Perpetual collision illusions

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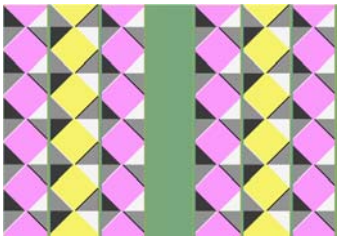
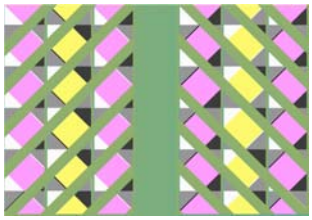
We have placed an html file that contains a series of interactive movie demonstrations at the website www.shapirolab.net/PerpetualCollision.



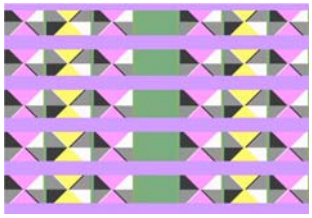
The basic version of the *Perpetual Collision illusion* consists of columns of stationary colored diamonds (here shaded pink and yellow) separated by rotating achromatic diamonds. The luminance levels of the achromatic diamonds and their edges were chosen so as to create edge motion (for instance, Gregory and Heard, 1982; Shapiro et al, 2005).

What is compelling about this illusion? Even though the colored columns are physically stationary, the yellow columns appear to drift to the left, and the pink columns appear to drift to the right. The motion is perpetual—the pink and yellow columns are always headed towards each other (or away from each other), but they never meet (and they never grow further apart).

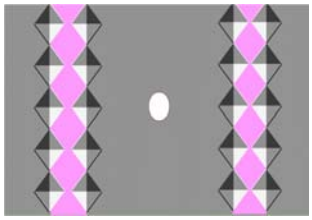
What is theoretically interesting about this illusion?



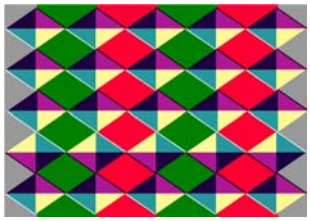
1. The colored columns appear to move horizontally, but the edges create oblique motion; the perceived direction of motion must result from the integration of local motion signals. To get better insight into this aspect of the phenomenon, click on the oblique bars button in the demonstration file. The bars cover up opposite sides of the diamonds, and the colored fields appear to move at 45 deg (or -45 deg) angles. We refer to this version of the effect as the *Boxcar illusion*.



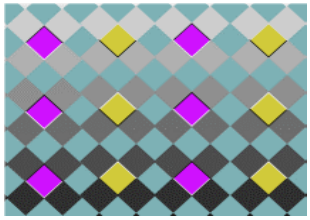
2. There is no motion signal in the center of the colored diamonds; the center is therefore "carried along" with the motion from the edges. To get better insight into this aspect of the phenomenon, click on the horizontal bars button. The bars cover up the center of the diamonds (or boxcars); the diamonds (or boxcars) appear to drift behind the bars. We refer to this version of the effect as the *amodal diamonds illusion*.



3. The motion of the colored diamonds requires phase information that is not available in the visual periphery. To get better insight into this aspect of the phenomenon, click on the button for the *moonwalk illusion*. When looking at the center disk, most people see the columns in the periphery drifting perpetually to the left; when looking at a single column, most people see the pink diamonds in the column moving to the right.



4. In the *J and D illusion*, a button press shifts the orientation of the spinning diamonds. The shift in orientation is not perceptible (or is barely perceptible), but it leads to a dramatic shift in the direction of motion in the colored columns.



5. The perpetual motion effect occurs because the luminance modulation of the edge is 90 deg out of phase with the luminance modulation of the center. In the *modulated perpetual motion* illusion, the magenta diamonds appear to move down the screen, and the stationary yellow diamonds appear to move up the screen. Click on the "phase" button to see that global motion information does not affect the apparent motion of the colored diamonds as long as the phase relationship at the local edge remains constant.