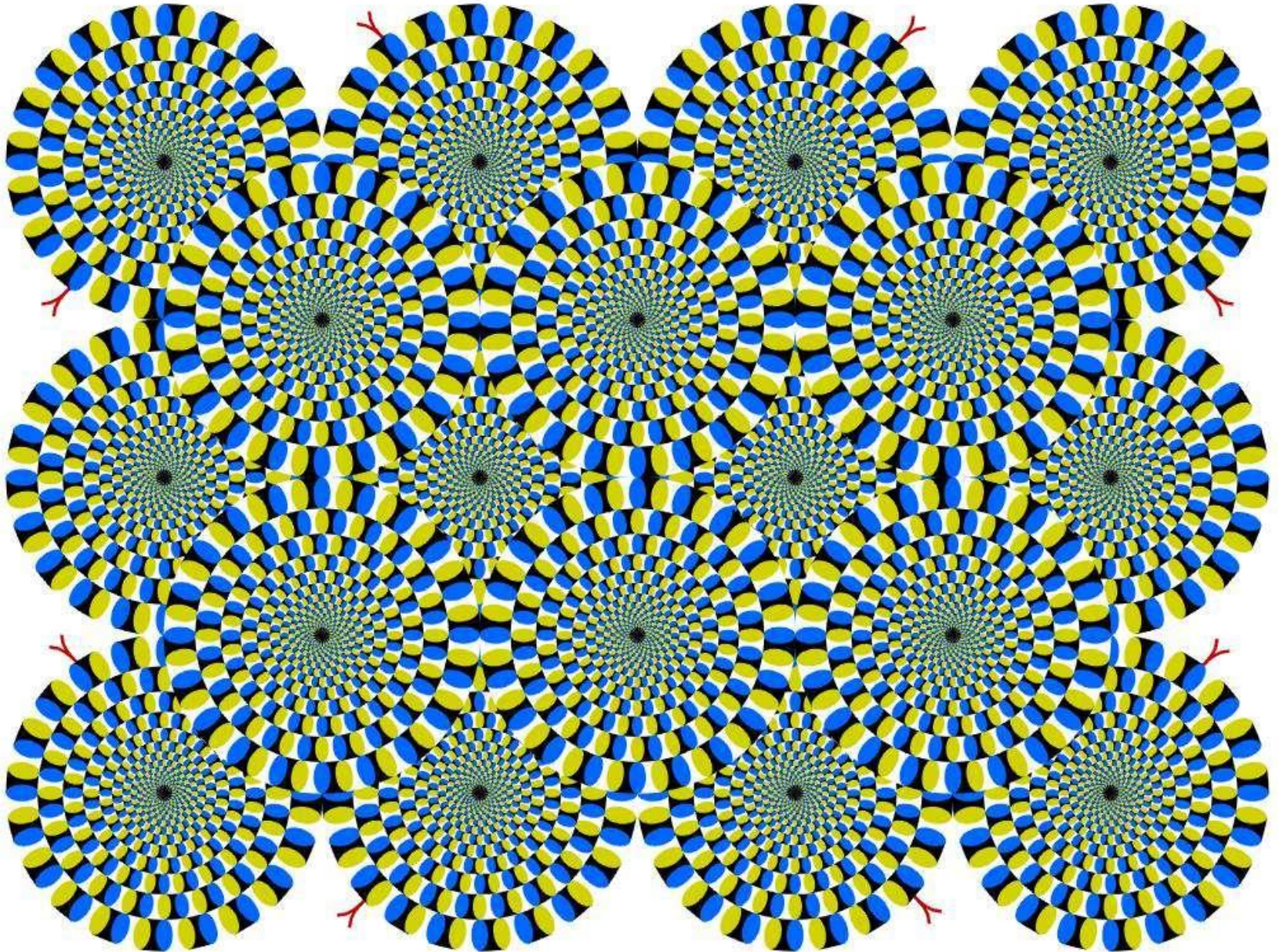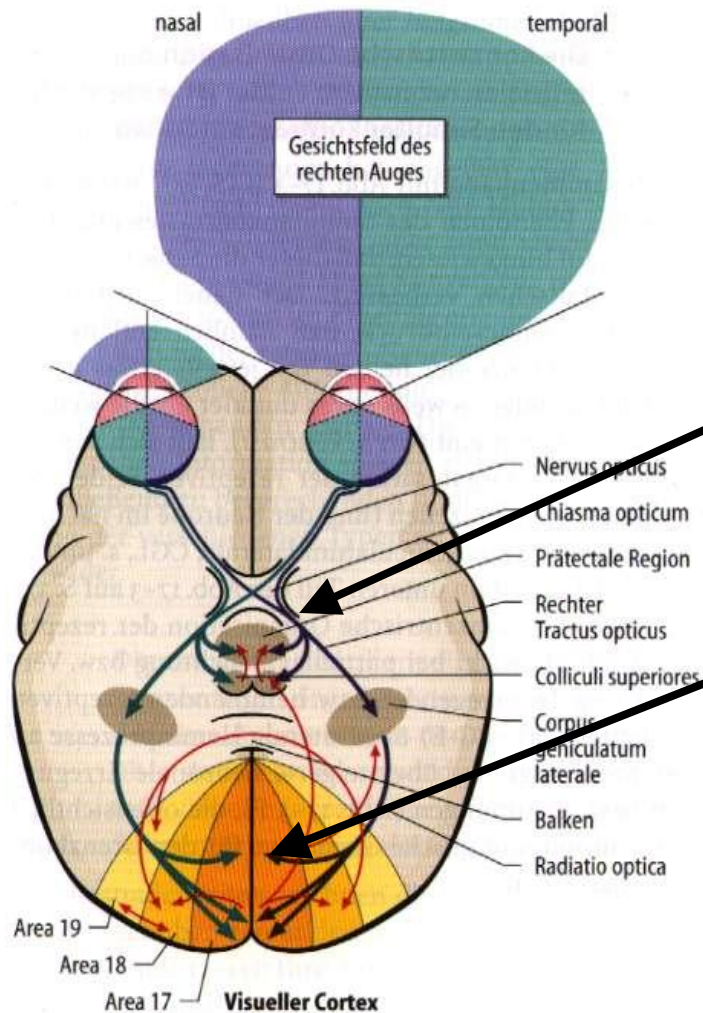