Research provides a new understanding of how a model insect species sees color

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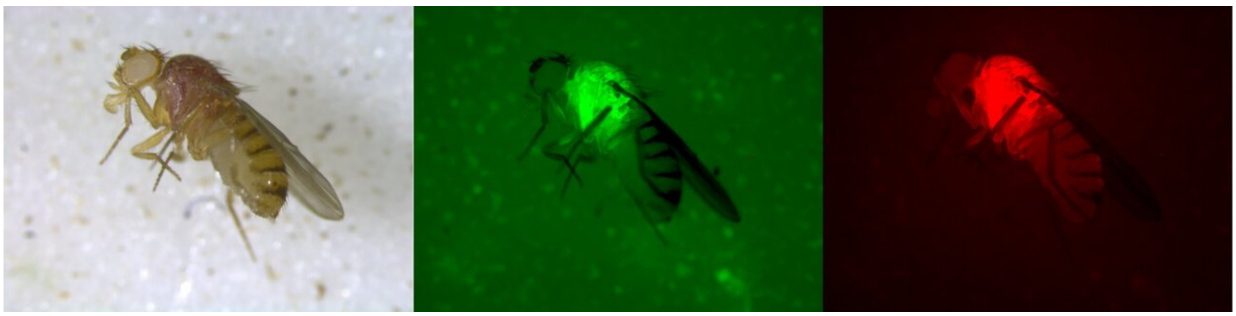

Drosophila melanogaster under green and red fluorescence used as a marker to indicate the presence of inserted genes. Credit: Camilla Sharkey

Through an effort to characterize the color receptors in the eyes of the fruit fly *Drosophila melanogaster*, University of Minnesota researchers discovered the spectrum of light it can see deviates significantly from what was previously recorded.

"The fruit fly has been, and continues to be, critical in helping scientists understand genetics, neuroscience, cancer and other areas of study across the sciences," said Camilla Sharkey, a post-doctoral researcher in the College of Biological Sciences' Wardill Lab. "Furthering our understanding of how the eye of the fruit fly detects different wavelengths of light will aid scientists in their research around color reception and neural processing."

The research, led by U of M Assistant Professor Trevor Wardill, is published in *Scientific Reports* and is among the first research of its kind in two decades to examine Drosophila photoreceptor sensitivity in 20 years. Through their genetic work, and with the aid of technological advancements, researchers were able to target specific photoreceptors and examine their sensitivity to different wavelengths of light (or hue).

The study found:

- all receptors—those processing UV, blue and green—had significant shifts in light sensitivities compared to what was previously known;
- the most significant shift occurred in the green photoreceptor, with its light sensitivity shifting by 92 nanometers (nm) from 508 nm to 600 nm; equivalent to seeing orange rather than green best;
- a yellow carotenoid filter in the eye (derived from Vitamin A) contributes to this shift; and
- the red pigmented eyes of fruit flies have long-wavelength light leakage between photoreceptors, which could negatively impact a fly's vision.

Wild-type eye colouration in Drosophila (red eyes) and those with reduced screening pigment (orange eyes). Credit: Camilla Sharkey

Researchers discovered this by reducing carotenoids in the diets of the flies with red eyes and by testing flies with reduced eye pigmentation. While fly species with black eyes, such as house flies, are able to better isolate the long-wavelength light for each pixel of their vision, flies with red eyes, such as fruit flies, likely suffer from a degraded visual image.

"The carotenoid filter, which absorbs light on the blue and violet light spectrum, also has a secondary effect," said Sharkey. "It sharpens ultraviolet light photoreceptors, providing the flies better light wavelength discrimination, and—as a result—better color vision."

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