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Photopigment Opsin Variation and Color Sensation

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Cognition and color appearance research frequently makes use of Trichromatic Theory in modeling higher-order color sensations. Recent results in molecular genetics indicate that many individuals express more than three color vision photopigments. To investigate the influences of more than three photoreceptor types on color sensation we assessed the color perception of individuals grouped by classes of photopigment opsin genes identified through Polymerase Chain Reaction (PCR) genetic assays. We compare groups of individuals identified as Dichromats and Trichromats with individuals exhibiting non-standard photopigment variations (including heterozygous and polymorphic variants). Two methods of assessing color sensations were used: (1) a method using a diffracted spectrum with heterochromatic luminance (Jameson, Highnote and Wasserman 1998), and (2) a method using an equal-energy spectrum (Bonnardel, 1998). Comparison of the results further clarifies the relations between photopigment opsin genotypes and color perception. Implications for cognitive models of color appearance phenomenology and Graßmann color coding are discussed.