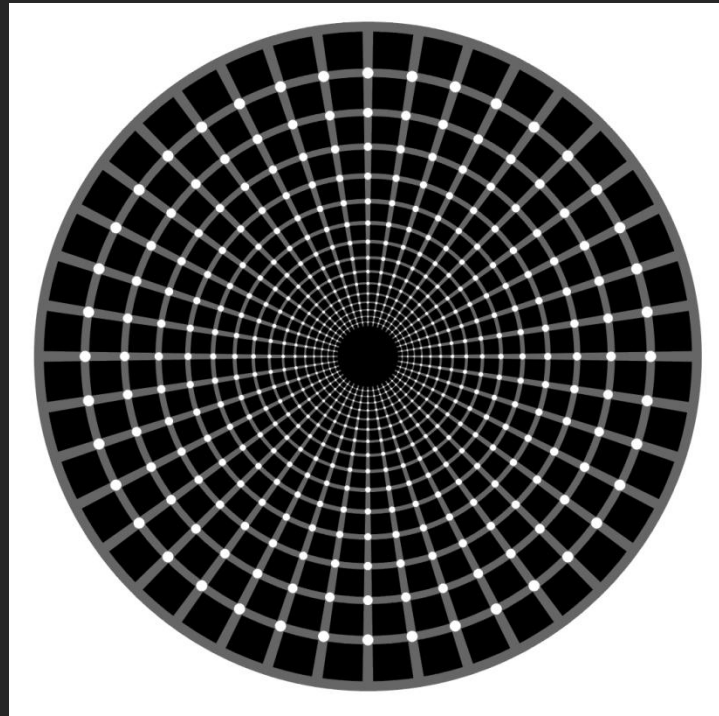


Understanding Optical Illusions



Mohit Gupta

What are optical illusions?

Perception: I see



Light (Sensing)



Truth: But this is an



!



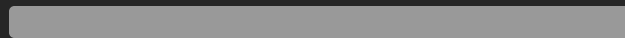
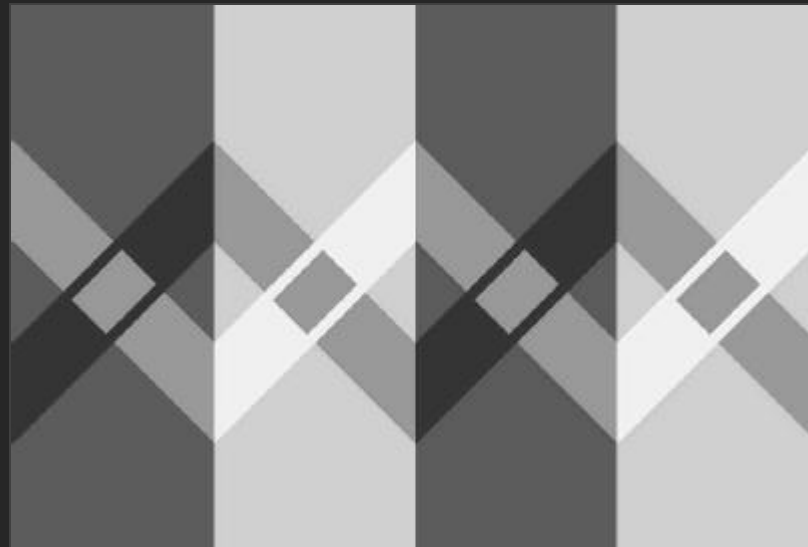
Oracle

Optical Illusion in Nature



© 2007 Thomson Higher Education

A Brightness Illusion

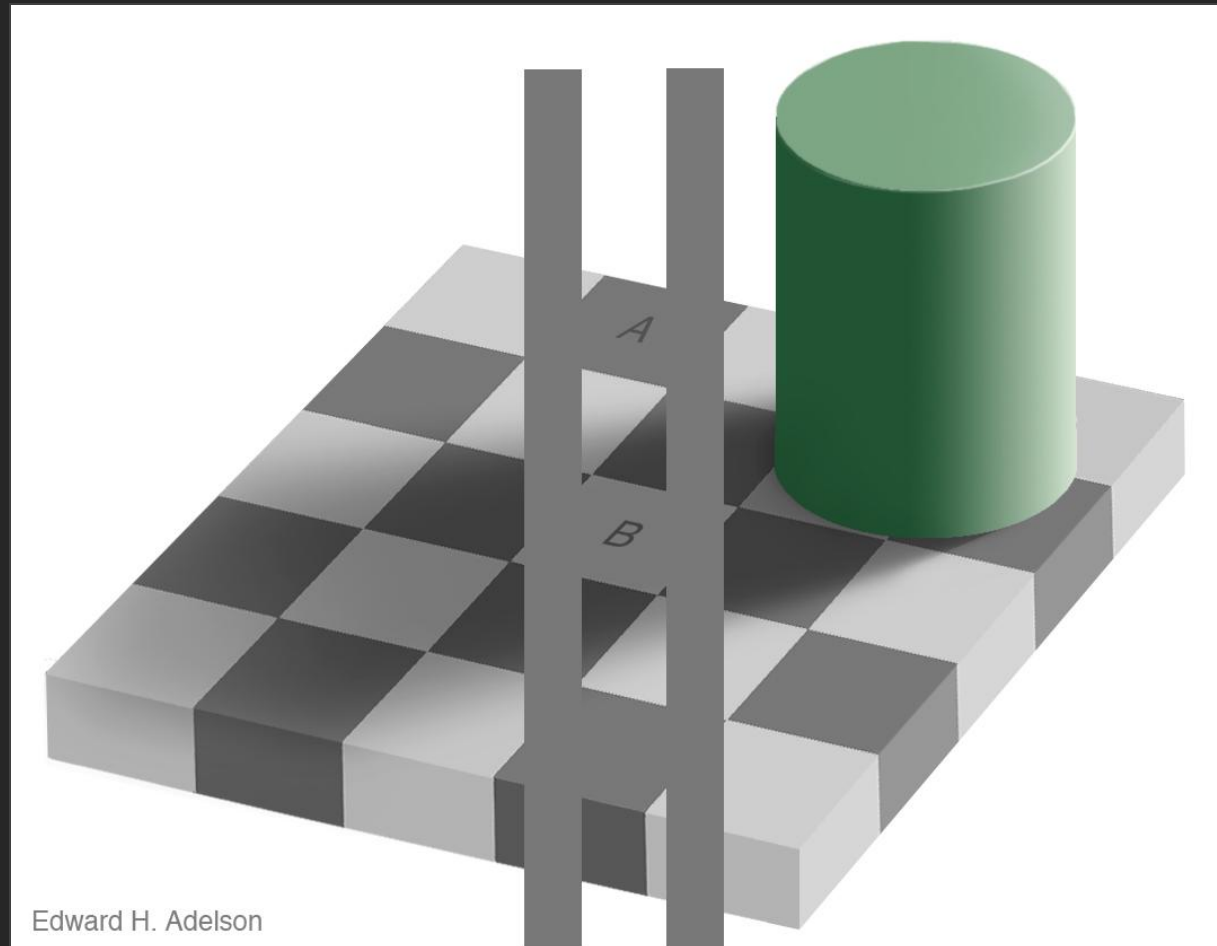


Different kinds of illusions

- Brightness and Contrast Illusions
- Twisted Cord Illusions
- Color Illusions
- Perspective Illusions
- Relative Motion Illusions
- Illusions of Expressions



Lightness Constancy



Our Vision System tries to compensate for differences in illumination

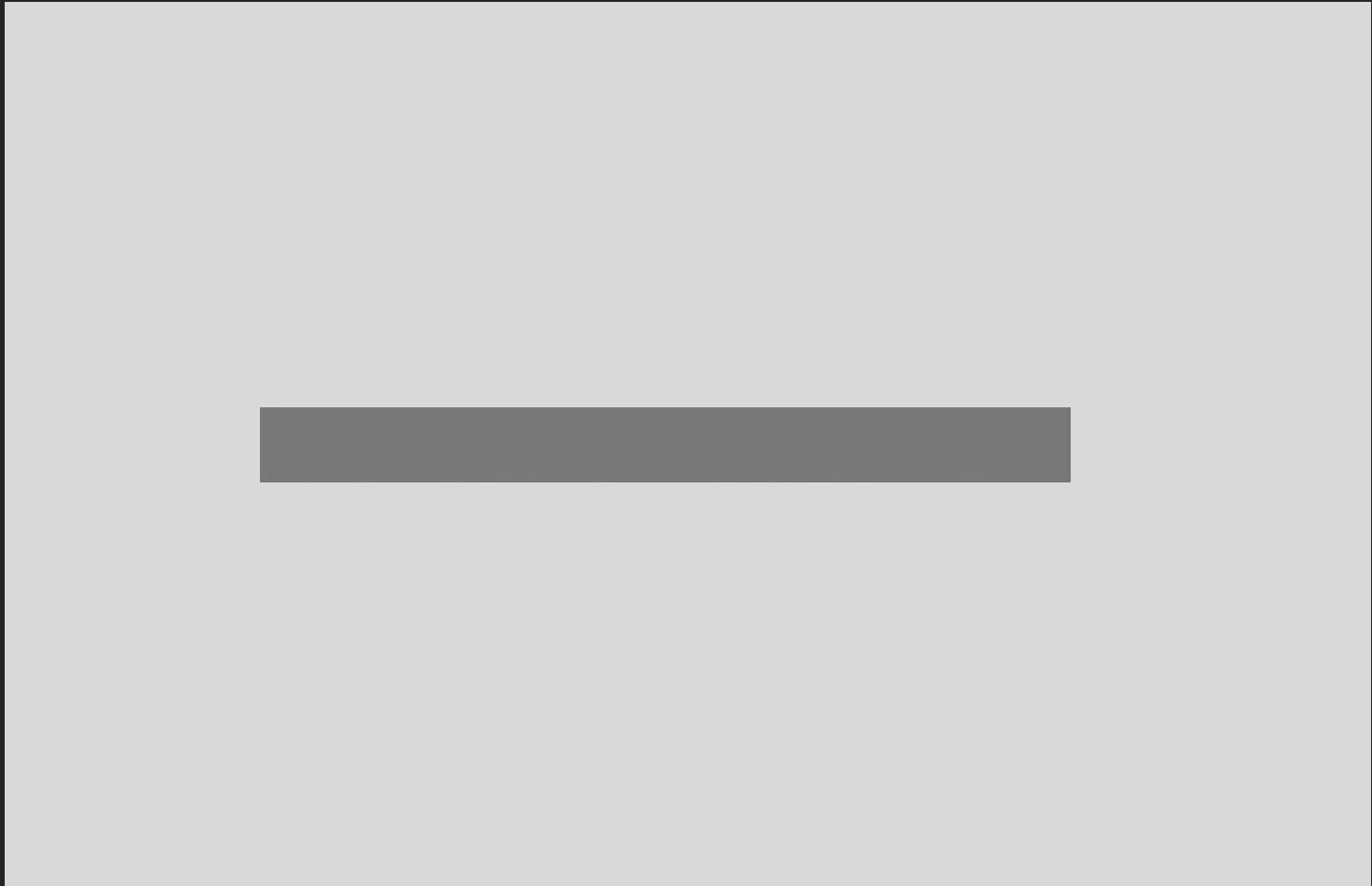
Why study optical illusions?

- Studying how brain is fooled teaches us how it works

“Illusions of the senses tell us the truth about perception” [Purkinje]

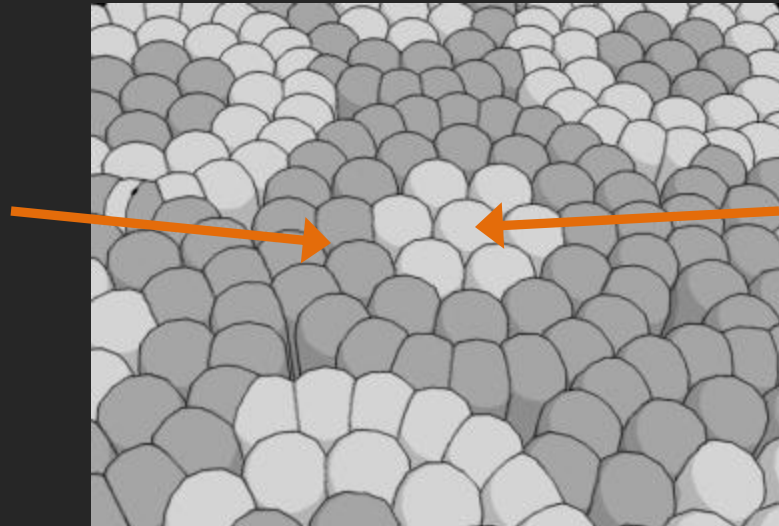
- It makes us happy 😊 : *Al Seckel*

Simultaneous Contrast Illusions



Low-level Vision Explanation

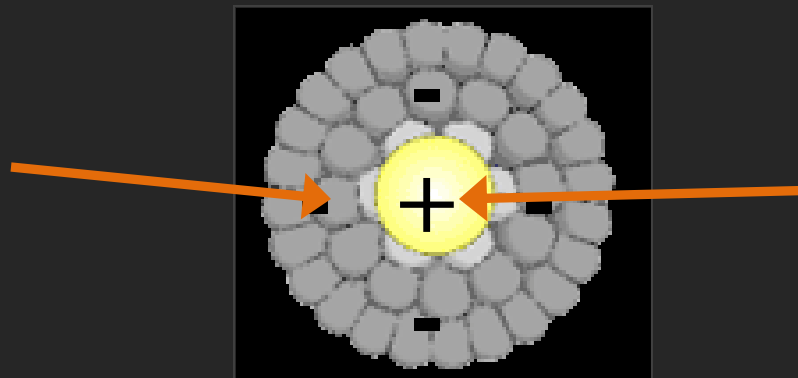
Negative
Photo-receptors



Positive
Photo-receptors

Receptive Fields in the Retina

Inhibitory
Light




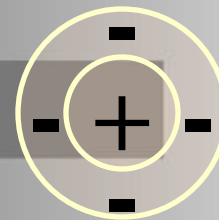
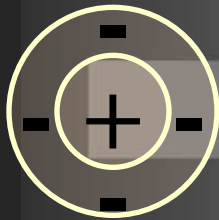
Excitatory
Light

Low-level Vision Explanation



Positive
Gradient

The graph shows a horizontal line that starts at a low level, then rises vertically to a higher level, and continues horizontally at that higher level.



