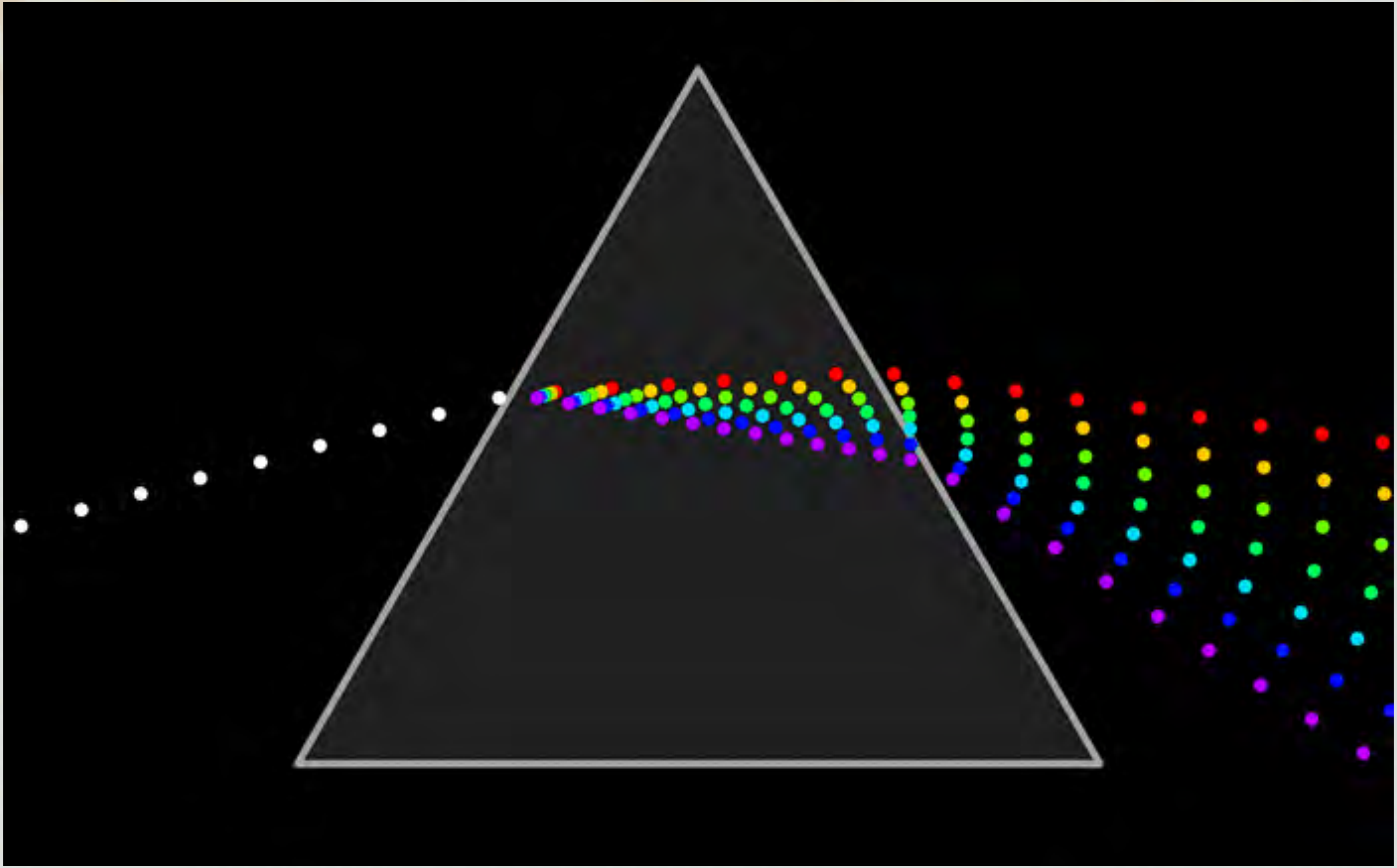
L2: Visual perception and map interpretation



Using maps

Simple tasks:
- Finding a place
- Selecting a route
- Discovering a name of a geographical feature

More complicated tasks:
- Trying to memorize a route
- Navigating a ship

Basic element in common: **to obtain information**.

For some purposes the map is more effective than any other source.

Text vs. map

Så röstade amerikanerna – delstat för delstat

- För att vinna valet krävs minst 270 elektorsröster. Slutresultat saknades i går kväll från Ohio, Iowa och New Mexico. Om resultatet från Ohio bekräftas har Bush fått 274.
- Segrare delstat för delstat (antal elektorsröster): Alabama Bush (9), Alaska Bush (3), Arizona Bush (10), Arkansas Bush (6), Colorado Bush (9), Connecticut Kerry (7), Delaware Kerry (3), District of Columbia Kerry (3), Florida Bush (27), Georgia Bush (15), Hawaii Kerry (4), Idaho Bush (4), Illinois Kerry (21), Indiana Bush (11), Iowa - (7), Kalifornien Kerry (55), Kansas Bush (6), Kentucky Bush (8), Louisiana Bush (9), Maine Kerry (4), Maryland Kerry (10), Massachusetts Kerry (12), Michigan Kerry (17), Minnesota Kerry (10), Mississippi Bush (6), Missouri Bush (11), Montana Bush (3), Nebraska Bush (5), Nevada Bush (5), New Hampshire Kerry (4), New Jersey Kerry (15), New Mexico - (5), New York Kerry (31), North Carolina Bush (15), North Dakota Bush (3), Ohio Bush (20*), Oklahoma Bush (7), Oregon Kerry (7), Pennsylvania Kerry (21), Rhode Island Kerry (4), South Carolina Bush (8), South Dakota Bush (3), Tennessee Bush (11), Texas Bush (34), Utah Bush (5), Vermont Kerry (3), Virginia Bush (13), Washington Kerry (11), West Virginia Bush (5), Wisconsin Kerry (10), Wyoming Bush (3).

