

Rod influence on appearance of desaturated hues

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Studies using maximally saturated, narrow-band spectral lights reveal three rod influences on hue perception: red bias at short wavelengths, blue bias at middle wavelengths, and green bias at long wavelengths). Studies using less saturated lights have shown only some of these effects. Here, we assessed rod influence on R/G and B/Y opponent-hue dimensions at chromaticities extending from the spectrum locus toward white.

A staircase procedure measured observers' null points for R/G (unique blue and unique yellow) and B/Y (unique green). Stimuli were 5°-diameter discs centered 7° from fixation in temporal visual field. Rod influence was inferred from differences in null points measured under dark-adapted (maximizes rod influence) and cone-plateau (minimizes rod influence) conditions for stimuli presented at 0 to 1.4 log photopic trolands (CIE 10°). R/G and B/Y null points were determined for both spectral lights and mixtures of pairs of monochromatic lights that spanned the chromaticity diagram.

Consistent with prior studies, along the spectrum locus, rods shifted all three unique hues to longer wavelengths: by up to 50 nm for unique green (blue bias), 10 nm for unique blue (red bias), and 9 nm for unique yellow (green bias). All three rod hue biases were also found for desaturated lights, extending toward white for distances that varied among observers. Some observers showed rod effects for stimuli of as little as ~25% excitation purity, the least saturated we have tested so far.

These results show that all three rod hue biases can alter the appearance of a wide range of desaturated hues like those found in the natural world, not just spectral hues of the laboratory.