Negative
Gradient

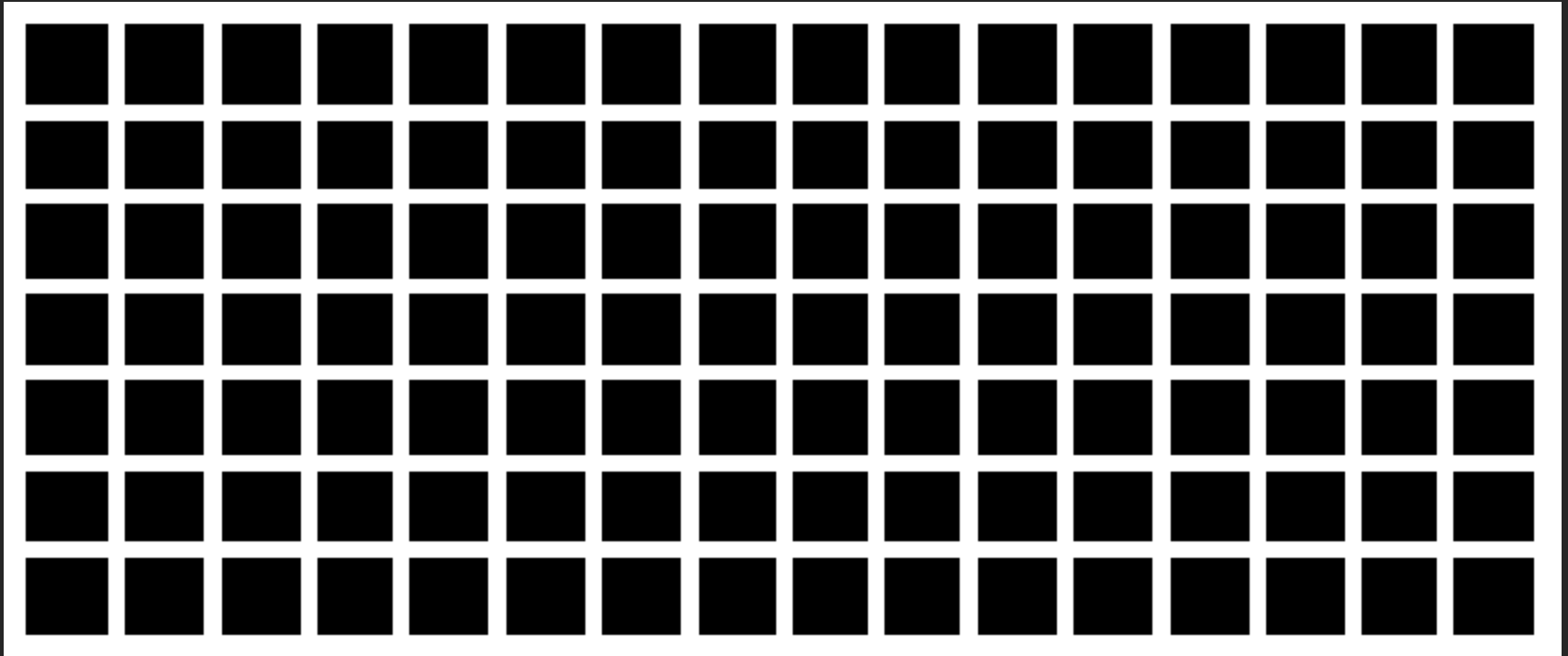
The graph shows a horizontal line that starts at a high level, then drops vertically to a lower level, and continues horizontally at that lower level.

High-level Vision Explanation: Context

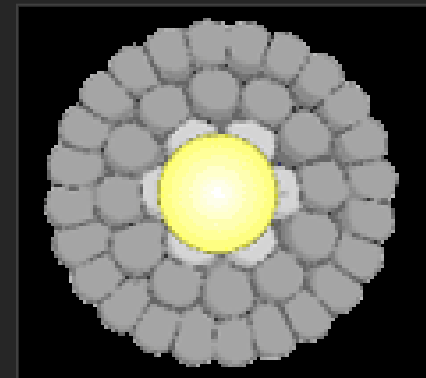
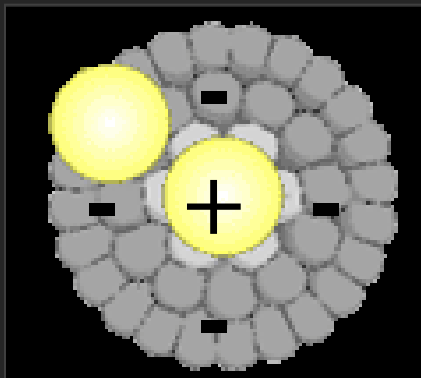
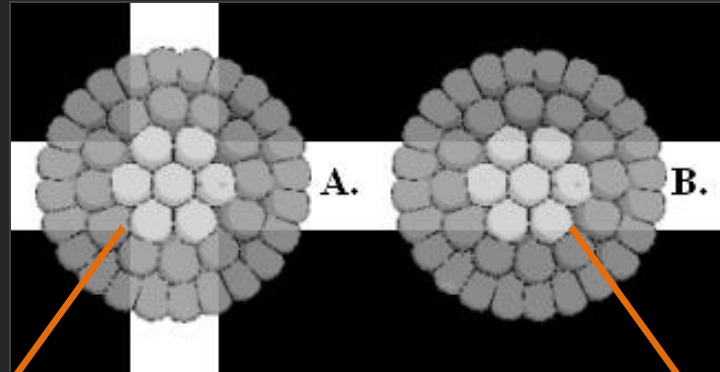


$$\text{Brightness} = \text{Reflectance} * \text{Incident Illumination}$$

The Hermann grid illusion

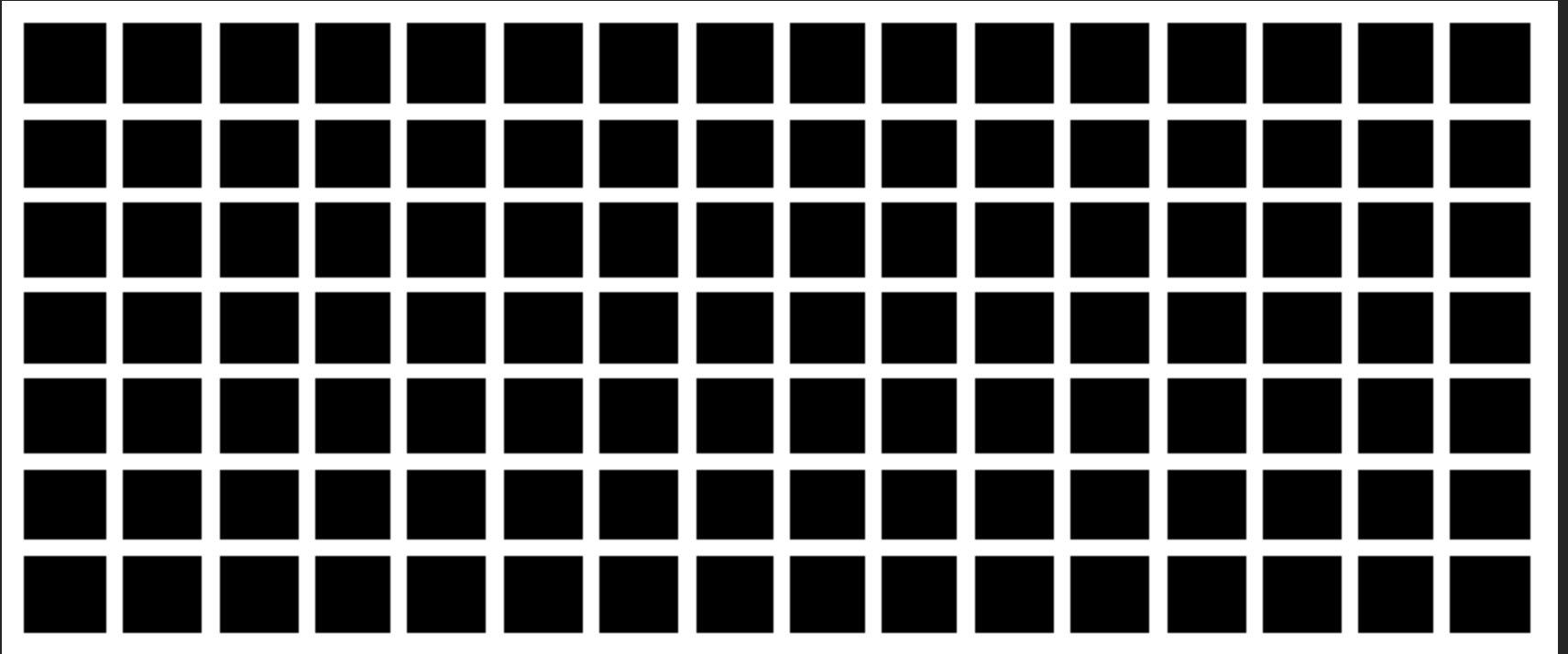


The Hermann grid: Low level Explanation



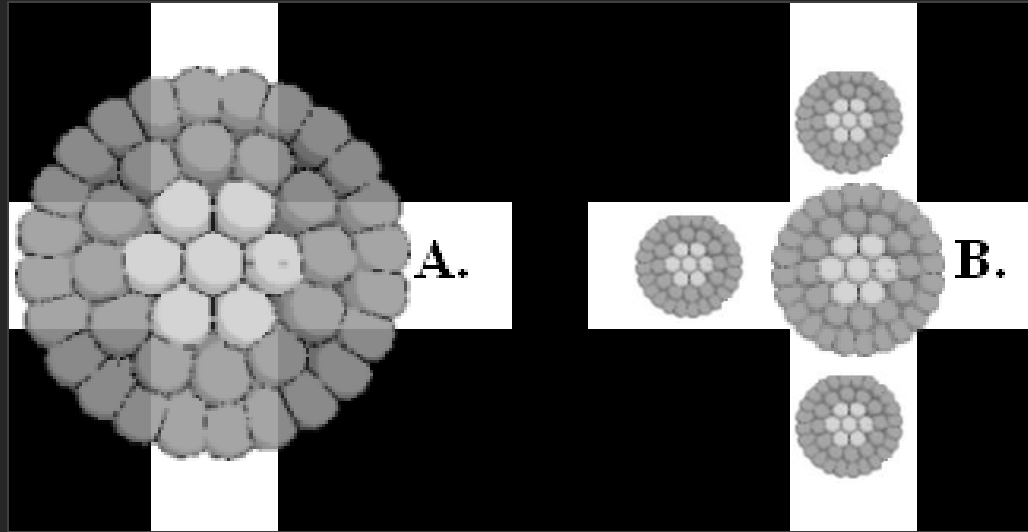
Lateral Inhibition

The Hermann grid illusion



Focus on one intersection

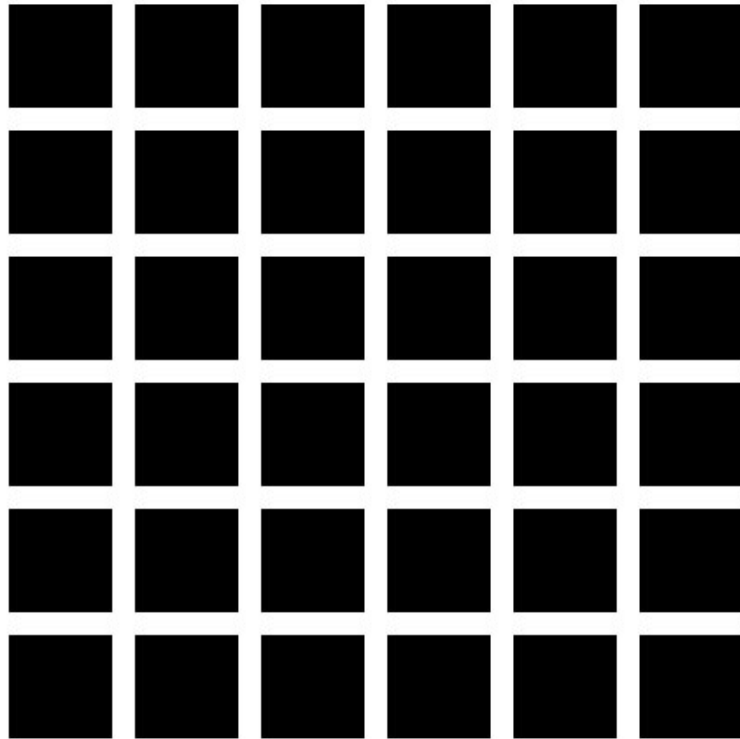
Why does the illusion disappear?



