Behavioral studies show UV contributes to marsupial color vision

March 20 2006

Work reported this week provides new evidence that marsupials, like primates, have functional color vision based on three different types of color photoreceptor cones--but unlike primates, a component of marsupial color vision includes sensitivity to ultraviolet wavelengths.

In the study, researchers employed behavioral tests to show that at least one type of marsupial uses its detection of UV light as part of its ability to discriminate between colors. The new work is reported by a group including Dr. Catherine Arrese of the University of Western Australia and appears in the March 21st issue of *Current Biology*.

The most prevalent system of color vision in mammals is known as dichromacy, which is a color-detection system based on two types of cone photoreceptors--those sensitive to short (SWS) and medium-to-long (M/LWS) wavelengths. Trichromacy, which is used by humans, was thought to be unique to primates that have re-evolved a third cone type from the duplication of the MWS/LWS gene, which enables the discrimination of green-red colors. But the researchers' previous physiological studies in Australian marsupials provided original evidence for the potential of trichromatic color vision in mammals other than primates.

The findings were consistent in several distantly related marsupial species, indicating that the presence of three spectrally distinct cone types, sensitive to short (SWS), medium (MWS), and long (LWS) wavelengths, is a common feature of Australian marsupials. However,

since evidence of color vision cannot be derived from physiological studies alone, marsupial trichromacy remained to be established with an unequivocal behavioural approach.

In the new study, the researchers therefore investigated the contribution of the distinct cone types to color vision in the fat-tailed dunnart (Sminthopsis crassicaudata), using additive color mixture experiments in which choice between a colored light (training wavelength) and an additive mixture of two different colored lights (primary wavelengths) is based exclusively on differences in chromatic content.

The results revealed that the fat-tailed dunnart possesses functional trichromacy, but that its version of trichromatic vision differs from that of primates in that it includes sensitivity to UV wavelengths. In addition to furthering our knowledge of how mammalian color vision functions, the findings provide an opportunity to re-examine theories on the evolution of this key sensory capacity.

Citation: Arrese et al.: "Behavioural evidence for marsupial trichromacy." Publishing in *Current Biology* 16, R193-R194, March 21, 2006.

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