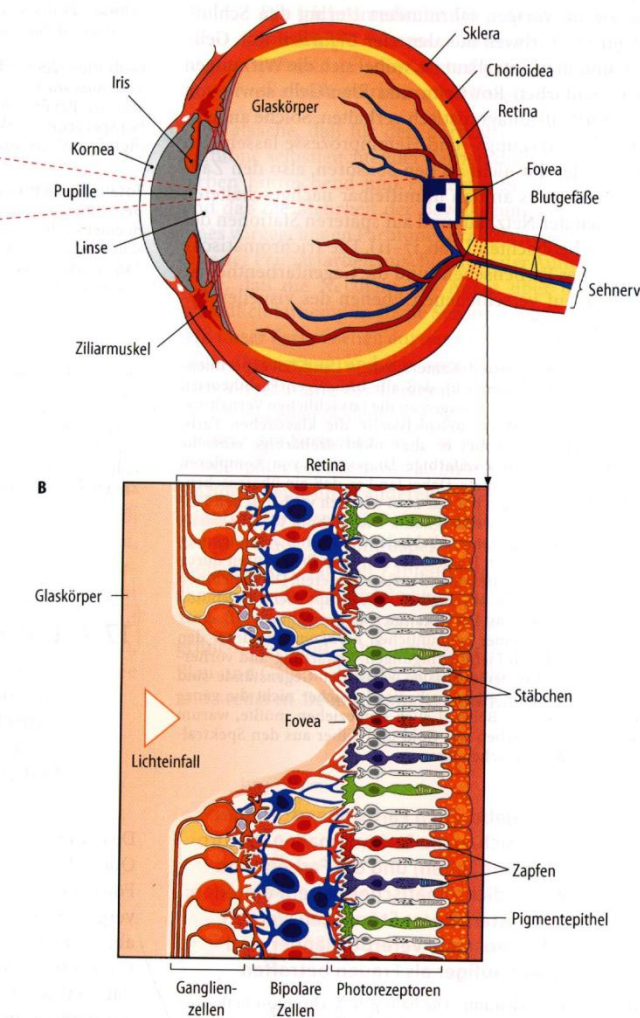# Image Processing