Receptive fields are smaller near the fovea (center) of the eye

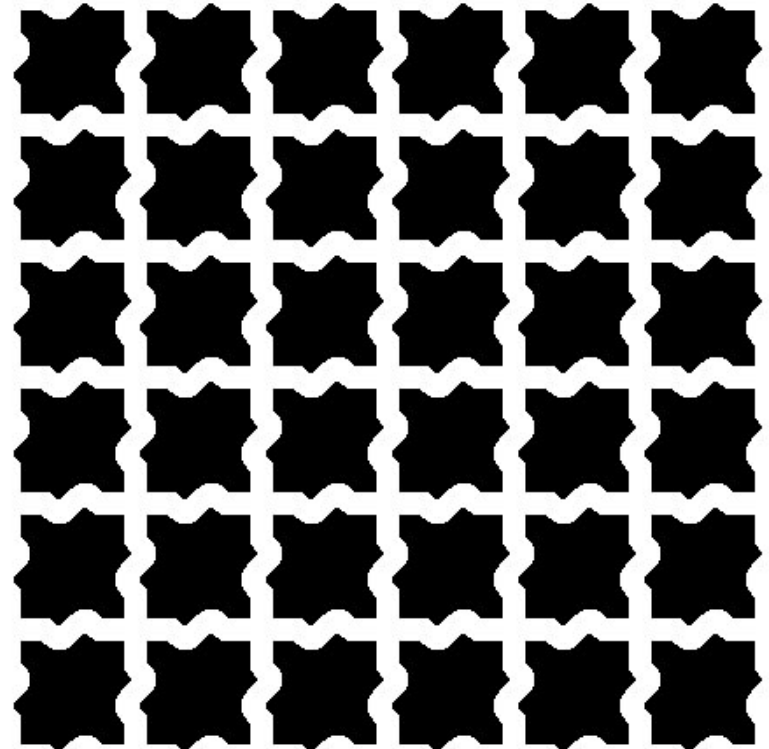
The Waved Grid: No illusion!

The Hermann grid



Why do you see spots?

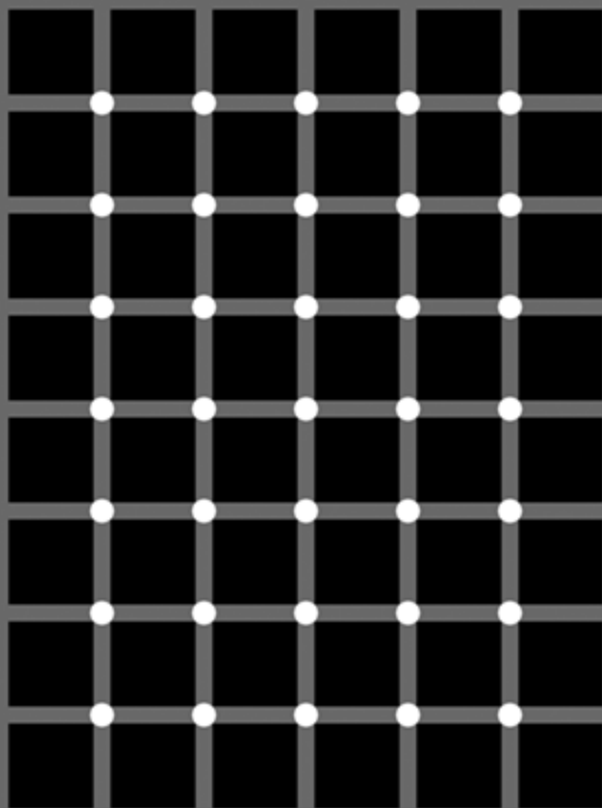
The waved grid



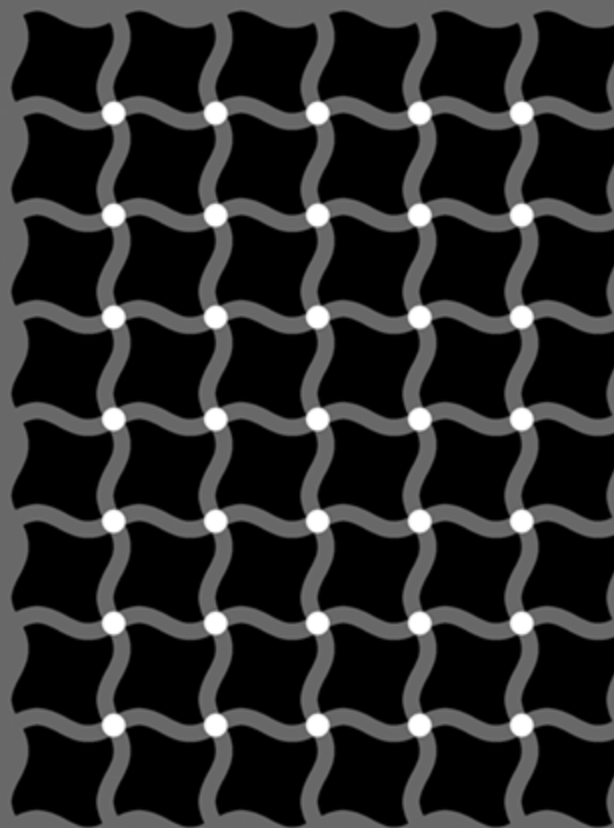
Why don't you see spots?

