What are optical illusions?

Perception: I see

Truth: But this is an illusion!

Oracle
Optical Illusion in Nature

Image Courtesy: http://apollo.lsc.vsc.edu/classes/met130/notes/chapter19/graphics/infer_mirage_road.jpg
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

Receptive Fields in the Retina

Negative Photo-receptors

Positive Photo-receptors

Inhibitory Light

Excitatory Light
Low-level Vision Explanation

Positive Gradient

Negative Gradient
High-level Vision Explanation: Context

Brightness = Reflectance * Incident Illumination

Less Incident Illumination

More Incident Illumination

Higher Perceived Reflectance

Lower Perceived Reflectance
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!

Why do you see spots?

Why don't you see spots?
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
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

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
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Click
Have fun with Optical Illusions

Escher’s Waterfall

Then think about them!