Human Seeing

A nice picture

The processing is hierarchical

the half of the fibers are exchanged in "chiasma opticum", so that the left side of the scene is projected to the left hemisphere, and vice-versa

Topology preserving in early layers

Strong feedback! (compare to the typical recognition pipeline ☹)

The eye

The retina contains different types of sensors: cones (colors, 6 million) and rodes (gray levels, 120 million)

Light must first pass through the layer of neurons before it reaches photo sensors (smoothing)

Only in the "fovea centralis" the light hits directly the photo sensors

Retina → Ganglion cells (1 million) → Optic nerve → 1 MPixel Camera ?

Perception of colors
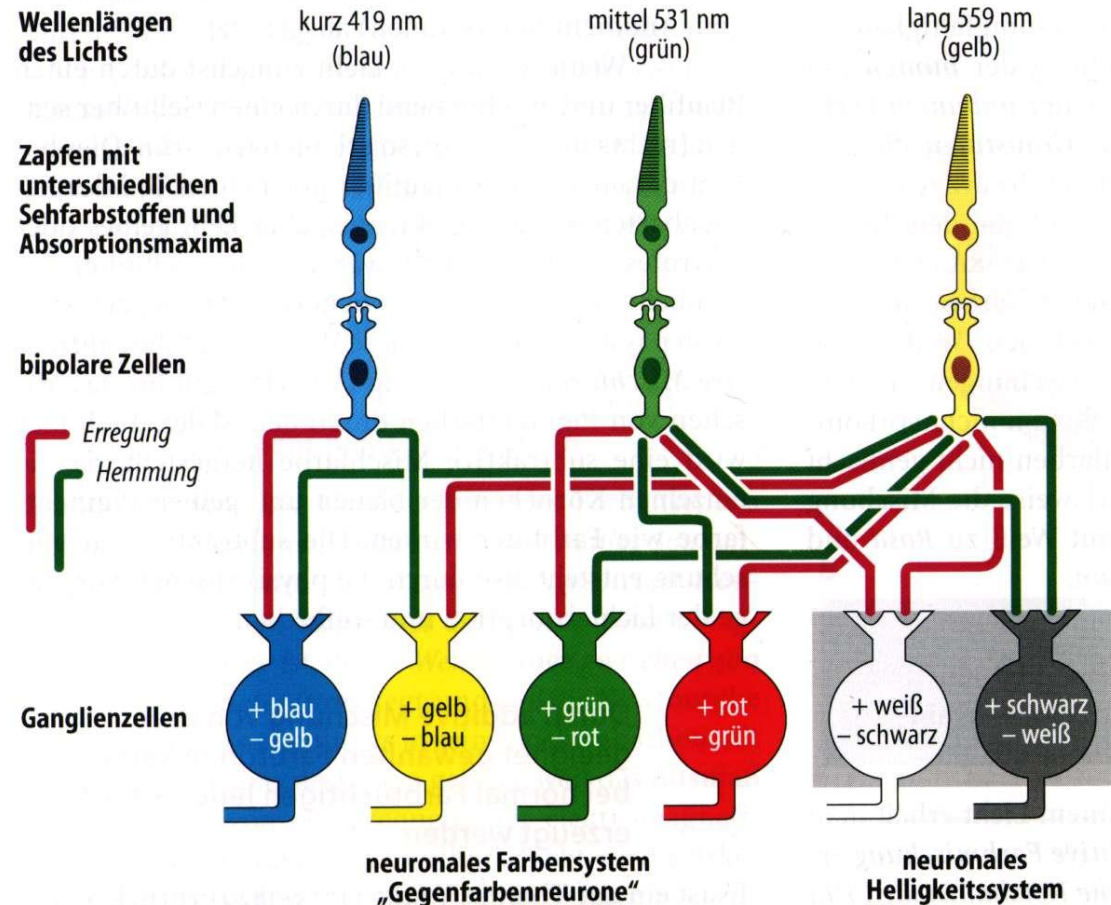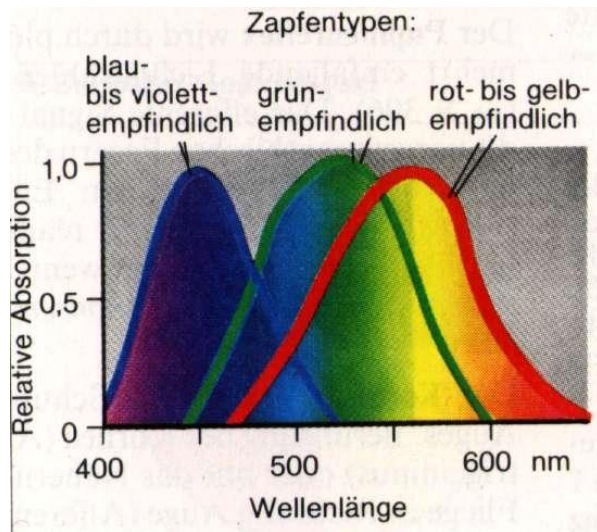
What is light?