Image by J. Geier <janos@geier.hu>

Scintillating Grids: Straight and Curved

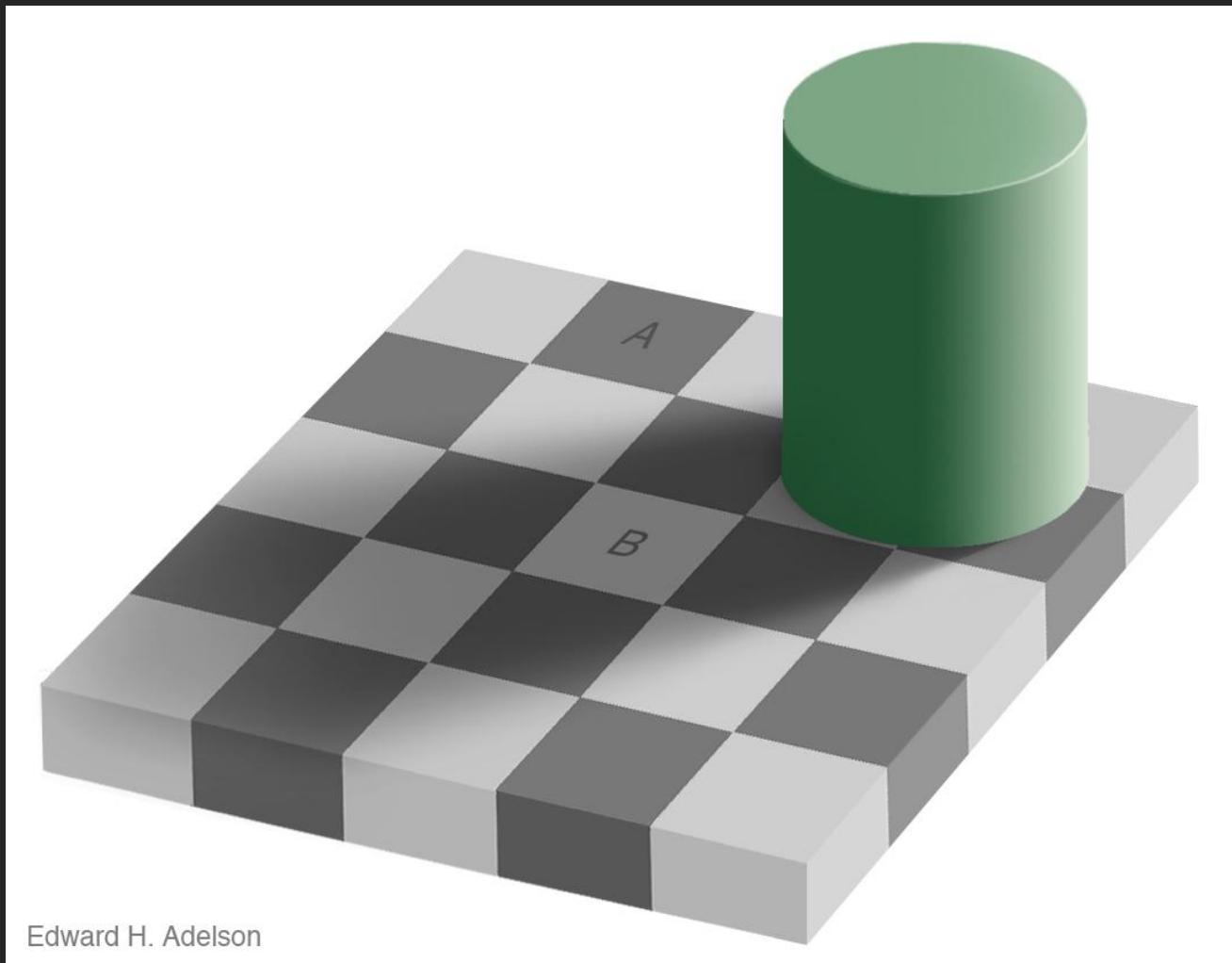


Scintillation grid: you see scintillations

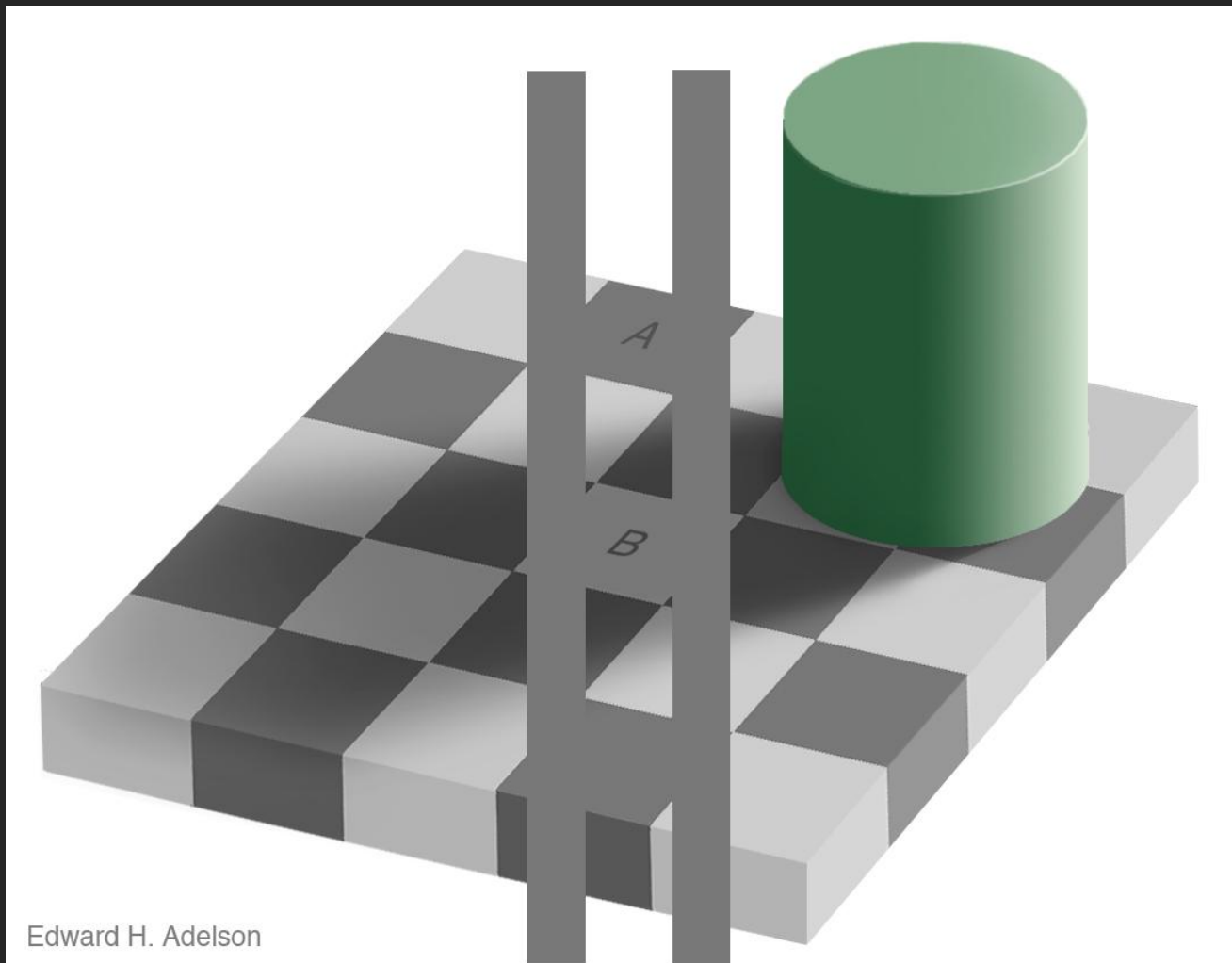


Sinusoid variation: you do not see scintillations

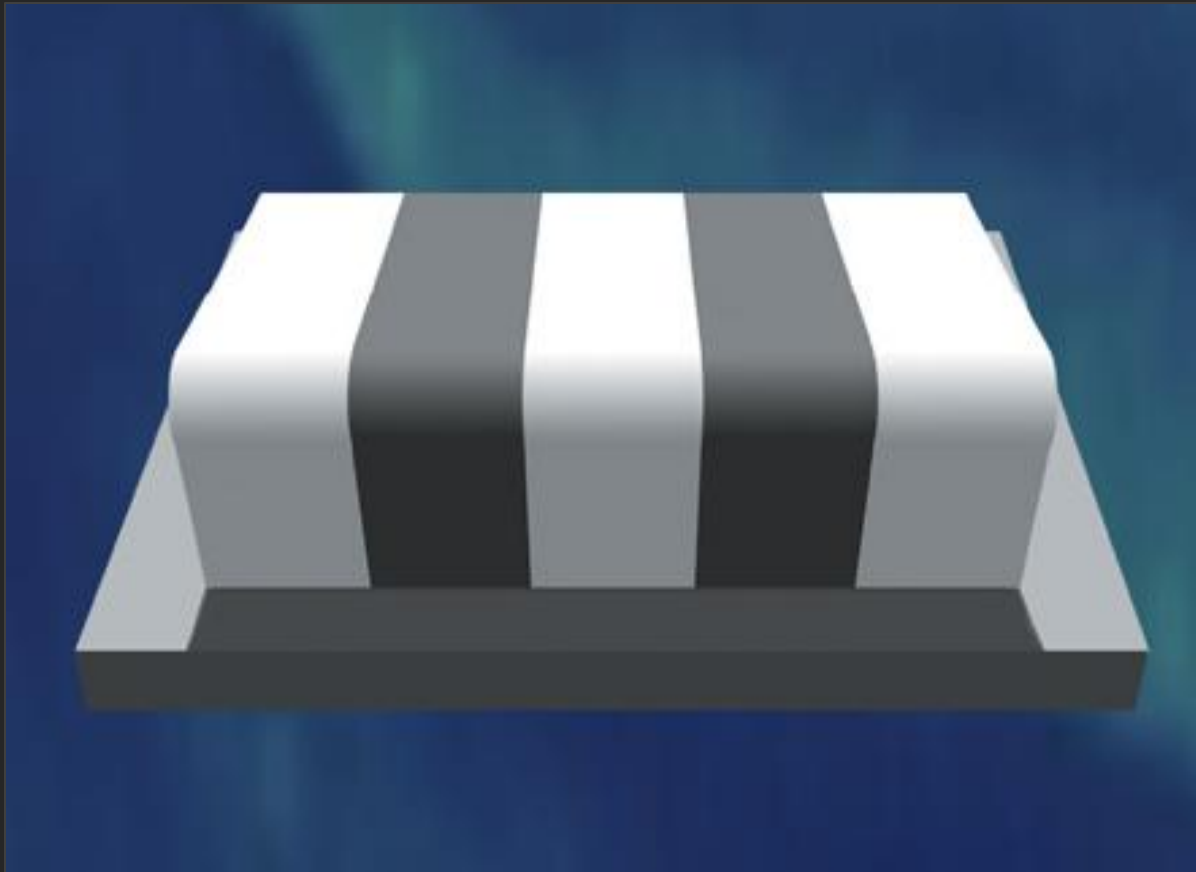
Adelson's checkerboard illusion



Adelson's checkerboard illusion



Where is the illusion?

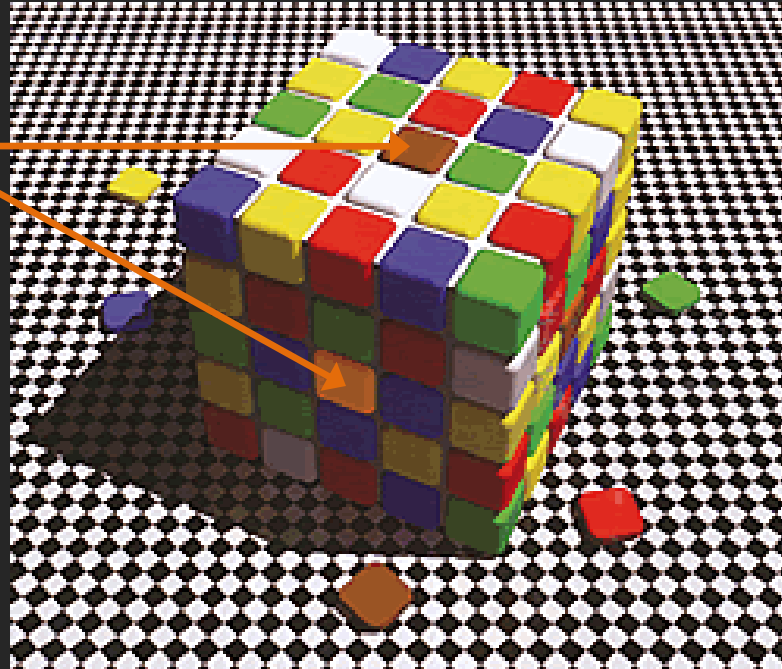


Where is the illusion?

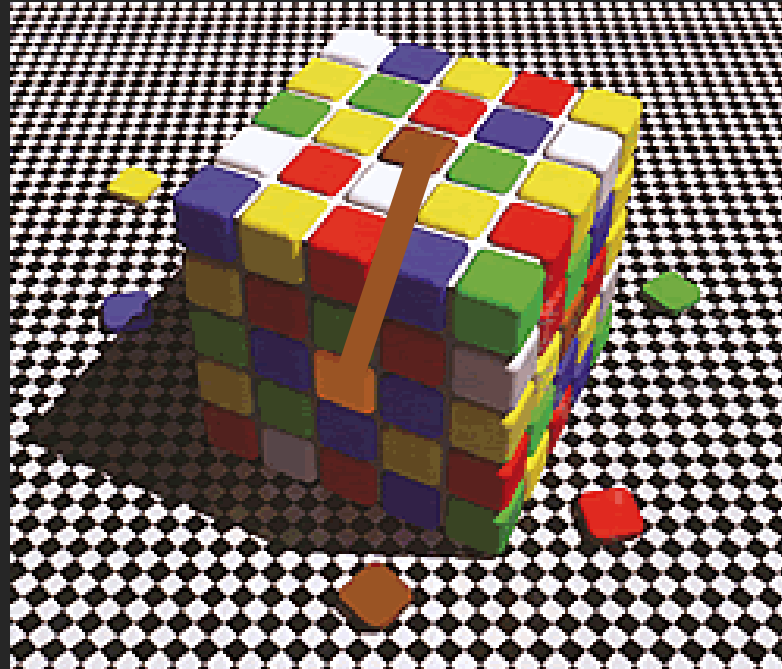


Rubik's Cube Color Illusion

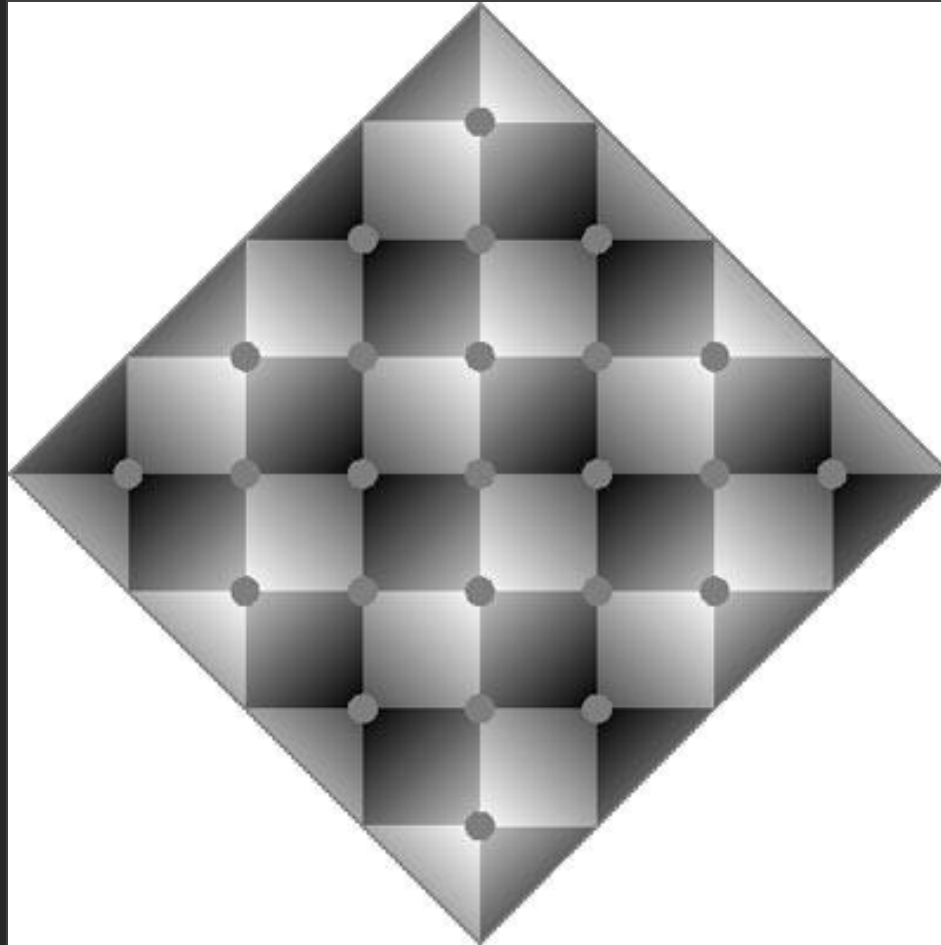
Same Color?



Rubik's Cube Color Illusion

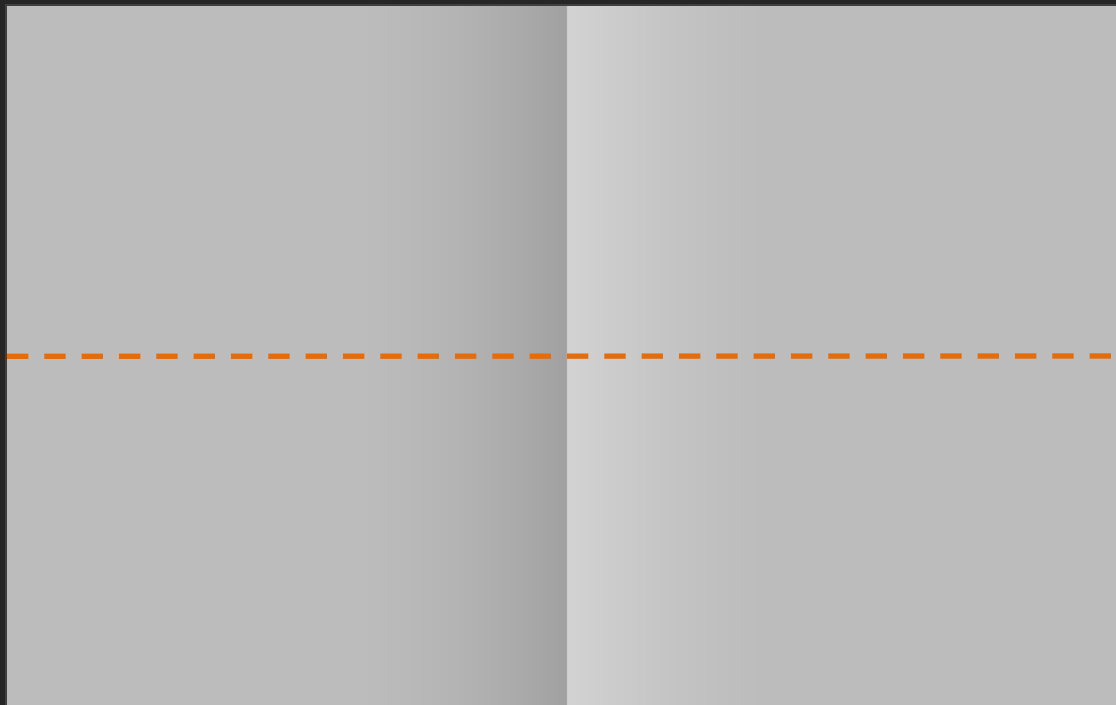


Todorovic's Gradient Chessboard Illusion



Are all the dots the same color?