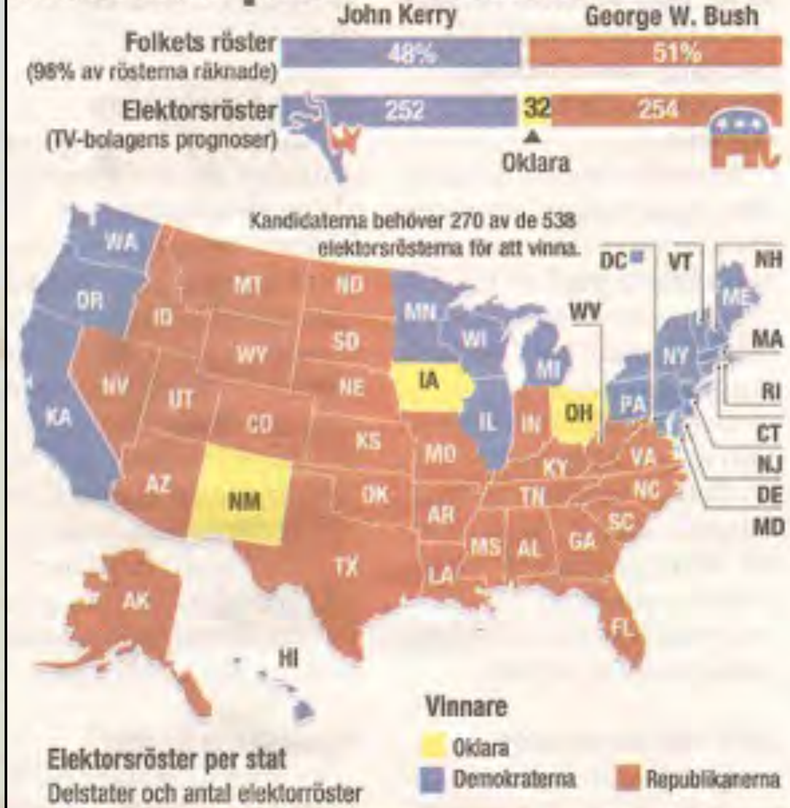
- Totalsumma: Bush 254 (274*) Kerry 252.

* Bushseger i Ohio, enligt två tv-kanaler, andra avstår från att utse segrare. KÄLLA: TT

METRO, 2004-11-04

The text and the map contain the same information. But the map communicates it in a better way?

Resultat presidentvalet 2004



Elektorsröster per stat
Delstater och antal elektorröster

AL	Alabama	9	KY	Kentucky	8	ND	North Dakota	3
AK	Alaska	3	LA	Louisiana	9	OH	Ohio	20
AZ	Arizona	10	ME	Maine	4	OK	Oklahoma	7
AR	Arkansas	6	MD	Maryland	10	OR	Oregon	7
CO	Colorado	9	MA	Massachusetts	12	PA	Pennsylvania	21
CT	Connecticut	7	MI	Michigan	17	RI	Rhode Island	4
DE	Delaware	3	MN	Minnesota	10	SC	South Carolina	8
DC	D. of Columbia	3	MS	Mississippi	6	SD	South Dakota	3
FL	Florida	27	MO	Missouri	11	TN	Tennessee	11
GA	Georgia	15	MT	Montana	3	TX	Texas	34
HI	Hawaii	4	NE	Nebraska	5	UT	Utah	5
ID	Idaho	4	NV	Nevada	5	VT	Vermont	3
IL	Illinois	21	NH	New Hampshire	4	VA	Virginia	13
IN	Indiana	11	NJ	New Jersey	15	WA	Washington	11
IA	Iowa	7	NM	New Mexico	5	WV	West Virginia	5
KA	Kalifornien	55	NY	New York	31	WI	Wisconsin	10
KS	Kansas	6	NC	North Carolina	15	WY	Wyoming	3

Källa: Reuters Grafik TT/SGB

STOCKHOLM CITY, 2004-11-04

General belief:
using a map is a simple process that requires only normal vision and average intelligence.

↓ **BUT...**

A sequence of processes when using a map:

Task: find the location of a small river
Processes: the user has to
- find a suitable map (atlas, road map, topographical map, at home, on internet, in a library, buy a map, etc.),
- search for the river on a map (no alphabetical name index, depending on the size/importance of the river & the user's previous knowledge),
- recognize the river on the map (the blue line symbol) and interpret it correctly in order to
- extend the knowledge about the river (a cognitive process, 2 ways: learn about it directly in real life or indirectly, from a description on a map, information about location, position, course, extent, relationship to other features).

Find the location of a small river

The user is looking at the map, searching for the blue line with a particular name.

What happens in the brain?

Visual perception

Detection

Detect a symbol

Discrimination

Discriminate a symbol from other symbols

physiological

Map interpretation

Interpretation

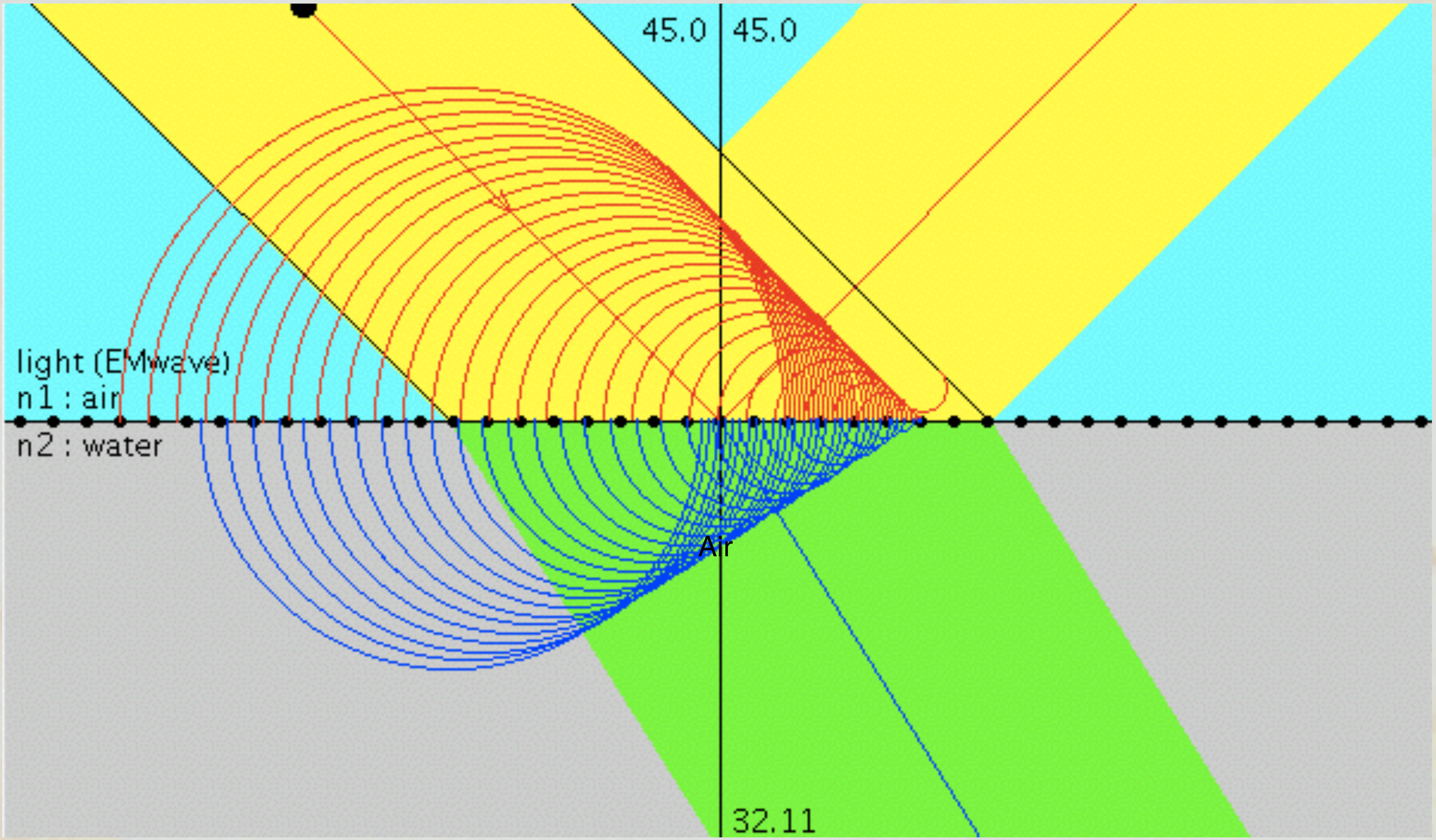
Using the knowledge about a symbol in regard to the map-using task