Spectrum, i.e. a function of the wavelength

Spectral resolution of the eye is relatively bad due to projection $\infty \rightarrow 3$ – only **one** "3D"-color at a particular location
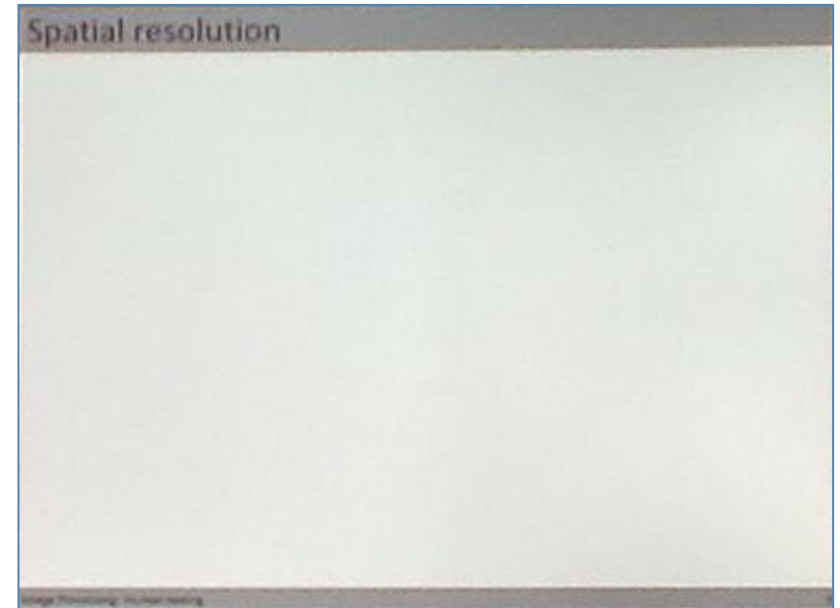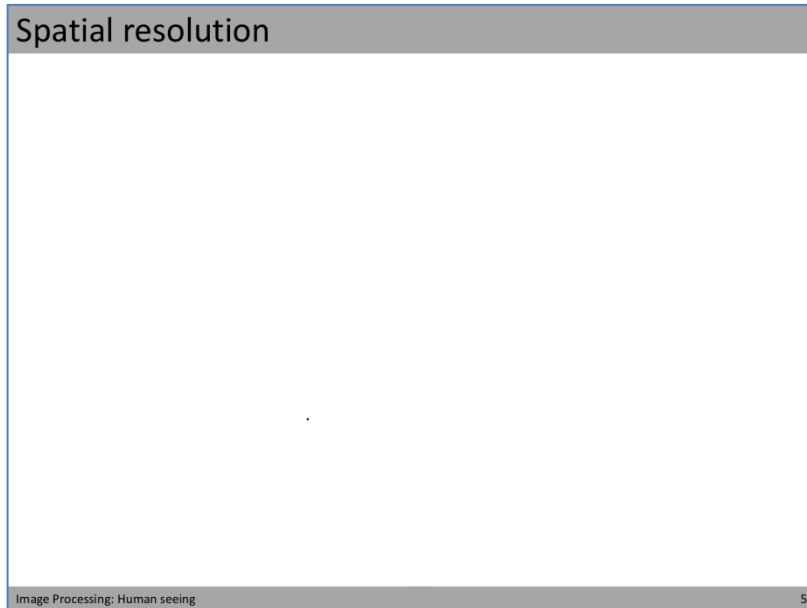
.