Craik-O'Brien-Cornsweet Illusion



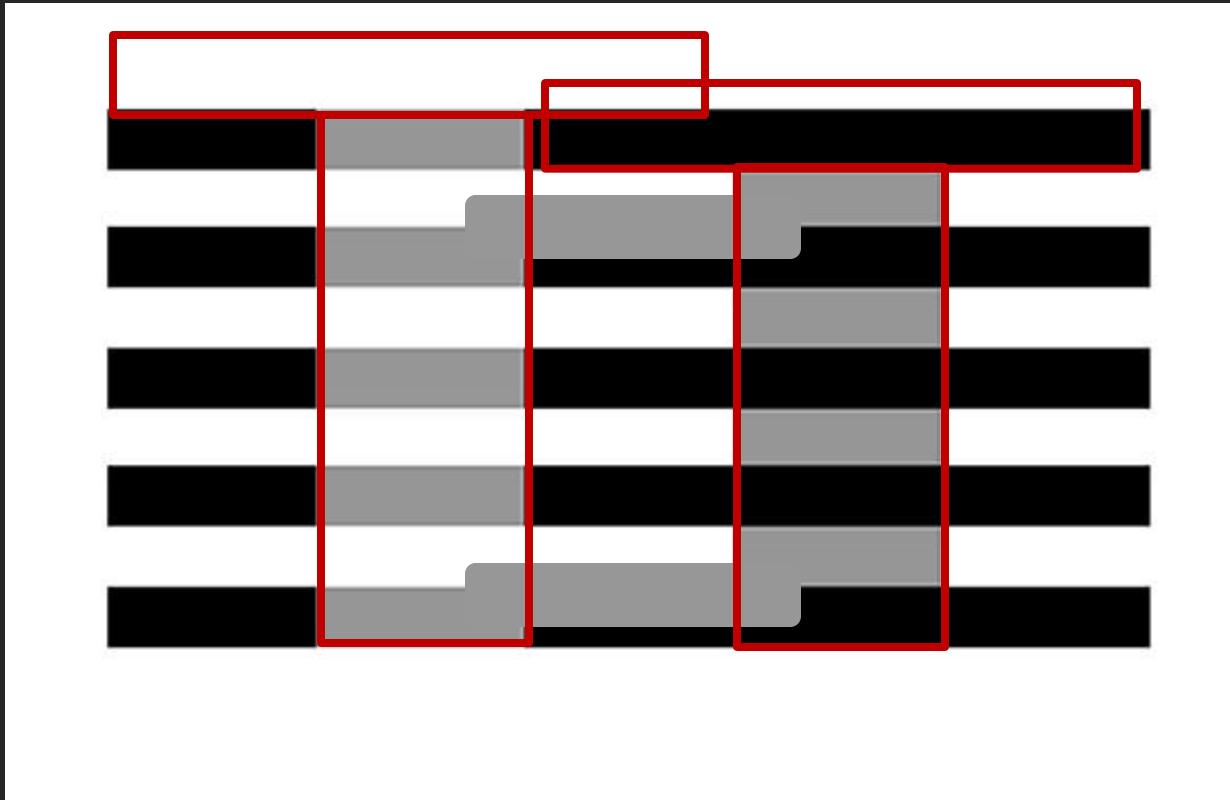
Actual Profile



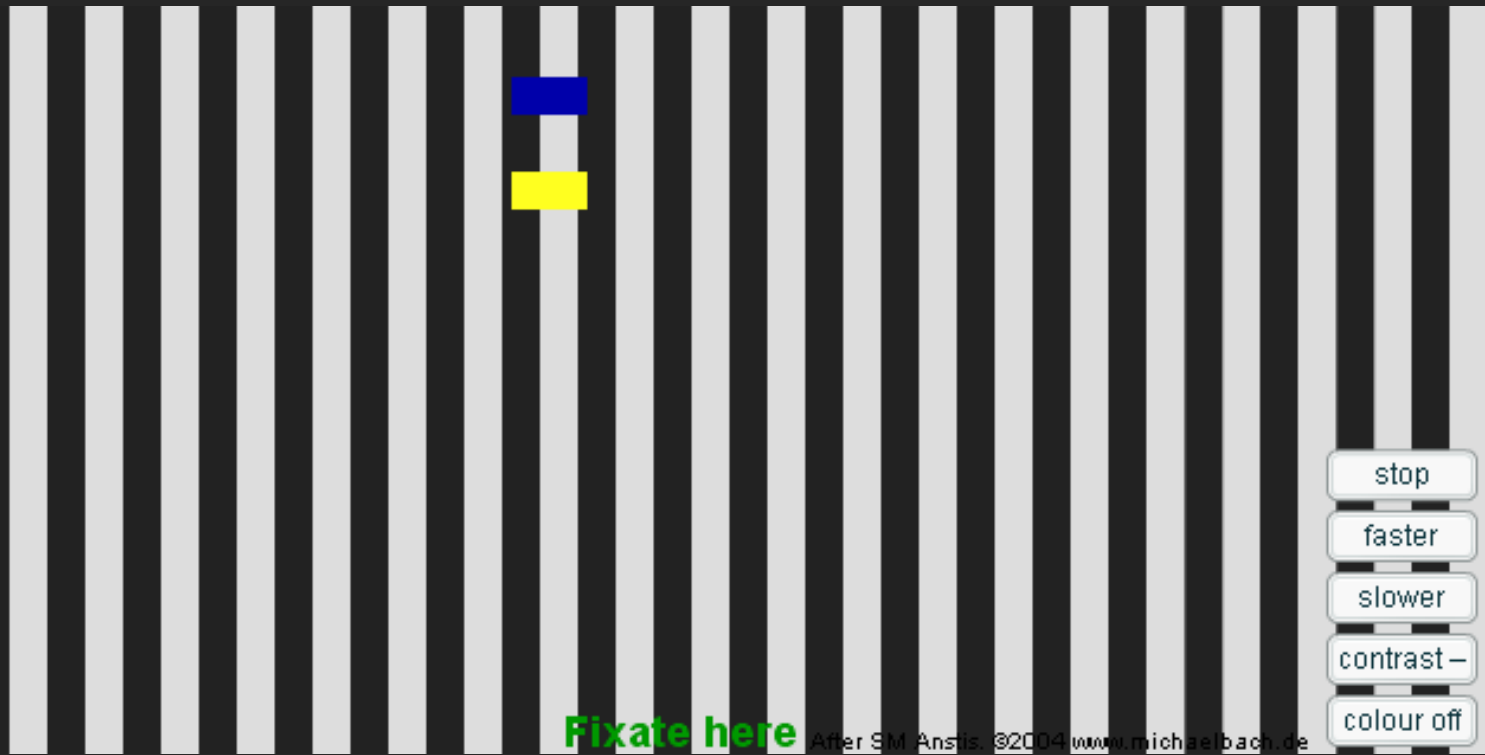
Perceived Profile



White's Illusion



Footstep Illusion

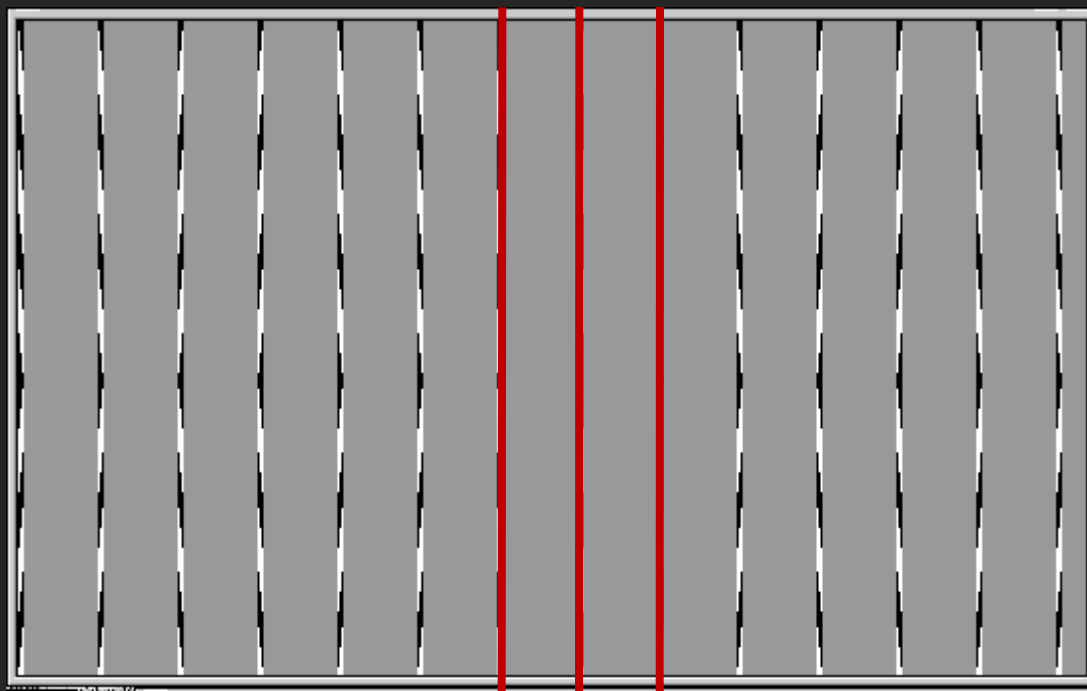


Contrast affecting Perception of speed

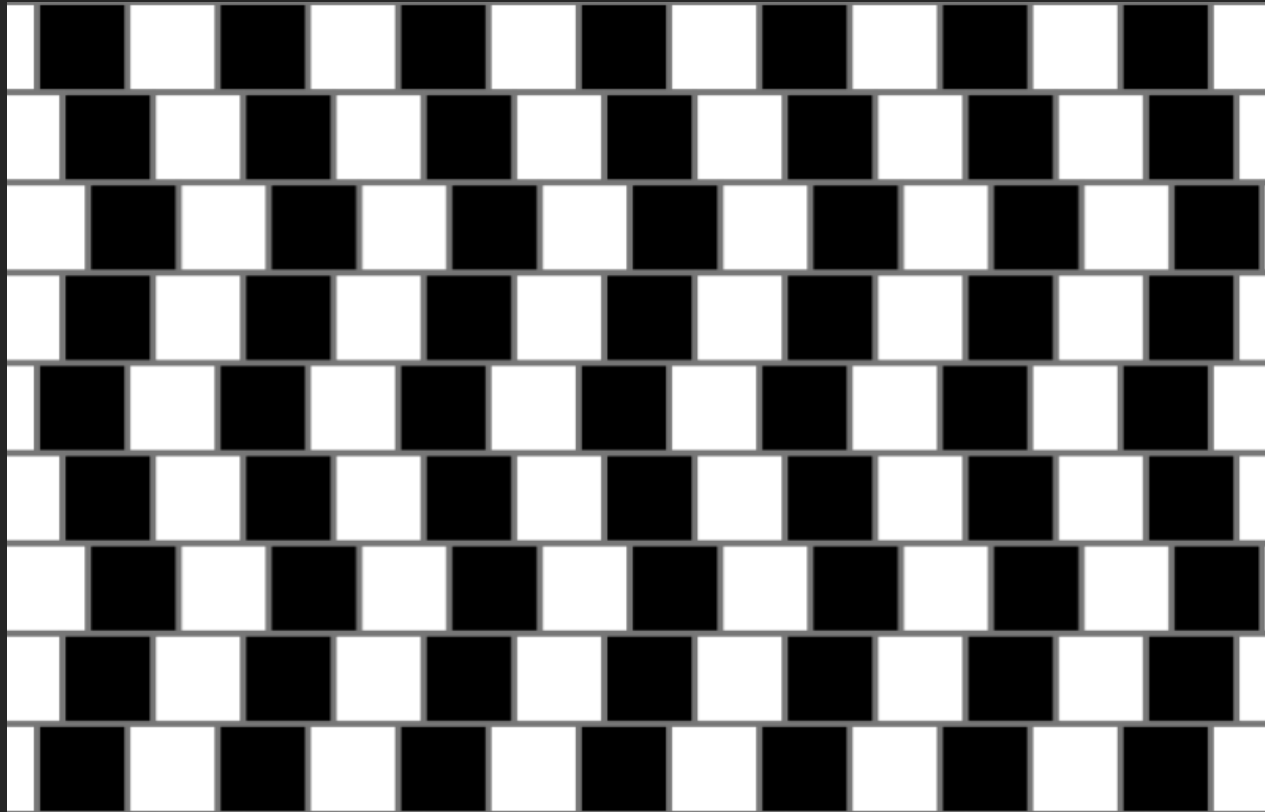
[Click](#)