Identification

What does the symbol mean?

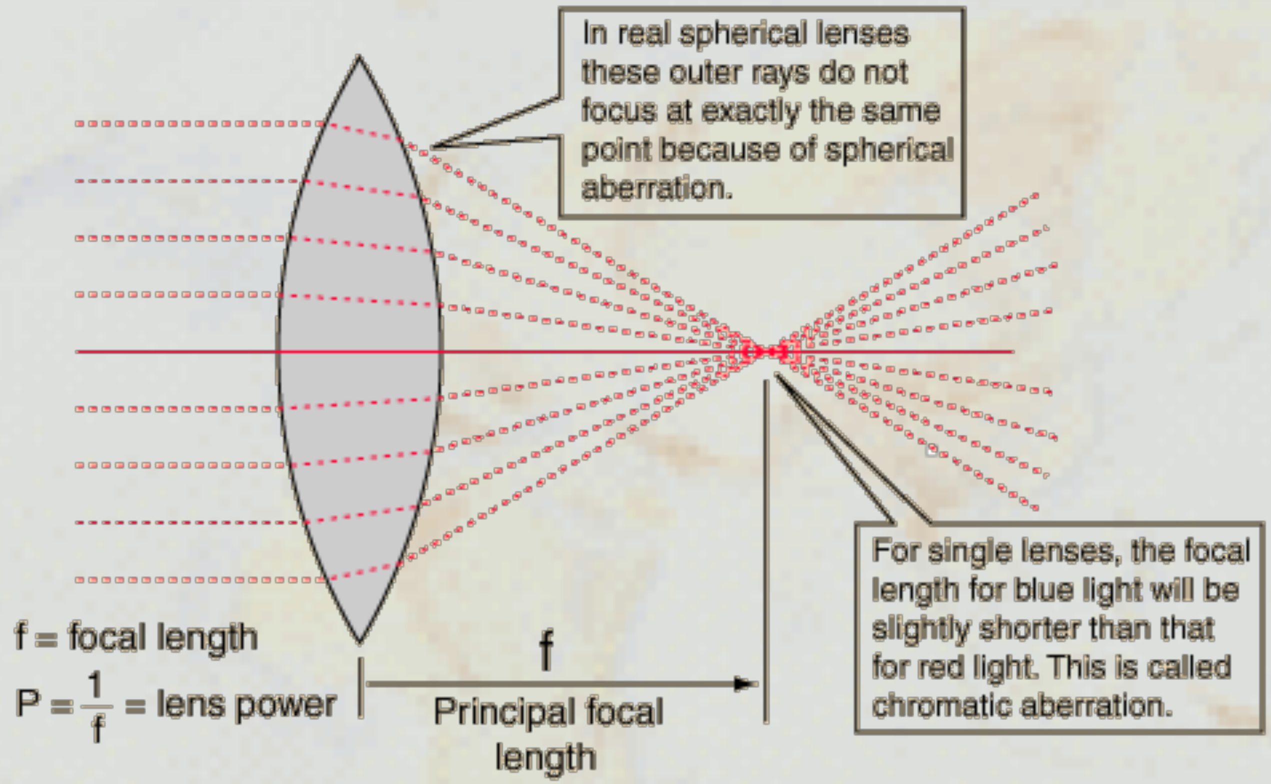
psychological

Refraction of light

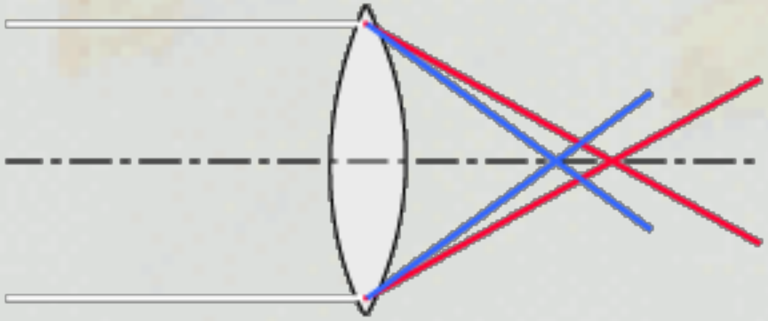


Air	**1,0008**
Water	**1,33**
Glass (soda-lime)	**1,51**
Diamond	**2,417**
Ruby	**1,76**

Focal length



Chromatic Aberration

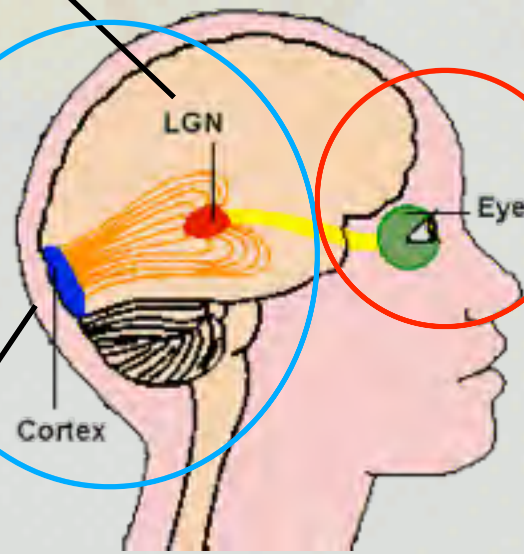


A lens will not focus different colors in exactly the same place because the focal length depends on refraction and the index of refraction for blue light (short wavelengths) is larger than that of red light (long wavelengths). The amount of chromatic aberration depends on the dispersion of the glass.

