

# Color averaging linked to contours, textures and orientation

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Journal of Vision May 2008, Vol.8, 1102. doi:10.1167/8.6.1102

## Abstract

A blurry, multicolored plaid was made by superimposing two crossed colored sinusoidal gratings: a horizontal red/green grating, and a vertical blue/yellow grating. [Disregarding ‘monocular rivalry’, which may just be an artifact from eye movements], we have found ways to enhance the visibility of either the vertical or the horizontal grating. We superimposed thin black lines, spaced half a spatial period apart, on the plaid. Vertical lines made the plaid look like a blue/yellow vertical grating. Horizontal lines made it look like a horizontal red/green grating. The perceived were stable and homogeneous between the bars. Similar effects were found for gratings that differed in spatial phase. A red/green and a blue/yellow vertical grating were superimposed shifted by 90°. Now superimposed vertical lines that lined up with the red-green grating made the plaid look like a vertical red/green grating. Displacing the vertical lines sideways to line up with the blue/yellow grating made the plaid look like a vertical blue/yellow grating. Instead of black contours, we can define regions with equiluminous second-order textures, with the same results. We conclude that the visual system combines or averages colors within regions defined by achromatic contours or textures. Another technique did not use superimposed lines, but relied on pre-adaptation to noisy vertical lines twinkling randomly in width and position. This adapted the visual system to vertical. Now the plaid of crossed gratings looked like a horizontal red-green grating. Conversely, adapting to noisy horizontal lines made the plaid look like a vertical blue/yellow grating. Thus the achromatic adapting orientation altered the perceived color of the test plaid. We conclude that the visual system enhances or suppresses colors together with orientation, perhaps owing to double-duty neural units tuned to both color and orientation.

Anstis, S. Vergeer, M. van Lier, R. (2008). Color averaging linked to contours, textures and orientation [Abstract]. *Journal of Vision*, 8(6):1102, 1102a, <http://journalofvision.org/8/6/1102/>, doi:10.1167/8.6.1102. [[CrossRef](#)]