Twisted Cord Illusions

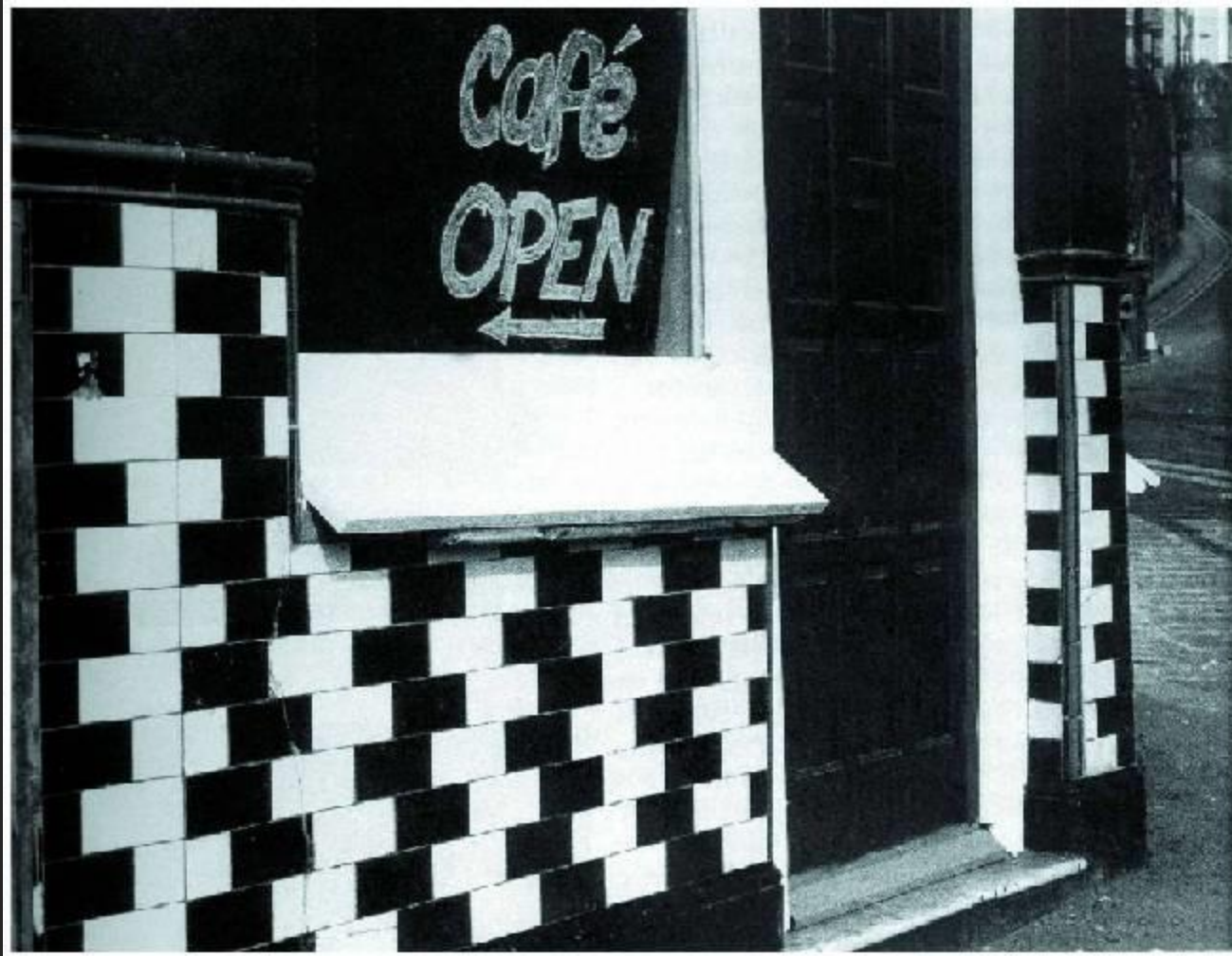
Are the lines parallel? Straight?