Human visual system

Lateral geniculate nucleus - LGN

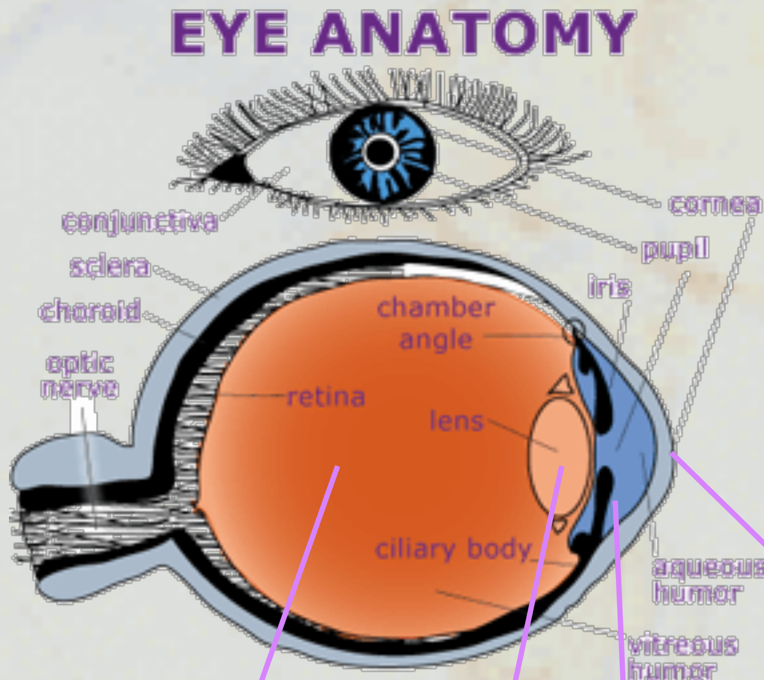
Brain – the processing system



Eyes – the receptor system

Visual cortex

Refraction, focal length and diopters of normal eye



Air = 1.00

Cornea = 1.38

Vitreous humor =1.34

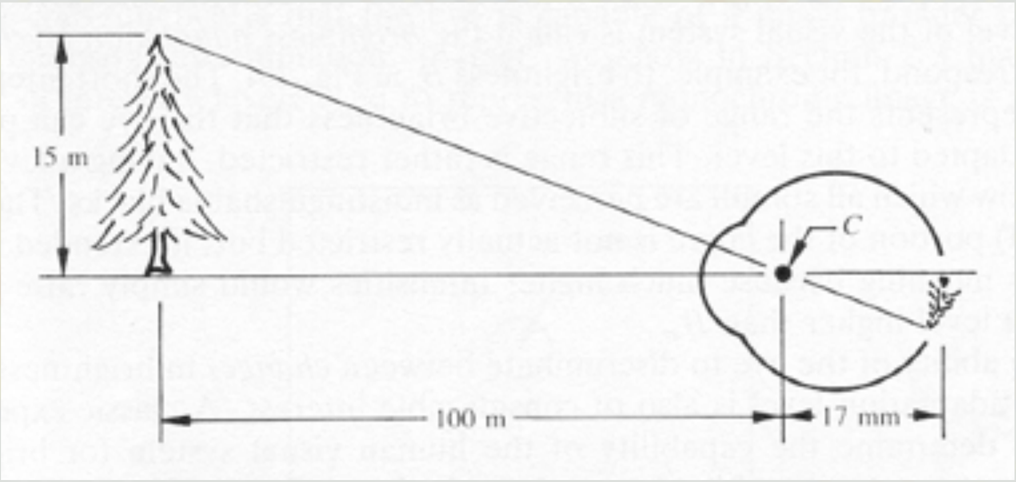
Lens = 1.40

Aqueous humor =1.33

Focal length(*f*) of eye (relaxed): 17mm
diopters (l/*f*) = 1000mm/17 = 59

Image formation in the eye

- Example:
  - Calculation of retinal image of an object



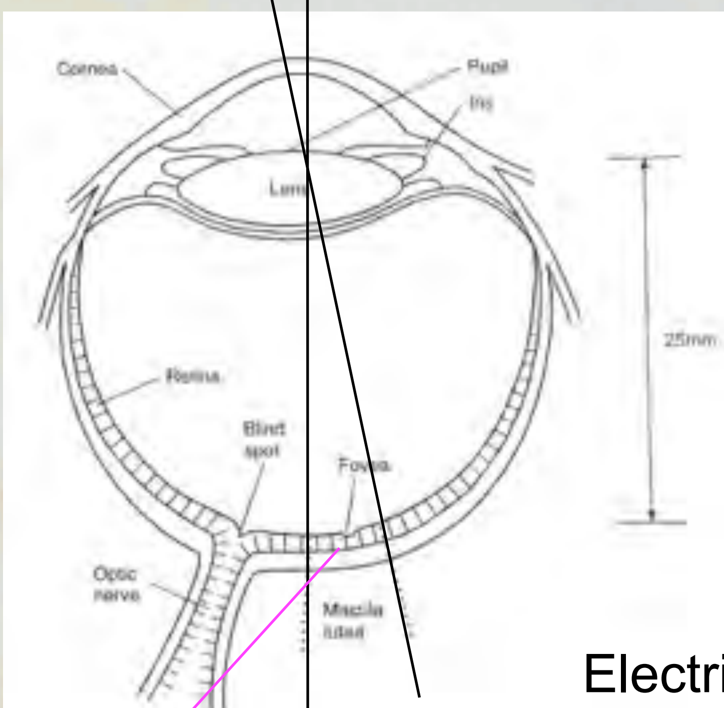
$$\frac{15}{100} = \frac{x}{17}$$

$$x = 2.55mm$$

The eye

15°

High visual acuity



Fovea (yellow spot), 0.5 mm diameter

Retina: a pattern of light-sensitive cells – photoreceptors

↓

Responds to small differences in intensity of the incoming radiation from different parts of visual field