2MP Camera, far from the screen

5MP Camera, close to the screen

Spatial resolution (secrets)

Spatial resolution

Spatial resolution

- The resolution is much higher In fovea centralis
- The Information is pre-processed by Ganglion cells (Compare: 3072×2304=7MPixel, 2.4 MB RGB JPEG lossless)
- No still image, but a „Video" (super-resolution)
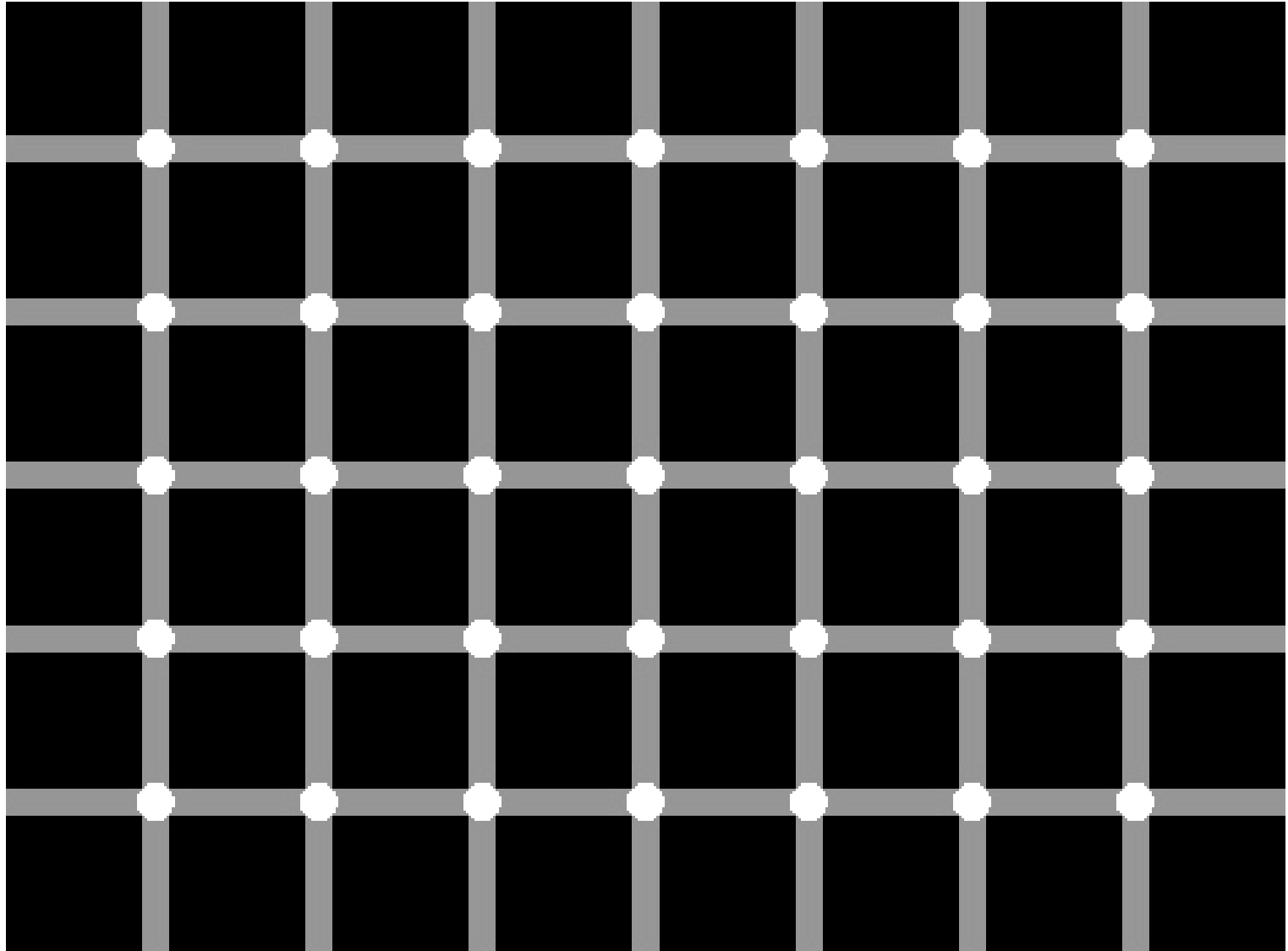- Scanning technique – Saccades