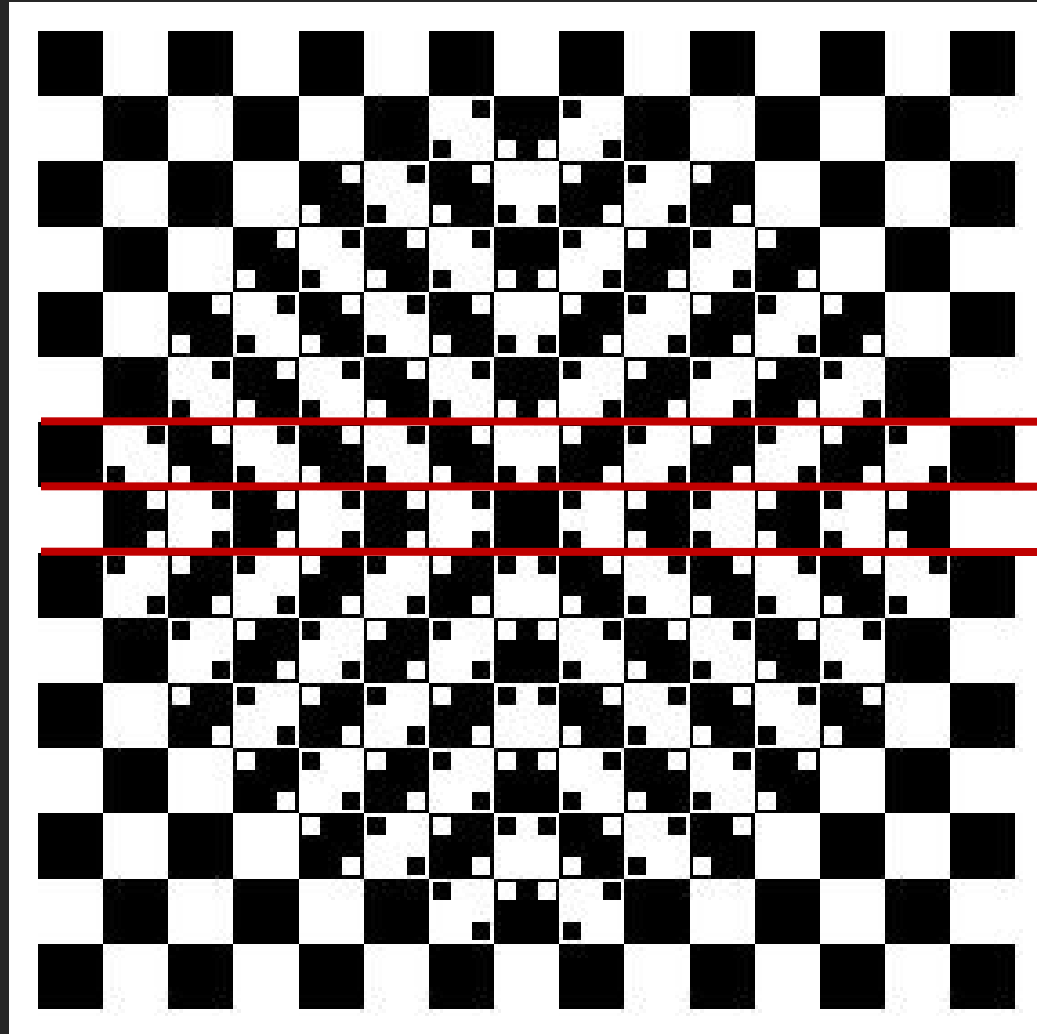
Café Wall Illusion



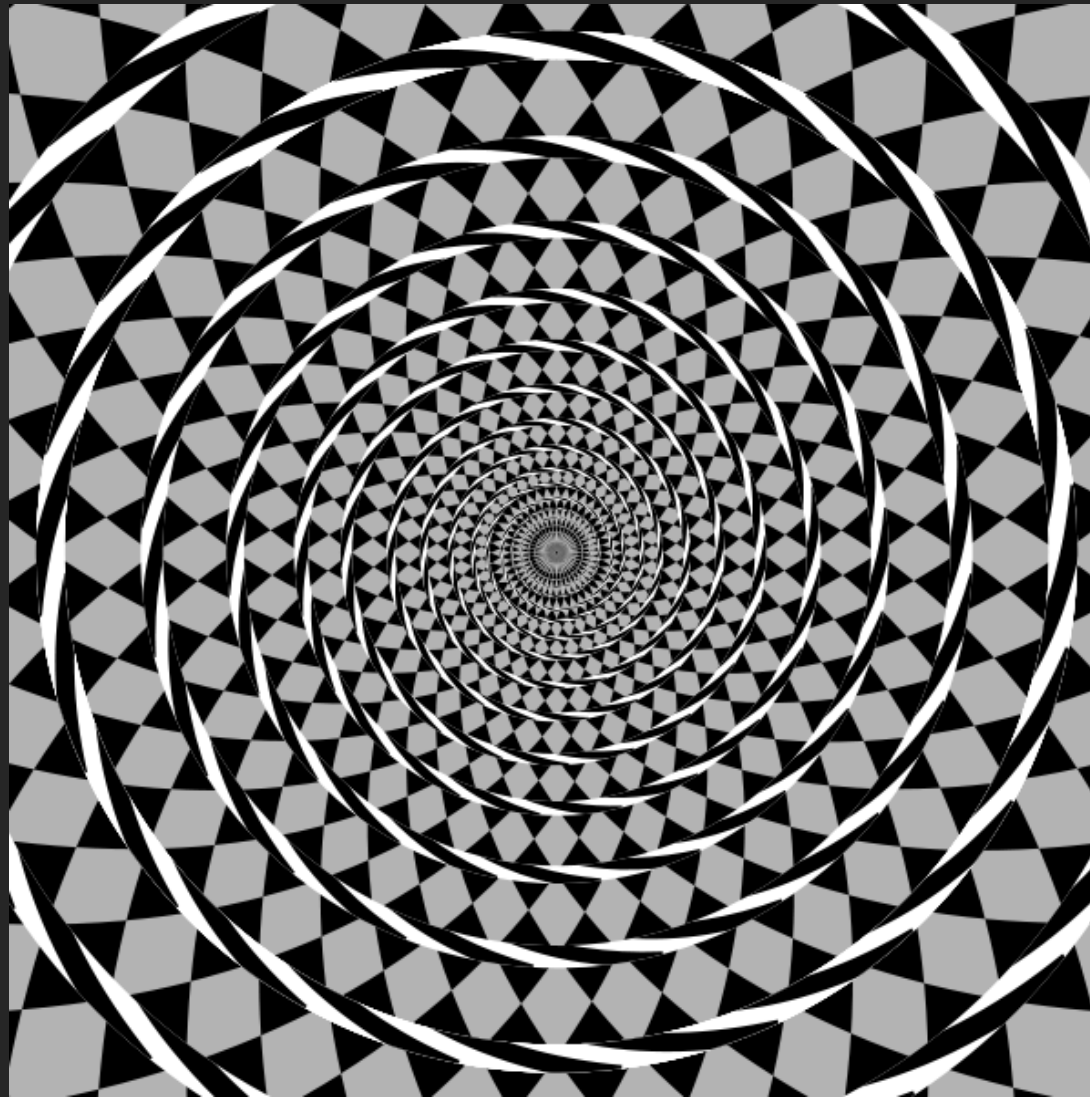
Café Wall Illusion



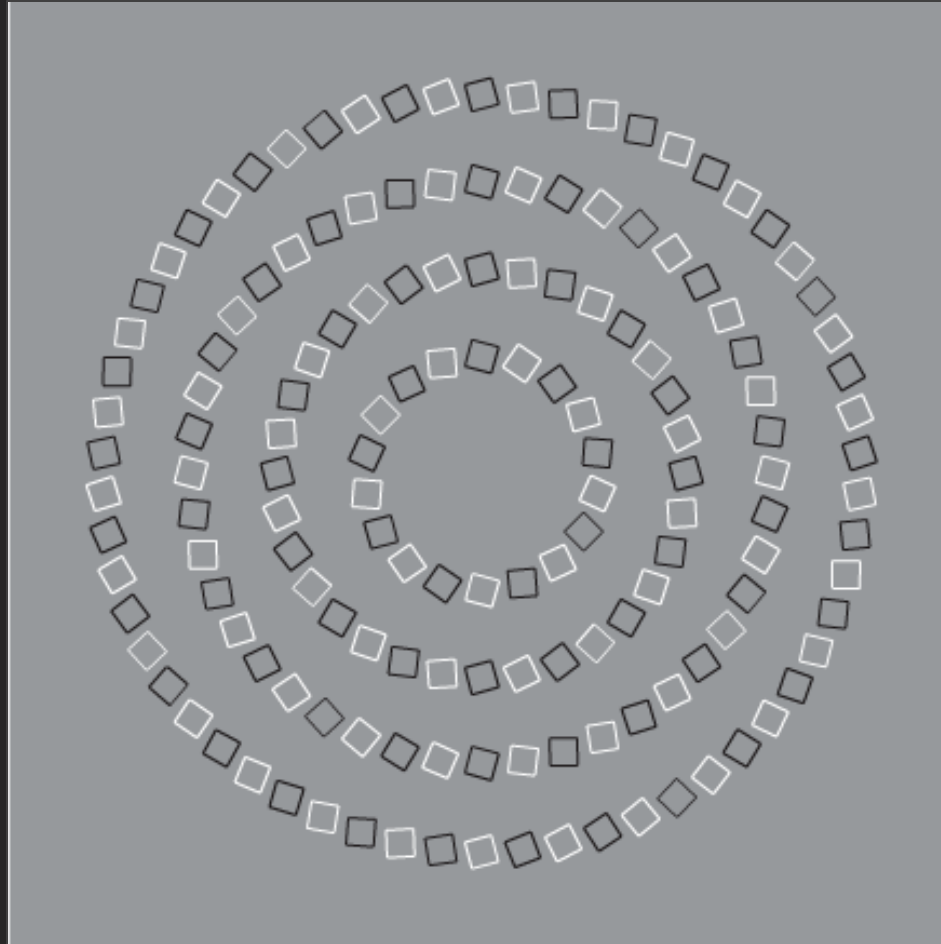
A variant of the Café Wall Illusion



The Fraser Spiral Illusion

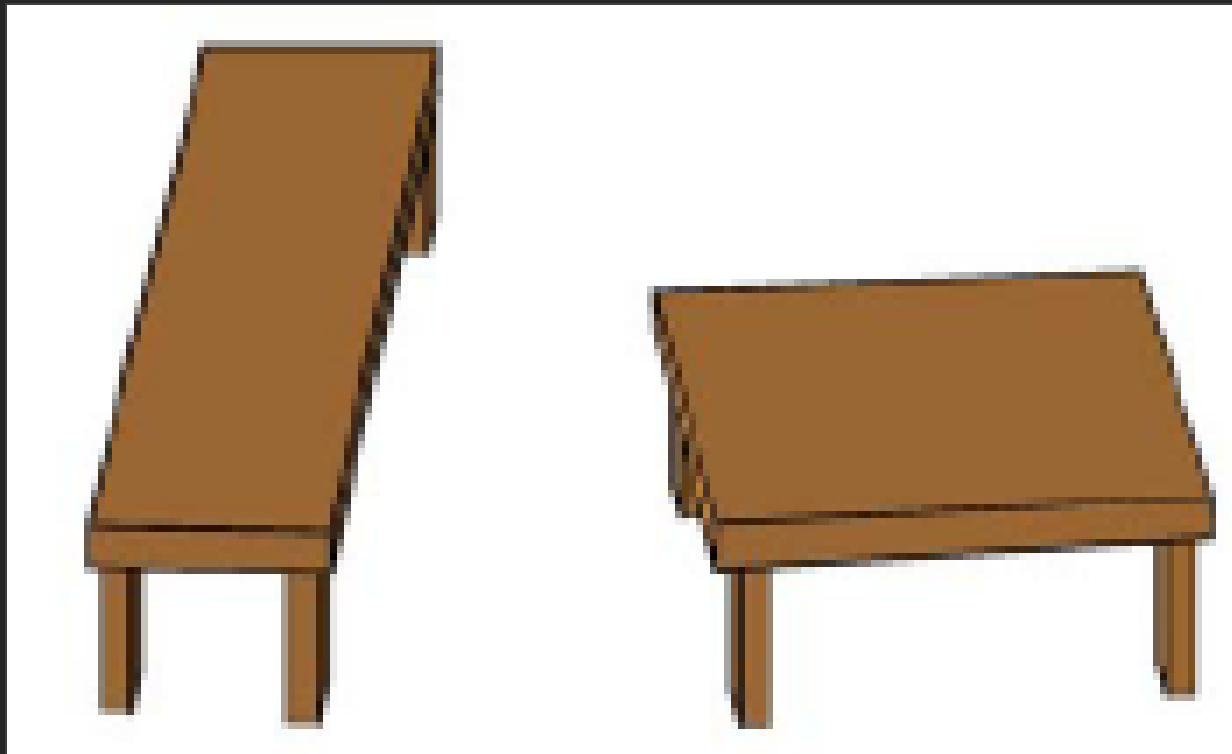


Pinna's Intertwining Illusion



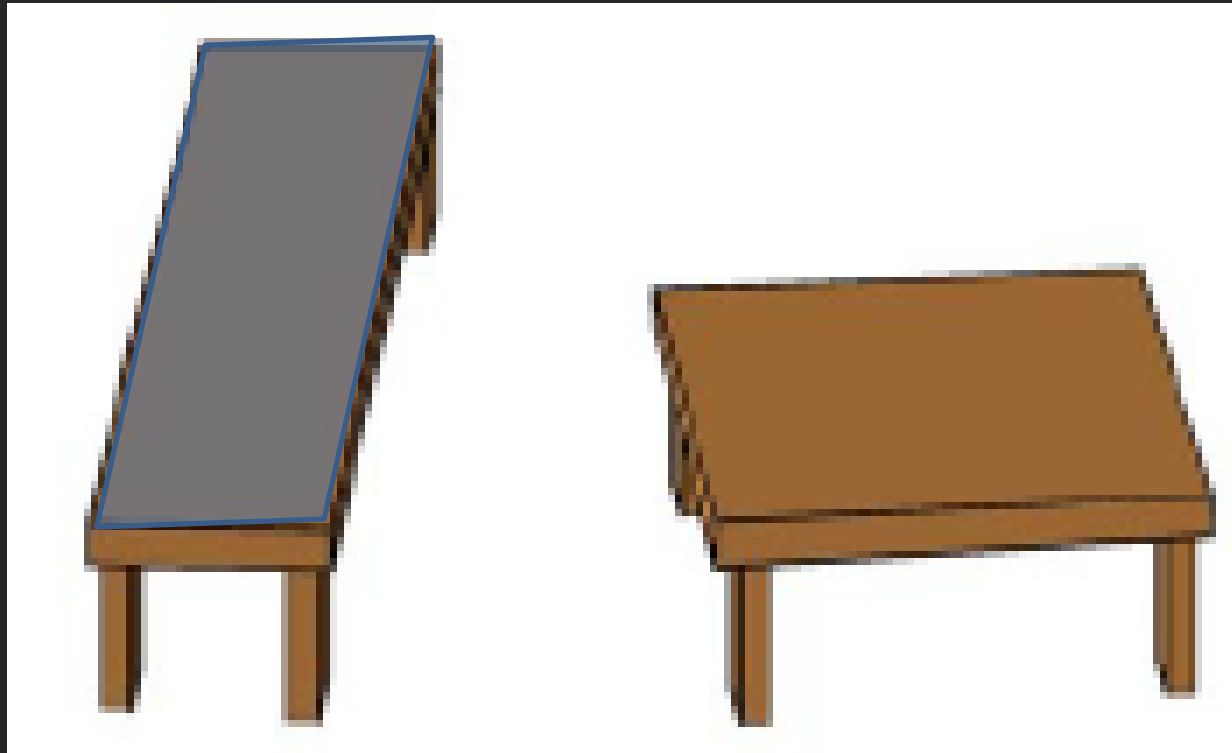
Illusions involving perspective

Shepard's table-top illusion



Which is bigger?

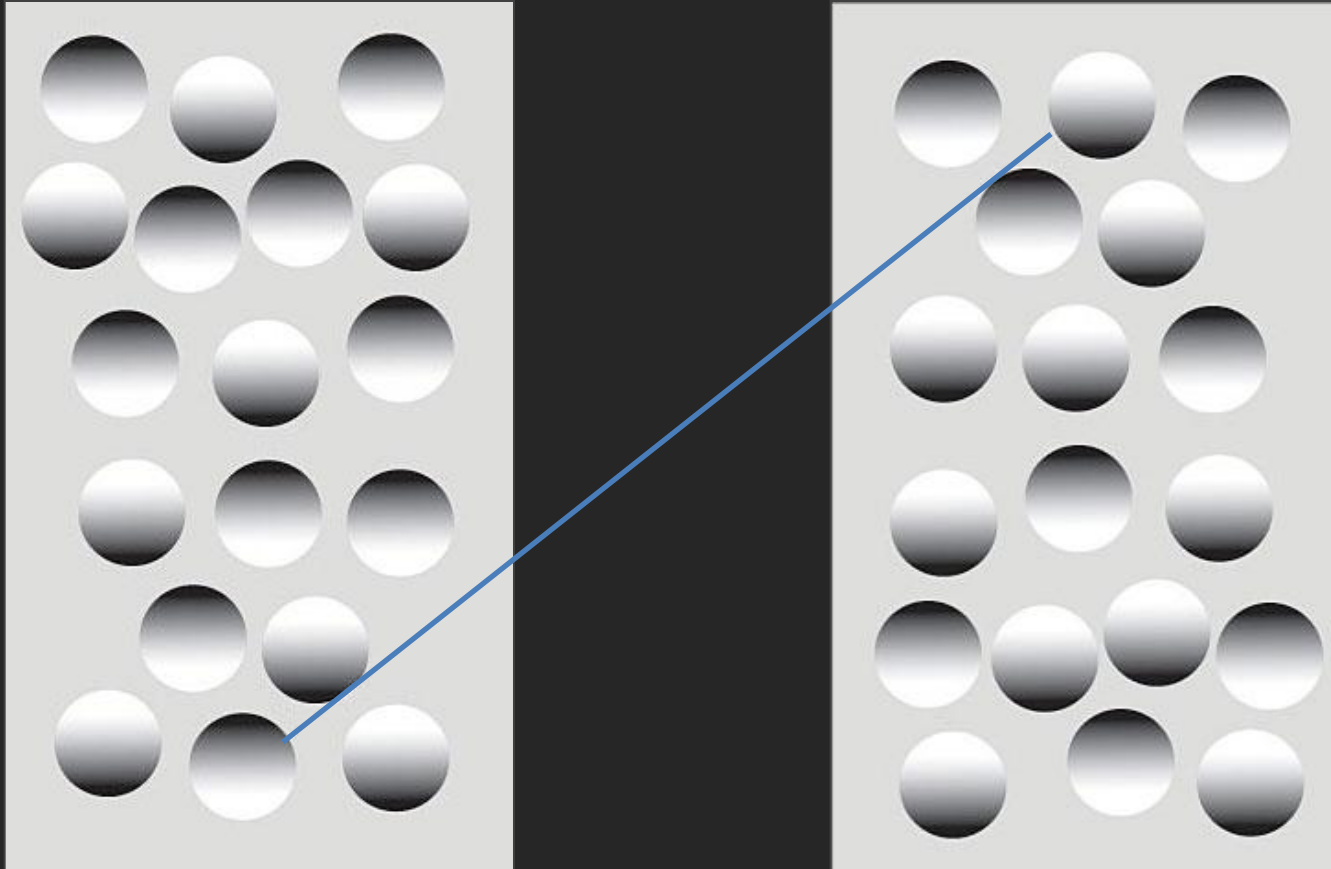
Shepard's table-top illusion



Which is bigger?

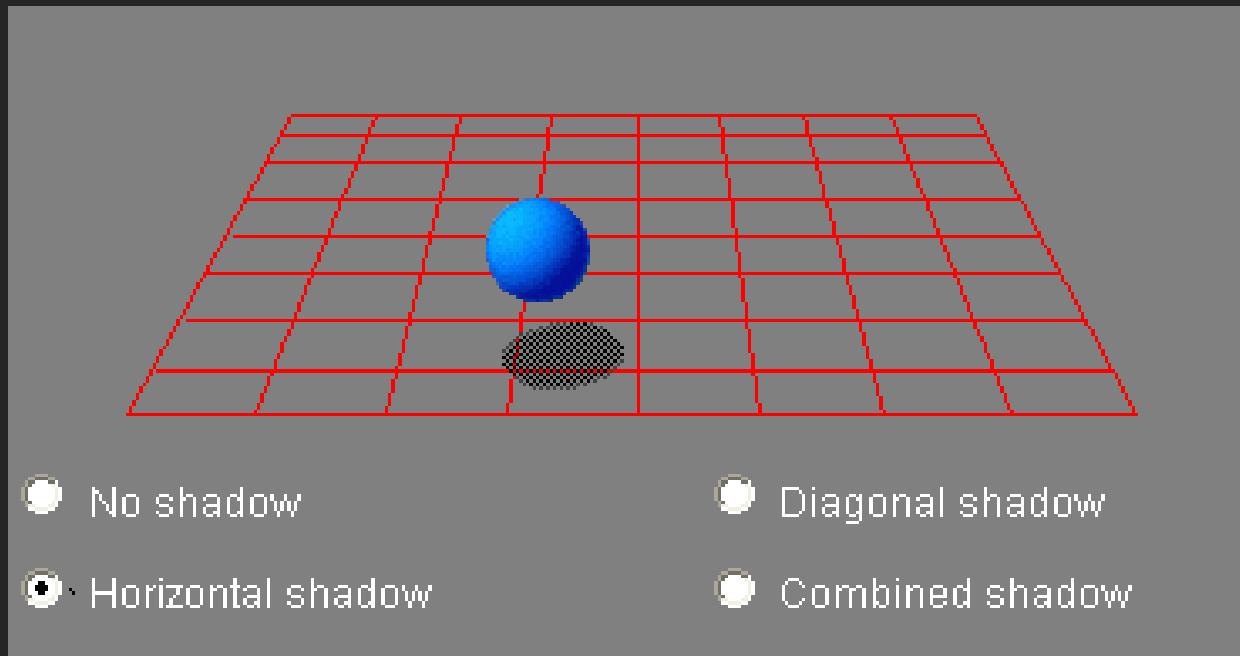
Shadow Illusions

Shape-from-Shading



Shadows influence the perception of shape

Kersten's Ball and Shadow Illusion

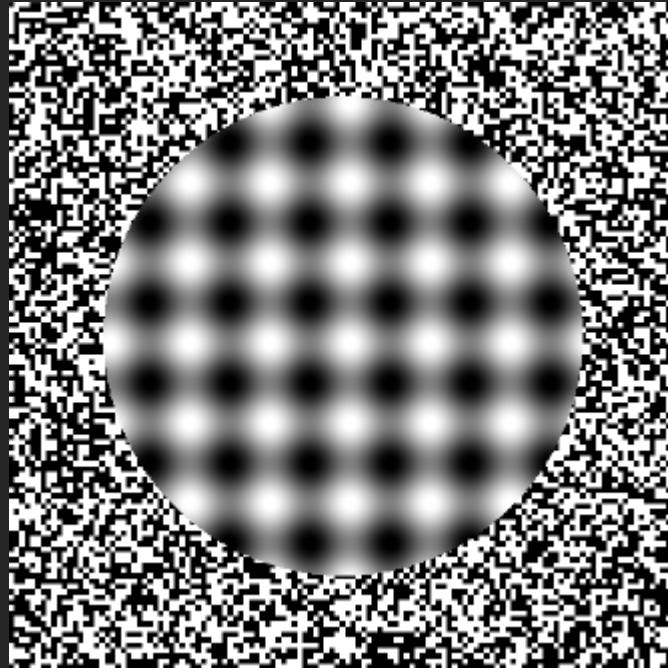


[Click](#)