↓

Chemical change in photoreceptors

↓

Electrical discharges from photoreceptors – signals

↓

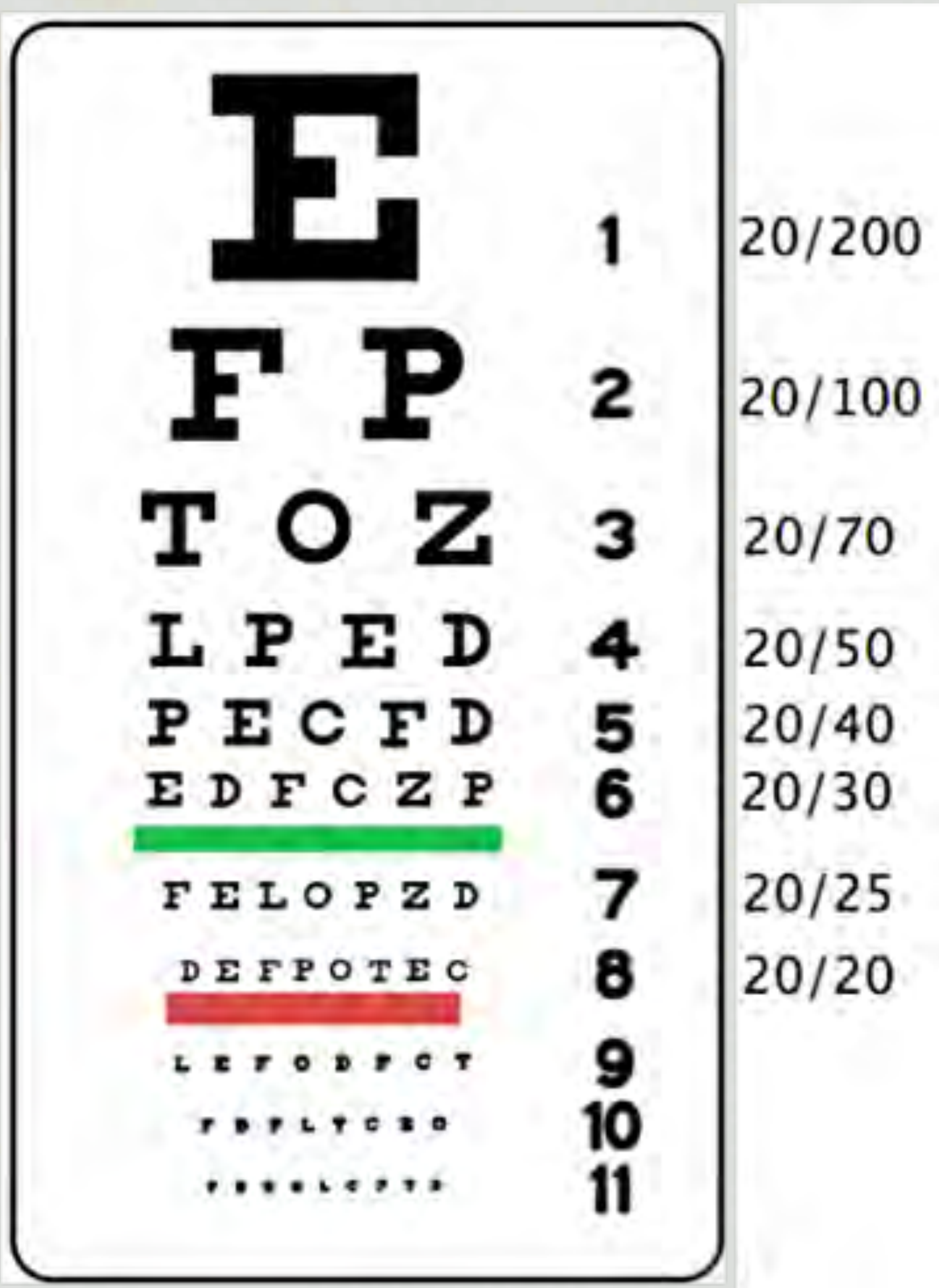
Ganglion cells, optic nerve

↓

The brain

Sensing the light patterns

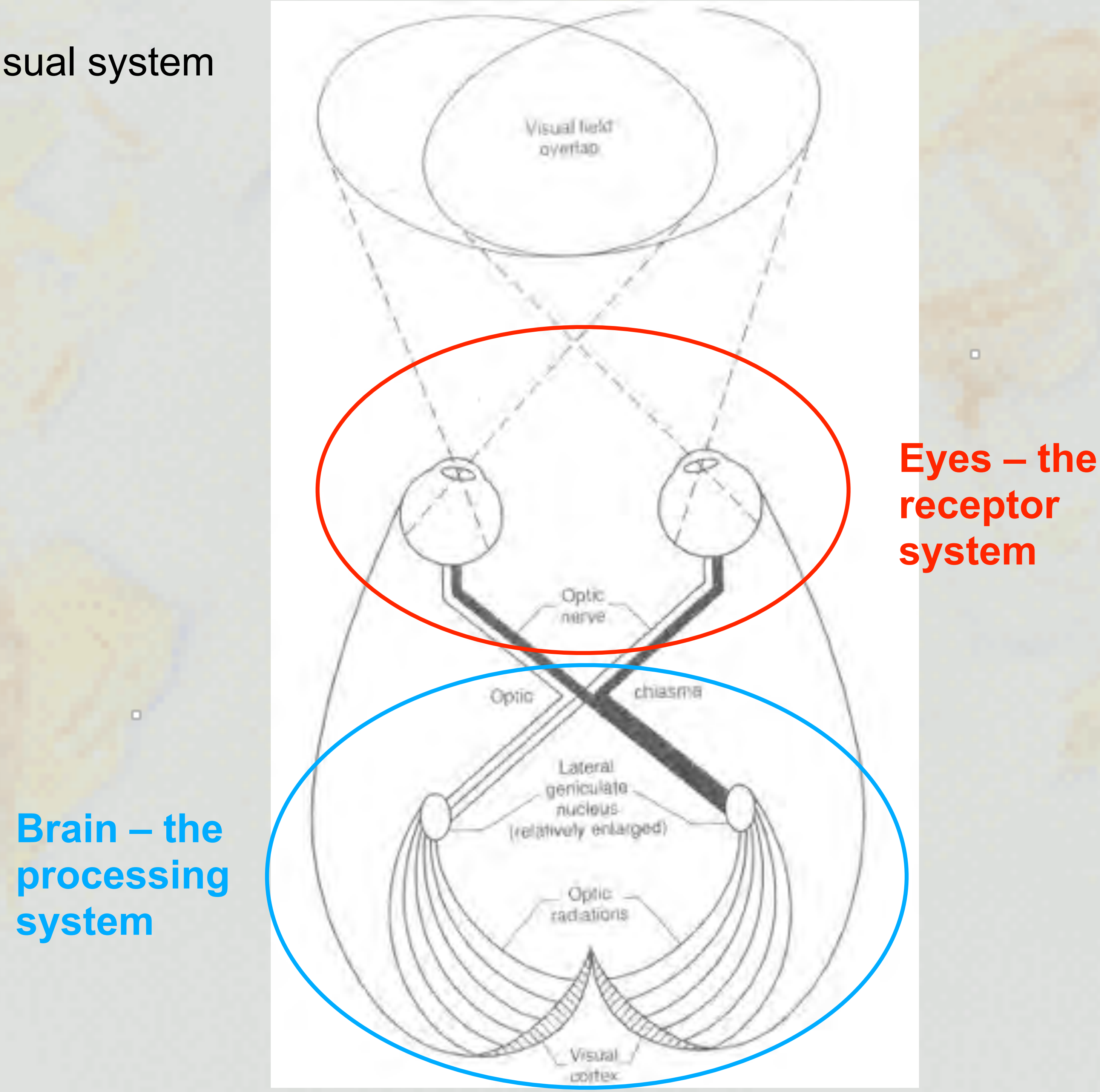
Visual acuity

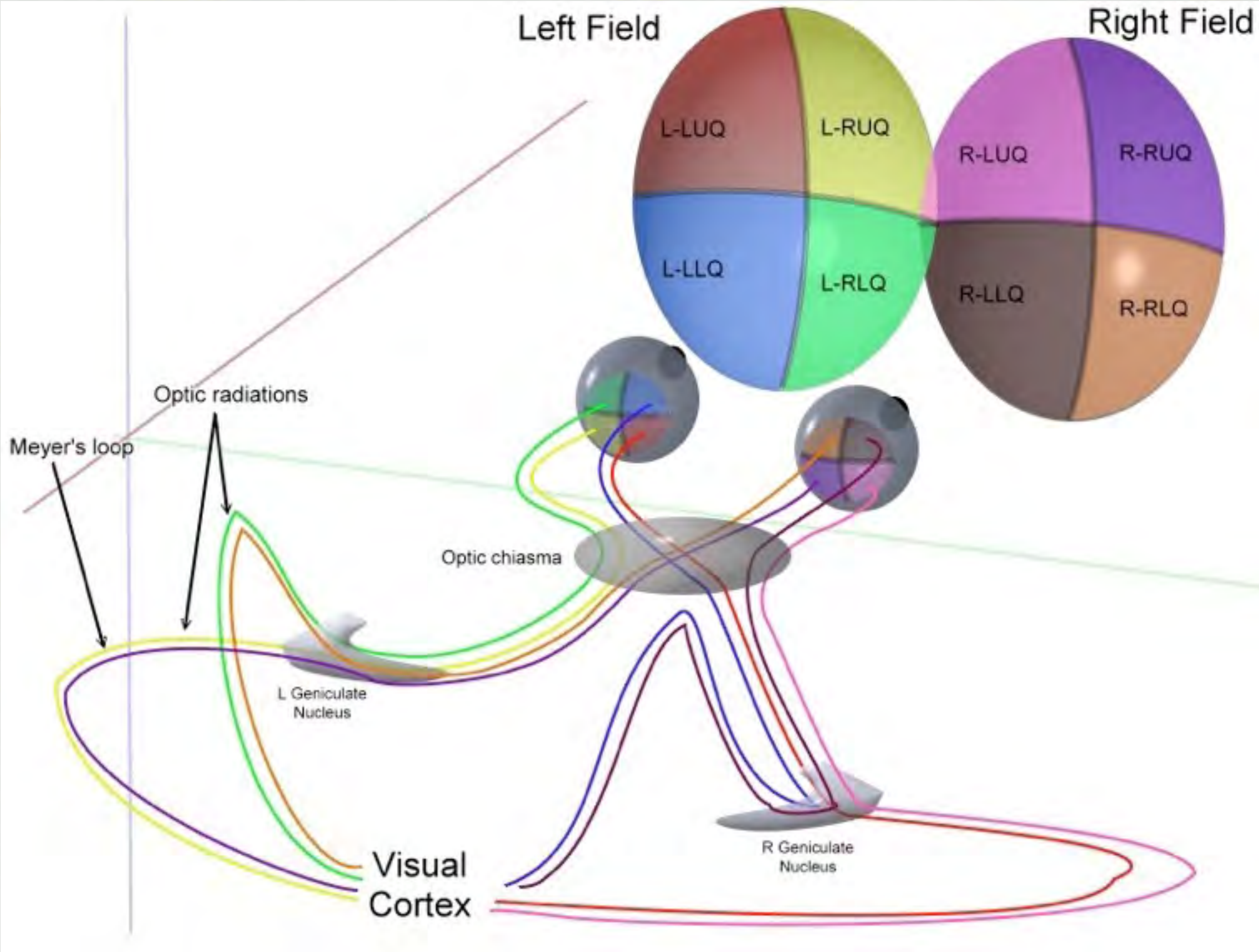


One degree of a scene is projected across 288μm on the retina.
The central area of the retina - the fovea (or yellow spot) occupies around 2 degrees of arc and is around 500μm in diameter.

In the fovea light falling 2μm apart can be separated, corresponding to an angle of 25 seconds of arc (1.5 mm at 10 m distance). This is equal to 20/20 visual acuity.

Human visual system




Left Field
Right Field
L-LUQ
L-RUQ
L-LLQ
L-RLQ
R-LUQ
R-RUQ
R-LLQ
R-RLQ
Optic radiations
Meyer's loop
Optic chiasma
L Geniculate Nucleus
R Geniculate Nucleus
Visual Cortex

Vision - a selective process for interpreting the environment

There is no one-on-one correspondence between retinal photoreceptors and cells in the optical nerve.

