Cover illustration: Not just another pretty face

The Union Jack butterfly (Delias myisis) is found along the tropical northeast coast of Queensland, Australia, including the Cape York Peninsula, and has the typical languid and random flight of most butterflies. But the behaviour of these solitary creatures belies their dynamic physiology, surprising learning abilities, and truly sensational visual mechanisms.

Investigators seeking further understanding of the visual mechanisms found members of a closely related species to be quick studiers when learning the whereabouts of food. Moreover, through behavioural techniques, these same investigators proved that butterflies definitely have colour vision, and even have colour constancy. This ability allows the neurological system of butterflies to draw conclusions about colour (and food sources) when the same wavelength may be not presented. For example, a flower that appears red in broad daylight may appear to be a dark maroon on an overcast day and/or when blooming in the shade of a tree. Any animal that relies on colour perception for food must have some degree of colour constancy or would not be able to recognize food sources in differing light. As with many other insects, butterflies also see into the ultraviolet, and can even detect polarised light. Many butterflies have in-born preferences for certain colours. Although not evaluated in many butterfly species, some species are known to have preferences for yellow and/or blue.

Usually when you see a butterfly, though, you don’t think of colour constancy. We are usually captivated by the gentle beauty of the creature, but did you ever consider how that colourful but these beautiful wings are used for more than flight or camouflage. Taxonomically, we rely on morphological characteristics for classification, but recent evidence suggests there may be other methods. The value and wings of adult males of various Delias species have been documented to produce volatile compounds which are species specific and are probably important in mate attraction for these solitary insects. In fact, these compounds are so specific that chemotaxonomic classification is possible, suggesting another mechanism at tracing evolution, or compounds are so specific that chemotaxonomic classification is possible, suggesting another mechanism at tracing evolution, or even classification.

As with most insects, butterflies have compound eyes. These optical sampling devices are quite different from any of the vertebrate ocular systems, and usually fit the animal’s ecological needs, as suggested in a previous cover (BJO, March 2001).

This species, as do other butterflies, has an appositional compound eye, but with an unusual twist. (By official classification there are at least eight types of eyes: camera, concave mirror, pinhole, appositional, neural superposition, refracting superpositional, reflecting superpositional, and parabolic superpositional, although more types are possible depending on classification system, and each type has its own visual mechanisms.) An appositional eye does not resolve the image beyond what each facet perceives directly. The array of ommatidia in an appositional compound eye produces good sensitivity to movement, but acuity can be limited by diffraction and limited capture of photons; hence, this eye performs best in a daylight environment—or perhaps only in a daylight environment. In this species, the cornea (this term refers to the