Notes and Comment

A motion-induced breakdown of visual figure-ground relationships

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Parker, Woods, and Tubbs (1977) have noted that if one looks at an oscilloscope in a darkened room and stamps his or her foot while a slowly moving trace is passing horizontally across its illuminated grid, the trace will appear to displace itself and briefly move in a vertical direction. They also indicate that a similar effect could be produced if the oscilloscope itself was caused to oscillate up and down in a vertical plane. Under these circumstances, the trace appeared to exhibit a sinusoidal path with respect to the vertically oscillating grid.

We report here that an apparently analogous illusion can be produced in a much simpler fashion. The only necessary equipment is either a hand-held calculator or a digital watch with an LED readout and a room in which the illumination level can be controlled. When either unit is viewed in sufficiently dim illumination by a subject who is somewhat dark adapted, the numerals will appear to retain their fixed position with respect to the frame of the unit only so long as the unit is stationary. If the unit is repeatedly moved up and down, or from side to side, the numerals will appear to become unstuck and to float about the face of the unit bumping into its edges.

Since the observed movement of the numerals relative to the face of the unit is quite compelling, and since it appears to represent a dramatic breakdown of the figure-ground invariance that usually prevails in the visual system, it has seemed worthwhile to try to identify some of the conditions under

which it occurs. In order to do so, we constructed a simple stimulus object that would duplicate the basic visual properties of a digital watch, but which employed incandescent lamps instead of LEDs. It consisted of an aspirin box with a pair of crossing lines cut through its cover. The box contained two grain of wheat bulbs (15-V) that were wired in series and were arranged in such a way that when they were lit and the box was viewed in dim illumination, the unit would look somewhat like a digital watch with XXs where the numerals ordinarily are seen.

We have tested more than two dozen naive student volunteers with this unit. When conditions were appropriate (e.g., dim illumination and a somewhat dark-adapted subject), the illusion was readily obtained regardless of whether the XXs were covered by red, green, or blue gelatin, or were uncovered, and regardless of whether the unit was viewed monocularly or binocularly. If, however, a subject was not somewhat dark-adapted (usually a minute in the dark was sufficient) or if the room was too brightly illuminated, the XXs and the frame retained their relative positions when the unit was moved, i.e., the illusion was not seen.

These observations imply that neither the rapid on/off cycling that characterizes most LED readouts nor the color of those readouts are critical to the illusion. They also indicate that the illusion depends upon the activity of some mechanism or mechanisms that ordinarily come into play only during twilight or night vision.

It is of interest that this last conclusion is consistent with the conditions of Parker, Woods, and Tubbs' study though neither their experiments nor their discussion of them directly addressed the issue.

REFERENCE

- PARKER, D. E., WOODS, D. L., & TUBBS, R. L. Illusory displacement of a moving trace with respect to the grid during oscilloscope motion. *Perception & Psychophysics*, 1977, 21, 439-444.

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