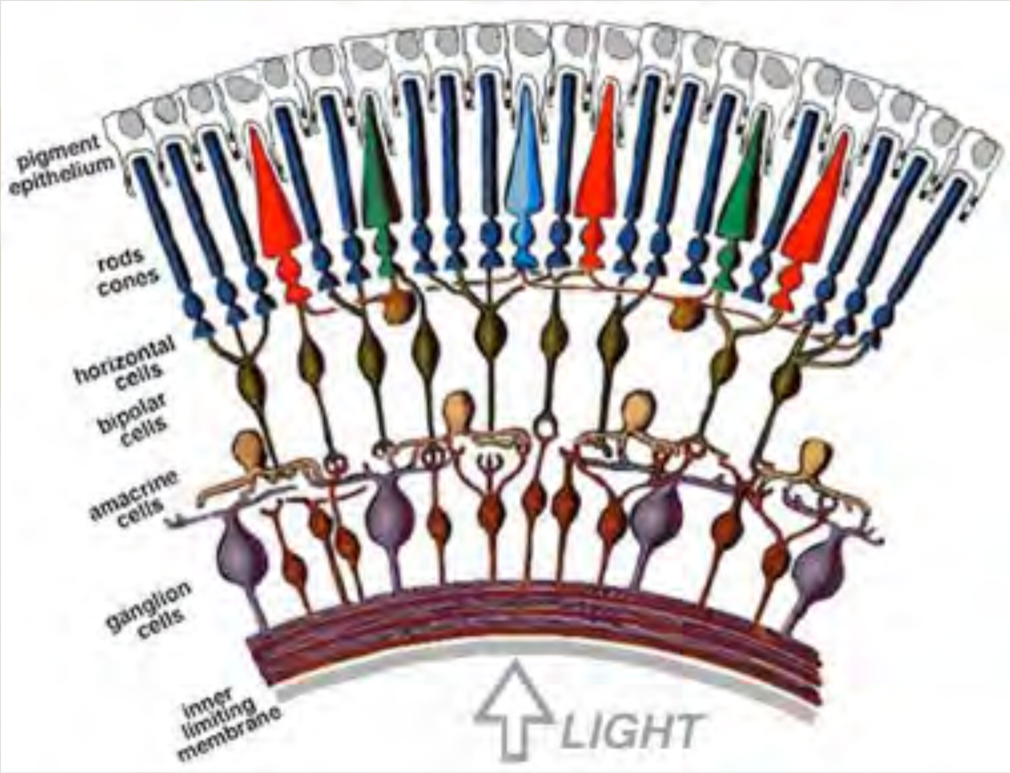
Retinal photoreceptors are unevenly distributed and interconnected.

Retinal photoreceptors are of different types.

Nerve signals are further relayed and gated in LGN and the visual cortex.

The retinal image of the visual field is NOT a copy of the external stimulus! It is a selectively processed version of the reality.

The retina



Two types of photoreceptors

Rods — **Intensity** → 120 millions

Cones — **Wavelength** (colour) → 5 millions

1 million optic nerve fibres leading from ganglion cells

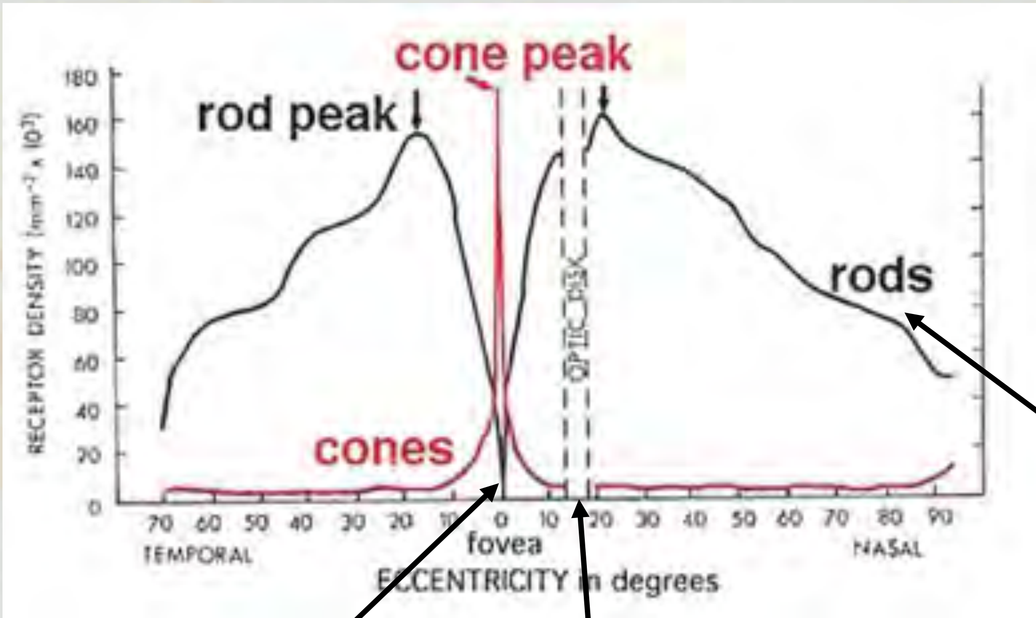
Vision more sensitive when based on rods than on cones. But fovea (yellow spot) only contains cones (appr. 350000).

Cones: need high intensity to sense colours

Rods: sensitive to low intensity of light

→ Colourless night vision

Rods and cones

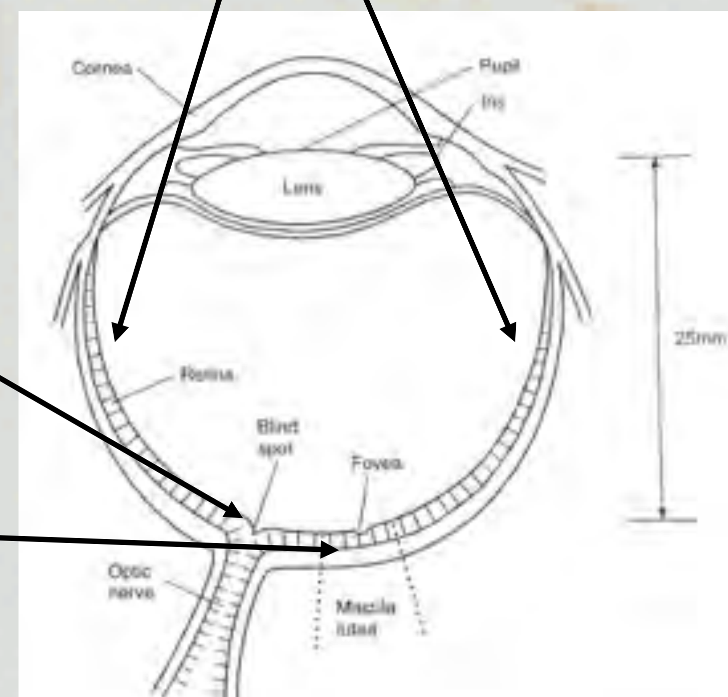


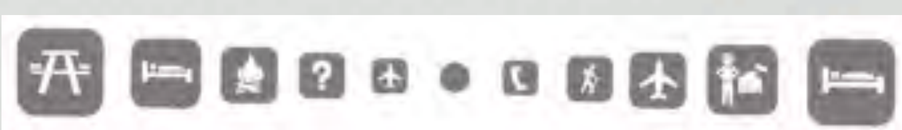
Density of rods and cones along the horizontal meridian of the eye.