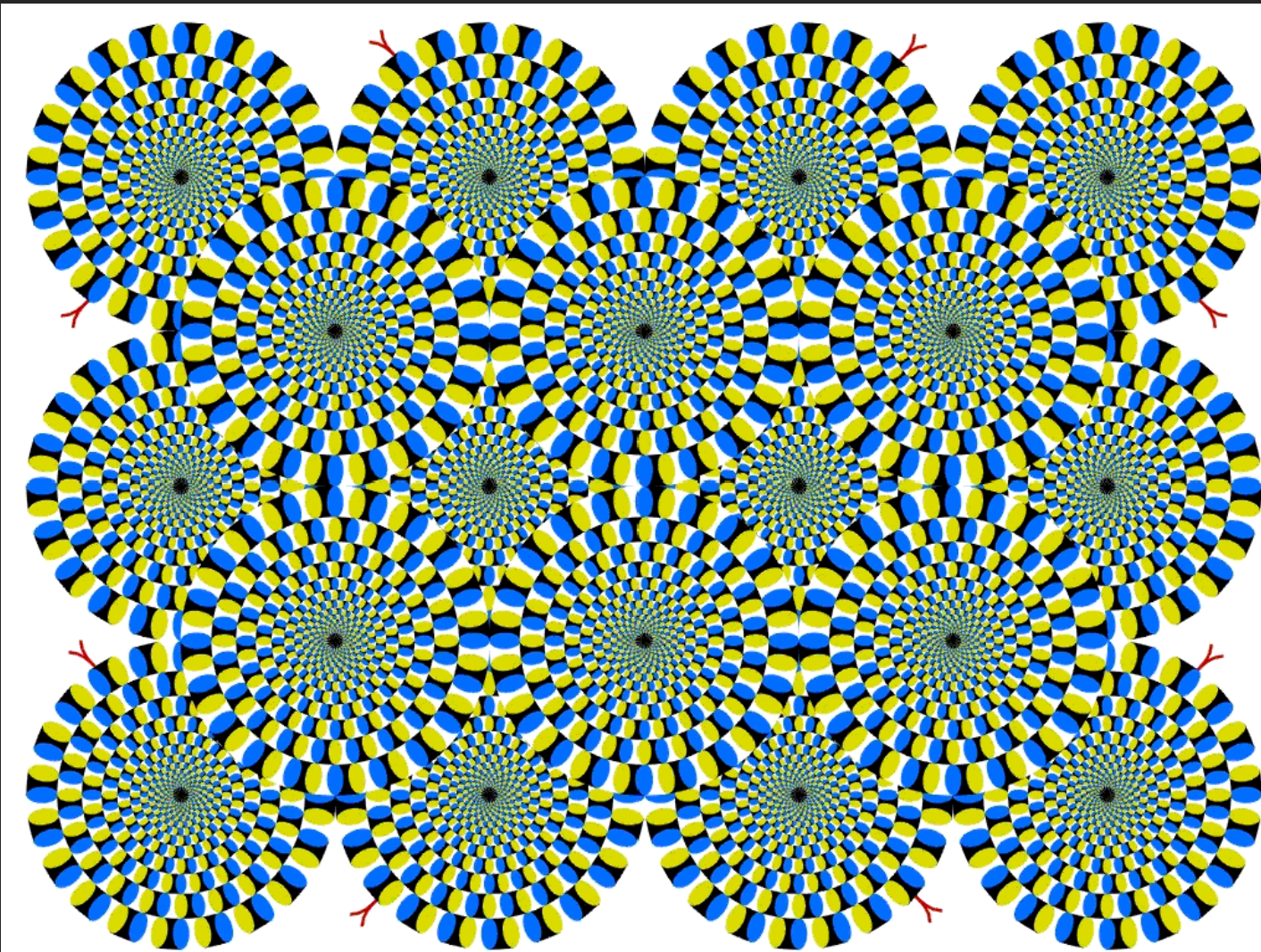
Shadows influence the perception of motion and position

Relative Motion Illusions

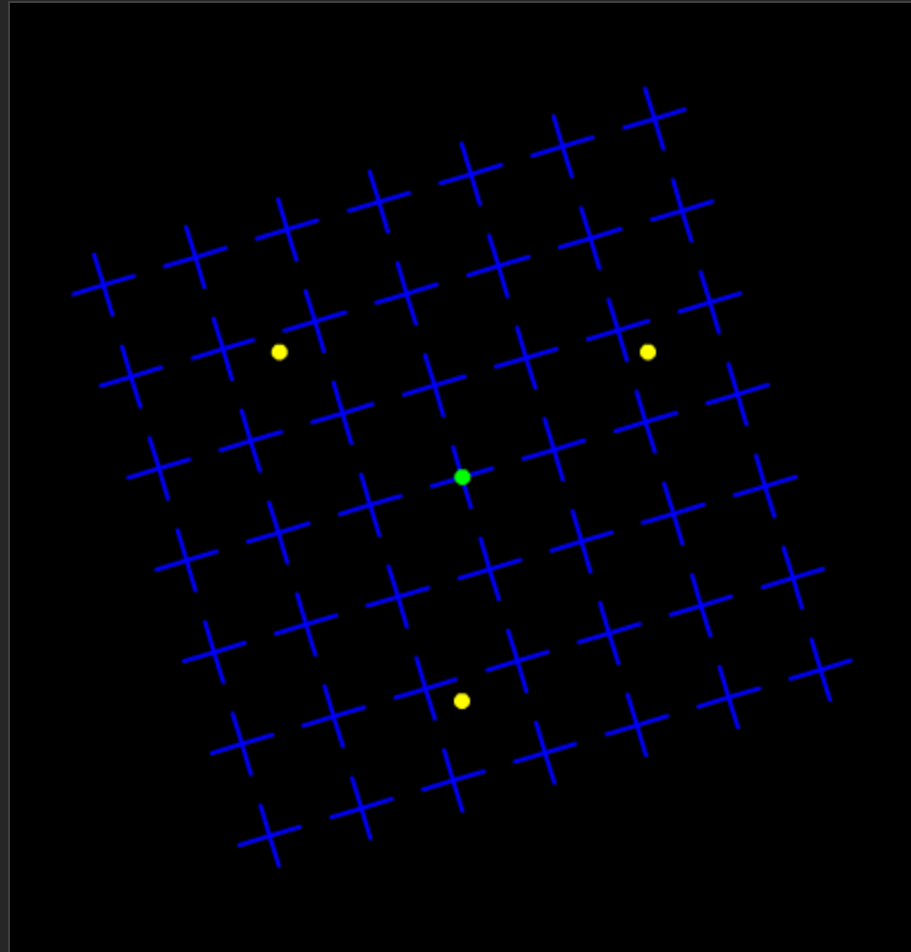
Out of Focus Illusion



Spinning Wheel Illusion

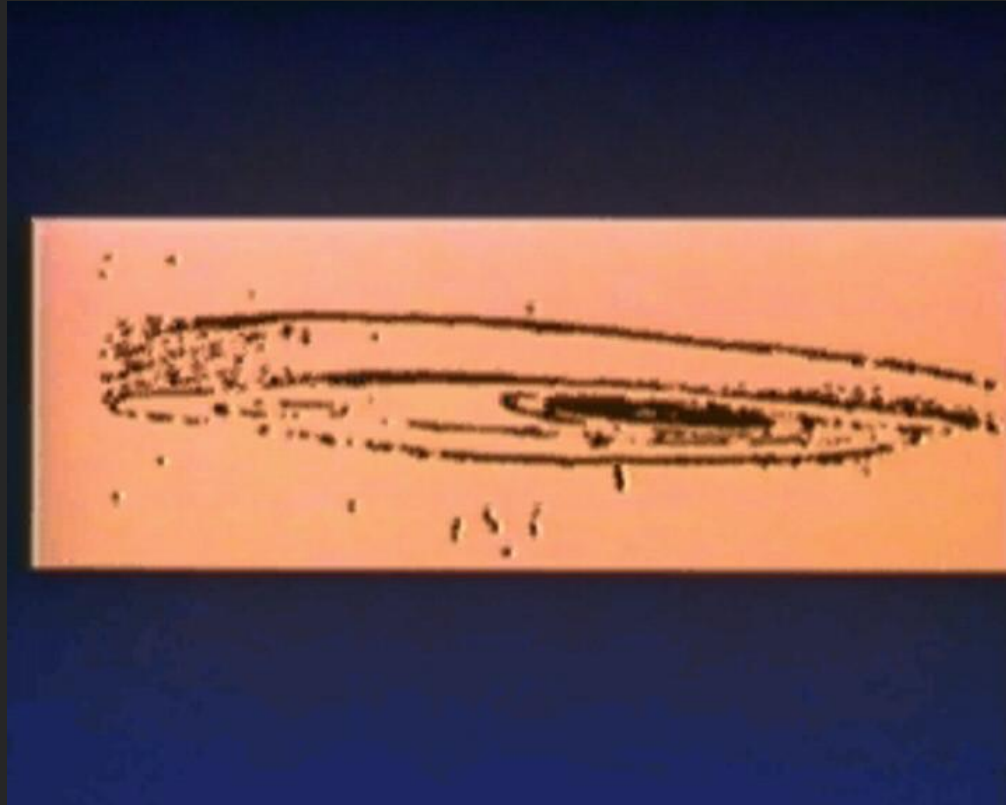


Motion Induced Blindness



[Click](#)

Anamorphoses



Leonardo's Eye [Leonardo Da Vinci, 1485]



Good things come to those who wait



Why study optical illusions?

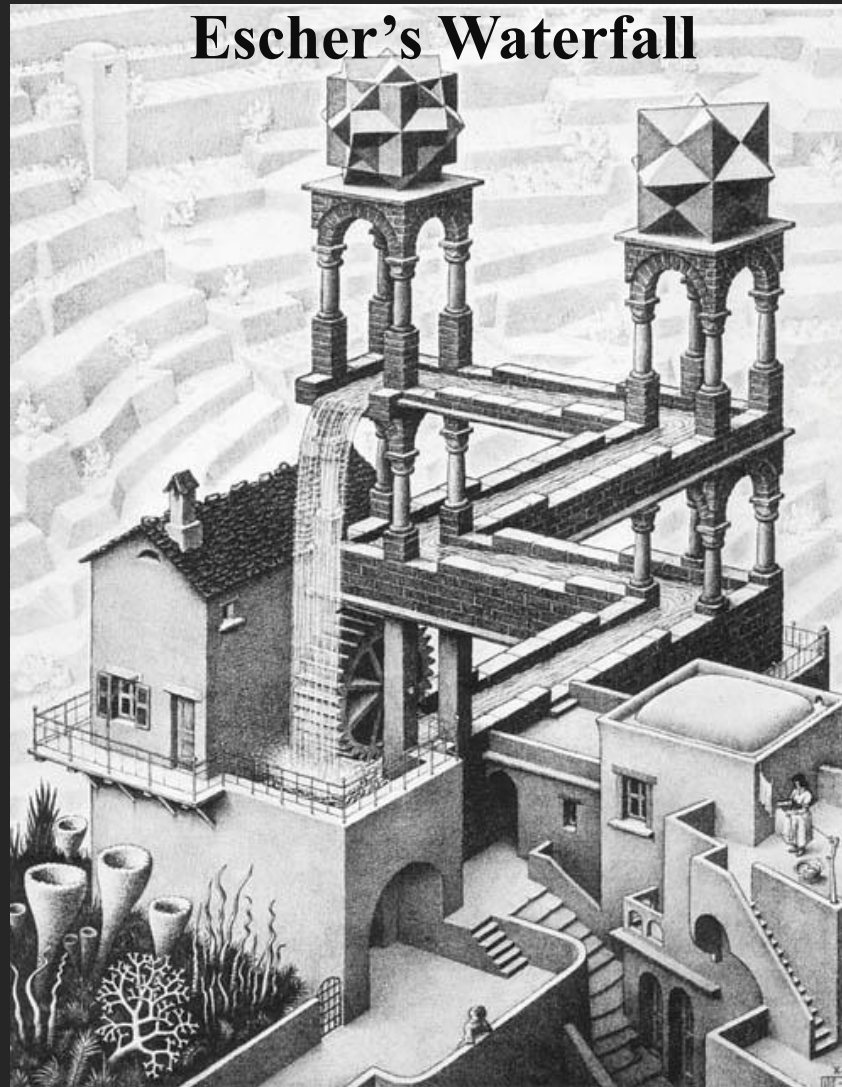
- Studying how brain is fooled teaches us how it works

“Illusions of the senses tell us the truth about perception” [Purkinje]

- It makes us happy 😊 : *Al Seckel*

[Click](#)

Have fun with Optical Illusions



Then think about them!