Female red postman butterflies see UV shades that males can’t

Flowers are masters at promoting their wares. From aromatic scents to flamboyant shades, the sexual organs of plants don’t hold back when attracting insects to distribute their pollen. But the vivid blooms that we behold are a mere shadow of the ostentatious visions that entice insects. Susan Finkbeiner and Adriana Briscoe from the University of California, Irvine, USA, explain that insects tend to perceive hues ranging from orange into the UV, thanks to a light-sensitive cell that is specifically tuned to UV wavelengths in addition to the conventional blue and green photoreceptors that pick up the more familiar end of the spectrum. However, even with a uniquely specialised UV photoreceptor, most UV shades appear simply as bright patches. Yet, when Kyle McCulloch checked the UV vision of red postman butterflies (*Heliconius erato*) he discovered that the females are equipped with a second UV-sensitive light sensor – which the males lack – raising the possibility that instead of perceiving UV wavelengths as brilliant regions, red postman females may be able to see genuine UV shades to which their mates are oblivious.

To test the females’ colour vision, Finkbeiner trained the butterflies to recognise a patch of UV light (390 nm) by initially carrying the females to the illuminated tile and encouraging them to sip a nectar reward until they could fly there on their own. Once the females had learned that this particular UV shade resulted in a pleasurable reward, Finkbeiner tested whether the females could distinguish between the 390 nm tile and another tile of a very similar UV hue (380 nm). ‘Some of the butterflies cooperated well, learned quickly during training and could fly to the food source on their own within a few days, but others never cooperated and were not able to be trained’, recalls Finkbeiner. Impressively, the females almost always successfully selected the UV shade they had been trained to recognise, even when it was 15 times dimmer than the 380 nm decoy tile. They were clearly capable of seeing the subtle difference between the two UV shades.

However, when Finkbeiner tested the colour vision of male red postman butterflies, the common postman butterfly (*Heliconius melpomene*) and Isabella’s heliconian (*Eueides isabella*) butterflies – which only have one UV photoreceptor each – the butterflies always preferred the brighter of the two UV tiles, regardless of the shade. Equipped with one UV receptor alone, the insects were unable to distinguish the close UV colour difference; instead, the butterflies only saw bright and dim tiles. And when she trained the insects to recognise violet hues visible to our eyes, all of the insects – including the UV-colour blind males – excelled; their lack of UV colour vision didn’t impede their ability to see other shades of violet.

So why have female red postman butterflies developed the ability to see shades extending into the UV when their partners do not? Briscoe suggests that the females’ UV colour vision may help them to locate the pollen rich corollas of little vine (*Psiguria*) flowers, which light up brilliantly under UV light; the females feast on the pollen to give their eggs the best start in life. She also suspects that the males’ lack of UV colour vision isn’t an impediment. Instead, their vision is probably tuned to help them to distinguish red postman females from other species that mimic their yellow patches, by allowing them to differentiate the unique yellow shades produced by the red postmans’ 3-hydroxykynurenine pigment.


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