

The McCollough effect obtained simultaneously on four orientations with four different colors

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The McCollough effect, an orientation-specific color aftereffect, typically has been demonstrated with two adaptation orientations and two colors. In the present experiment, the McCollough effect is obtained simultaneously on four orientations with four different colors.

McCollough (1965) described an orientation-specific color aftereffect. After the subjects adapted to a blue-black horizontal grating alternated with an orange-black vertical grating, they reported that a vertical black-white test grating appeared blue-green and that a horizontal black-white test grating appeared orange. McCollough attributed this aftereffect to the adaptation of orientation-specific edge detectors which also coded color.

Fidell (1970) supported McCollough's interpretation of the aftereffect. She showed that strong aftereffects could be obtained regardless of the orientations of the adapting stimuli as long as they were at right angles to each other. However, with one of the adapting stimuli kept constant at vertical, the aftereffects were much weaker when the adapting stimuli differed by 11° or 22° than when they differed by 45° or 90° . These findings are consistent with the results of Campbell, Cleland, Cooper, and Enroth-Cugell (1968), who determined that the rate of firing of most orientation-sensitive units in the cat's visual cortex falls to half of its maximum value when the stimulus is rotated 14° - 26° from the optimum orientation. Fidell suggested that adapting stimuli of less than 22° angular divergence would not stimulate distinctly different populations of orientation-sensitive neurons and, therefore, would not readily produce an aftereffect. This implies that the McCollough effect could be obtained only when the adapting stimuli affect distinctly different populations of orientation-sensitive neurons. If this is the case, one might expect to obtain orientation-specific aftercolors when more than one pair of adapting orientations is used. The present experiment demonstrates that orientation-specific aftercolors can be obtained simultaneously at four orientations by having the subjects adapt in the same session to violet-vertical, green-horizontal, orange-right-diagonal, and green-blue-left-diagonal gratings.

Requests for reprints should be sent to Paul C. Vitz, Department of Psychology, New York University, 4 Washington Place, Ninth Floor, New York, New York 10003. This research was supported by a grant to the second author from the Institute of Neurological Diseases and Stroke, National Institutes of Health (No. NS-07636-06).

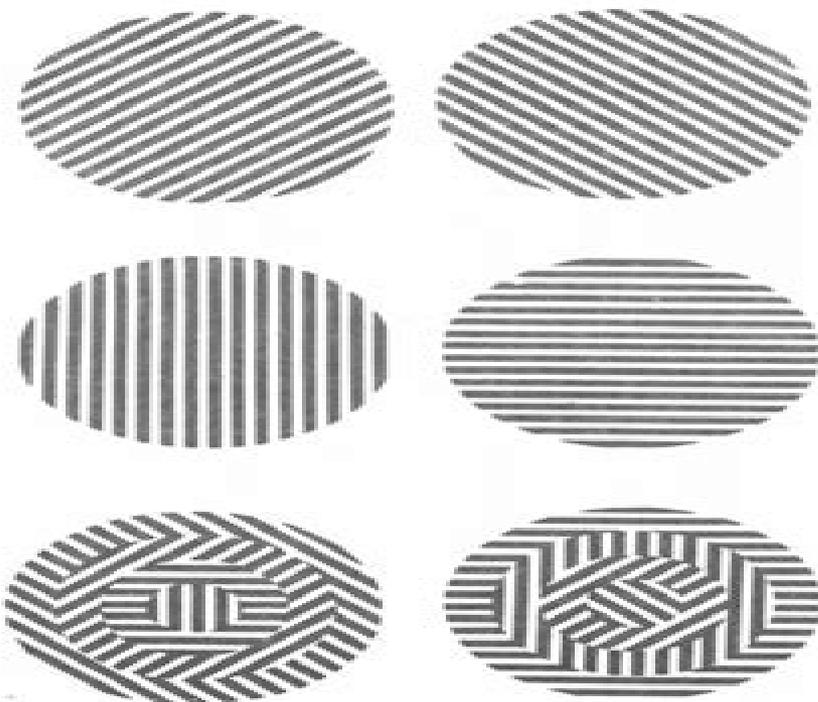


Figure 1. Top two rows: Adapting stimuli presented at right-diagonal, left-diagonal, vertical, and horizontal orientations. Bottom row: Test stimuli, each containing all four of the adapting orientations.

METHOD

Subjects

The eight subjects were male and female volunteers from the New York University psychology department. All were familiar with the basic McCollough effect.

Apparatus

Figure 1 shows the adapting and test stimuli. The adapting

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