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 REPORT



A Different Form of Color Vision in Mantis Shrimp

HANNE H. THOEN, MARTIN J. HOW, TSYR-HUEI CHIOU, AND JUSTIN MARSHALL [Authors Info & Affiliations](#)

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Color vision is generally carried out through the number of photoreceptor types found in the retina. The mantis shrimps (stomatopods) can have up to 12 photoreceptors, far more than needed for even extreme color acuity. **Thoen *et al.*** (p. [411](#); see the Perspective by [Land and Osorio](#)) conducted paired color discrimination tests with stomatopods and found that their ability to discriminate among colors was surprisingly low. Instead, stomatopods appear to use a color identification approach that results from a temporal scan of an object across the 12 photoreceptor sensitivities. This entirely unique form of vision would allow for extremely rapid color recognition without the need to discriminate between wavelengths within a spectrum.

Abstract

One of the most complex eyes in the animal kingdom can be found in species of stomatopod crustaceans (mantis shrimp), some of which have 12 different photoreceptor types, each sampling a narrow set of wavelengths ranging from deep ultraviolet to far red (300 to 720 nanometers) (1–3). Functionally, this chromatic complexity has presented a mystery (3–5). Why use 12 color channels when three or four are sufficient for fine color discrimination? Behavioral wavelength discrimination tests ($\Delta\lambda$ functions) in stomatopods revealed a surprisingly poor performance, ruling out color vision that makes use of the conventional color-opponent coding system (6–8). Instead, our experiments suggest that stomatopods use a previously unknown color vision system based on temporal signaling combined with scanning eye movements, enabling a type of color recognition rather than discrimination.

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References (26–29)

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