Color shifts induced by time-varying chromatic context:
Linear and nonlinear neural mechanisms

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In natural viewing, an object often is seen against a chromatic background that varies in space and time. Spatially complex backgrounds have been studied extensively since the 'Mondrian' experiment of McCann, McKee & Taylor (1976); temporally varying backgrounds, however, have received much less attention, despite the intriguing and now classical report that a temporally varying chromatic surround at a relatively low frequency (~4 Hz) is seen to fluctuate in color itself but does not induce temporally varying color changes within a central test field (DeValois, Webster, DeValois, & Lingelbach, 1986). The standard explanation is a cortical linear temporal filter that attenuates the chromatic inducing signal above 4 Hz. Experiments reviewed here require revising this account to include a nonlinear neural response and two linear temporal filters, one prior to and another following the nonlinear mechanism. The first linear filter is within pathways that maintain nearly independent *l*=L/(L+M) and *s*=S/(L+M) responses; the second linear filter acts on a higher-order chromatic representation that combines *l* and *s* responses. Experimental evidence includes (i) for a surround at temporal frequency *f* well above 4 Hz, a steady induced color shift that differs from the induced shift with a steady surround at the temporally-averaged surround chromaticity; (ii) for a surround modulated simultaneously at two temporal frequencies f_1 and f_2 both above 4 Hz, induced temporal variation within the central-test color at (iii) perceived temporal frequency $|f_1 - f_2|$; (iv) for a 6 Hz chromatic surround that varies simultaneously along both *l* and *s*, a steady induced color shift that is altered by changing the relative phase of *l* and *s* stimulation (that is, simultaneous chromatic surround modulation from $+l$ to $-l$ and $+s$ to $-s$, with $+l$ coincident with $+s$ compared to $+l$ coincident with $-s$).

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