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Optical Illusion: Tracking the trajectory of a curveball

By Larry Greenemeier in 60-Second Science Blog

In baseball, a good curveball can turn a hitter's legs to jelly, traveling on a devastating arc that causes him to wave his bat awkwardly at where the baseball used to be. In science, a good curveball can tell researchers a lot about the differences between what a person sees when an object is viewed via the eye's narrow band of central (or foveal) vision, compared with what the object looks like when spotted through one's peripheral vision.

"The differences between peripheral and foveal vision are important whenever you discuss eye diseases like glaucoma, which affects your peripheral vision, or macular degeneration, which affects foveal vision," says Arthur Shapiro, an associate professor of psychology at American University in Washington, D.C. (Until recently, Shapiro researched and taught at Bucknell University in Lewisburg, Pa.) "You really want to understand what people suffering from these are able to see."

To get a sense of the scope of human foveal vision, Shapiro says to hold your thumb directly in front of you at arms length. The thumb will fit into your foveal vision, but looking to the left or right of it engages your peripheral vision and makes the thumb's details more difficult to distinguish.

Shapiro hatched the idea of using baseball to illustrate this when trying to explain the differences between foveal and peripheral vision to his 10-year-old twins during a game of catch. When the 2.9-inch (7.4-centimeter) diameter baseball is in the pitcher's hand, 60 feet (18.3 meters) away from home plate, it appears small enough to fit in the batter's foveal vision. By the time a 75-mile (121-kilometer) per hour curveball spinning at about 1,500 rotations per minute reaches the plate, it is too big to be seen only in the foveal and moves to the batter's peripheral vision, according to Shapiro.

In the optical illusion Shapiro created to demonstrate this effect, the perception of a change in the curveball's path may be related to physiological differences between foveal and peripheral vision. The curveball illusion consists of a single oval that drifts from the top of the screen to the bottom. To see Shapiro's optical illusion, Click Here.

When the observer tracks the oval foveally, the motion will follow the oval (i.e., the oval appears to descend vertically). However, if the observer shifts his gaze to a blue dot to the right of the screen (thus viewing the falling oval out of peripheral vision), the oval appears to fall at a diagonal angle.

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