Saccades
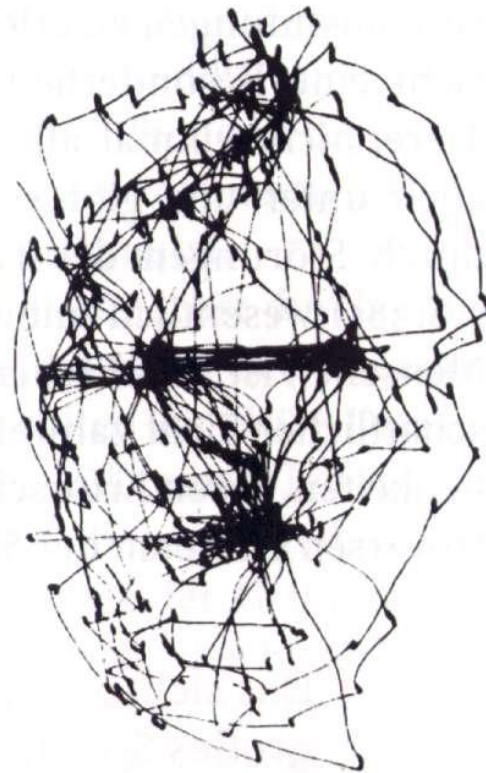
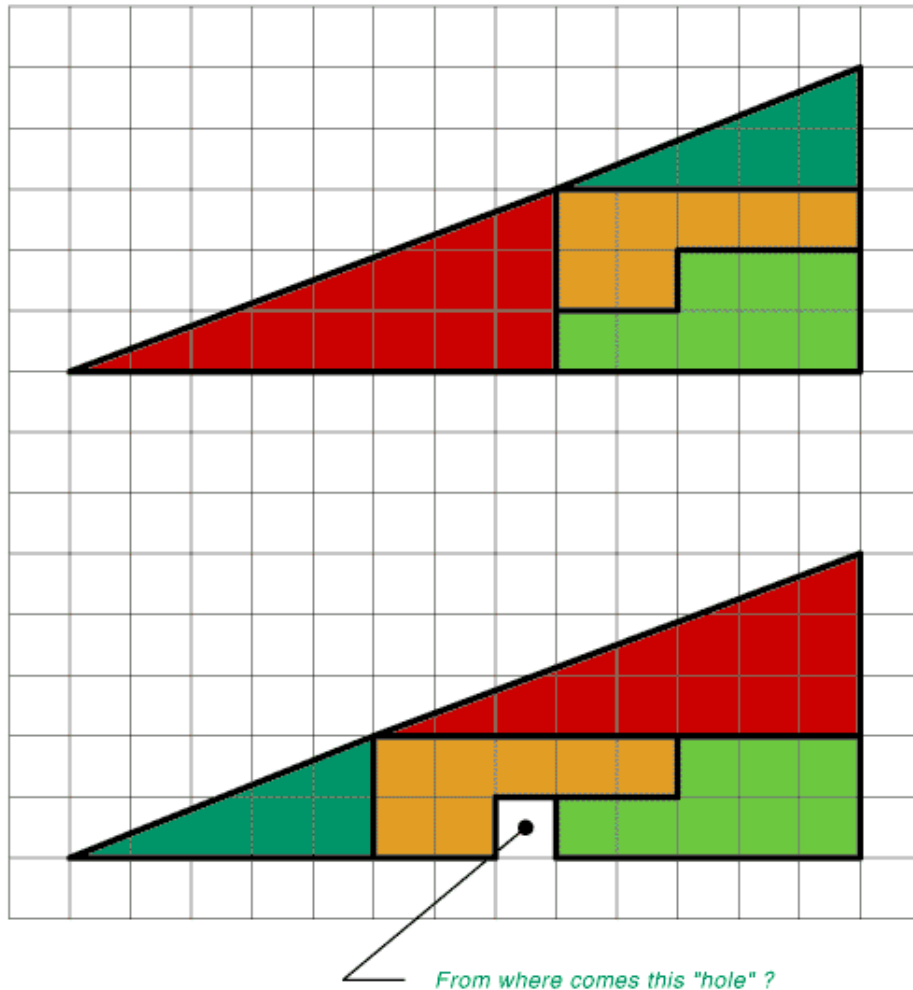Eyes never move uniformly, but jump in **saccades** (approximately 15-100 ms duration between fixation points)

Saccades are driven by the "importance" of the scene parts (eyes, mouth etc).

Optical illusions

Optical illusions

HOW CAN THIS BE TRUE ?

Below the four parts are moved around

The partitions are exactly the same, as those used above

From where comes this "hole" ?

Are there optical illusions in Computer Vision?