The Breathing Light Illusion: illusory size and brightness variation induced by motion

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Simone Gori\textsuperscript{1,2}, Enrico Giora\textsuperscript{3}, & D. Alan Stubbs\textsuperscript{4}

\textit{1 Developmental and Cognitive Neuroscience Lab, Department of General Psychology, University of Padua, Italy} \\
\textit{2 Developmental Neuropsychology Unit, Scientific Institute “E. Medea”, Bosisio Parini, Lecco, Italy} \\
\textit{3 Department of Psychology, University of Milano-Bicocca, Italy} \\
\textit{4 Perceptual Stuff Organization, USA}

1. Introduction

The aim of this chapter is to present a size and brightness illusion named the Breathing Light Illusion (Gori & Stubbs, 2006) and to review studies that helped to understand the underlying mechanisms that could be responsible for that phenomenon.

It is often assumed that perceiving a surface as a source of light depends just on its physical radiant emission (Kingdom, 2011 for a recent review regarding luminance perception). However, since the pioneering investigations on simultaneous contrast by the Persian natural philosopher Ibn Al-Haytham (circa 965-1040 AD), known as Alhazen, the subjective nature of color sensation has been highlighted (Wade, 1996). Arguing that color appearance was partly due to a mental process,

[...]

References


Mach, E. (1865). Über die Wirkung der räumlichen Vertheilung des Lichtreizes auf der Netzhaut. *Sitzungsberichte der kaiserlichen Akademie der Wissenschaften, Mathematisch-


**Figure Legends**

**Figure 1.** Panel a. A simple version of the Breathing Light Illusion. Panel b. A gray-scale version of the Dynamic Luminance-Gradient Illusion. Approaching these patterns by moving one's head toward it makes the spot appear to become larger, more diffuse, and filled with white. On receding from it, the spot's center remains white but the remainder appears smaller, darker, and sharper.

**Figure 2.** Some variations of the Breathing Light illusion. Approaching the stimuli in panels a, c and d with central fixation, an illusory rotation is perceived together with the typical illusory effect of the Breathing Light Illusion. This illusory rotation is the same experienced in the Rotating Tilted Lines Illusion (Gori & Hamburger, 2006; Gori & Yazdanbakhsh, 2008; Yazdanbakhsh & Gori, 2008).

**Figure 3.** Some variations of the Breathing Light illusion where shape, colors and amodal completion are varied.

**Figure 4.** Panel a. Fixate the white blurry disk to see the Gori-Stubbs effect: the disk looks whiter and more diffuse when approached, and sharper and darker when the head moves back. Now fixate the cross in panel a for 5-10 s. When the head is moved sharply forward to half the viewing distance, the stimulus briefly looks like in panel b, with small blurry afterimages superimposed. Hold the fixation, then move the head back again, and the stimulus briefly looks like in panel c, with large blurry afterimages. Panels d, e, f represent the hypothetical retinal images of blurry patterns. Panel d. A blurry disk fixated from far away at time T1 and from half the distance at time
T2. Panel e. The disk at T1 has the afterimage from T2 (dashed lines) superimposed, yielding a difference-of-Gaussians combined retinal image (thick lines) that looks sharp and dark; and vice versa, which looks white and diffuse. This accounts for the Gori-Stubbs effect. Panel f. During eccentric fixation, the afterimages are no longer centered on the stimuli, but offset, giving the percepts diagrammed in panels b and c.