pigment (which is fairly rare is the animal kingdom). This ability can be very useful in signaling other insects without being seen by predators that are not able to perceive those specific wavelengths. These small wavelngths can also help insects, such as beetles, to blend in easily with their environments to avoid potentional disturbances from predators.



PHOTOGRAPHIC CHALLENGE

Photographing insects that have this iridescence is not an easy task. In the case of beetles, their shells tend to be very rounded, which makes directing the light how you want a bit tricky. Nice even diffused light sources tend to work best for eliminating strong reflections. Another trick to getting rid of those pesky reflections is using a polarizing filter on your lens. This will not take away all of the flare, but it will help you image significantly. Because the direction of light is so important to the way the iridescence looks, you must play around with it to achieve the look you are trying to get. Generally, the "hidden" color, which is only seen at some viewing points, is best found when using a light source directly over the insect's exoskeleton.

RESOURCES

http://rstb.royalsocietypublishing.org/content/366/1565/709.short

http://rsif.royalsocietypublishing.org/content/6/Suppl_2/S115.short

http://www.jstor.org/discover/10.2307/3495550?uid=33292&uid=3739832&uid=2&uid=3&uid=67&uid=33291&uid=62&uid=3739256&sid=21102877837107

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Cover Image: New Guinea Coleoptera ischiopsopa, Flower Beetle

Underside of a *Lamprima adolphinae*, Greenish Bronze Stag Beetle