Periphery: only rods

Blind spot: optic nerve enters the eye, no photoreceptors

Fovea: only cones, tightly packed
– maximal visual acuity

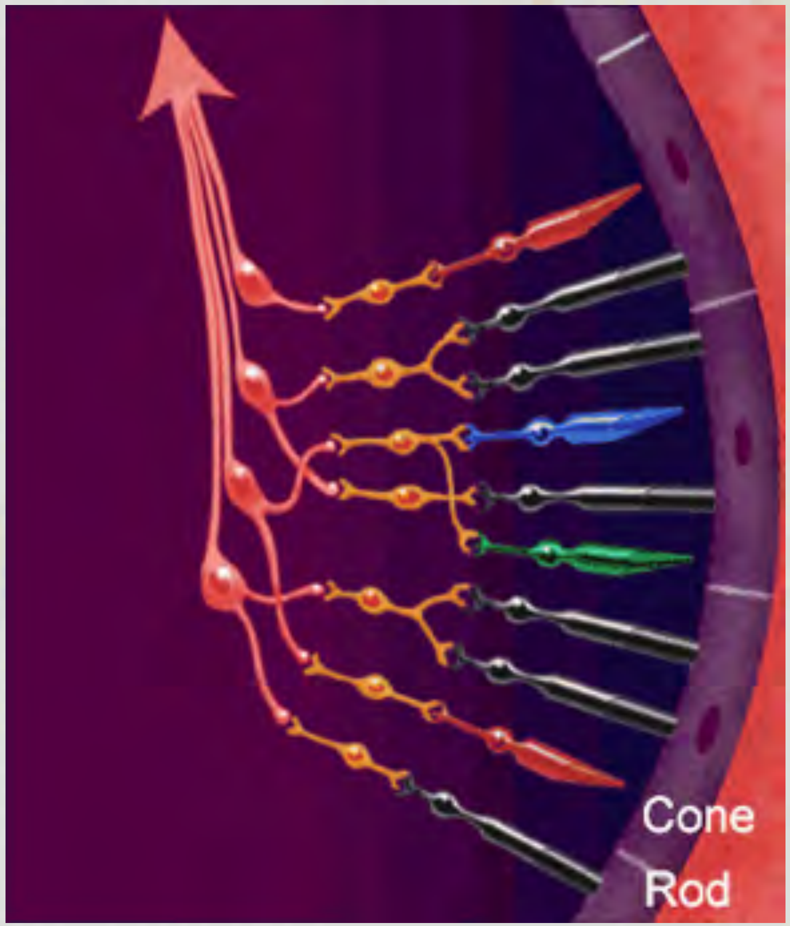




Blind spot test

Retina structure

The light



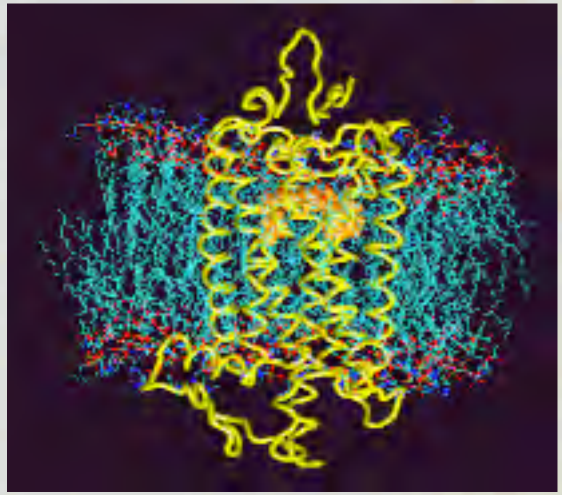
Light has to penetrate

- inner membrane
- ganglion cells
- amacrine cells
- bipolar cells
- horisontal cells

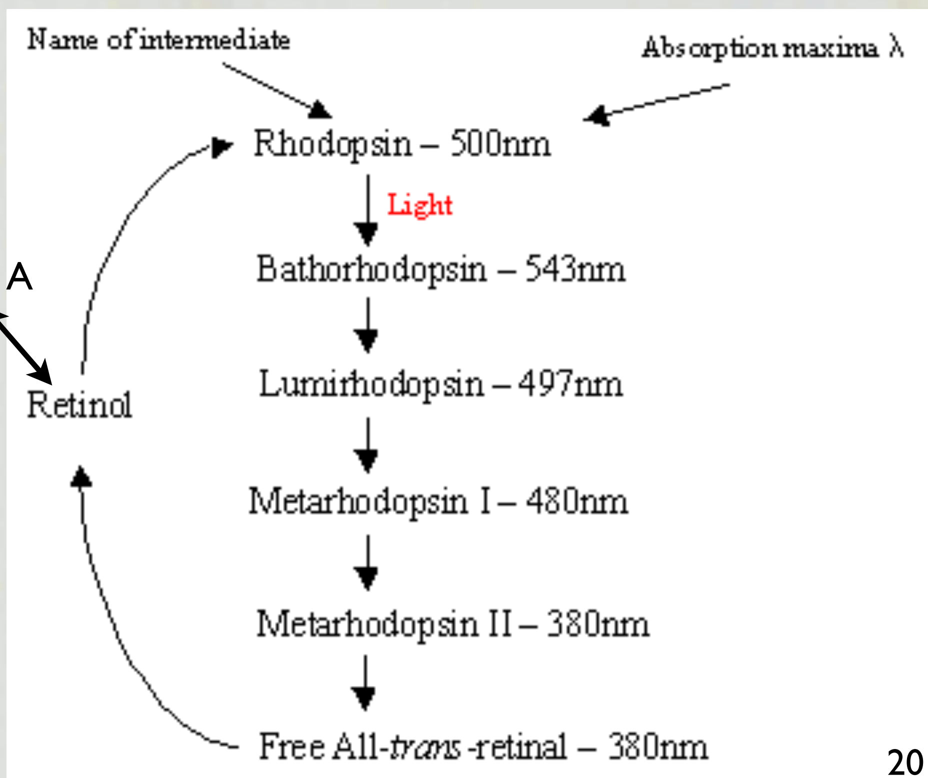
before reaching the rods and cones. In the fovea the the membranes and cells are less hindering.

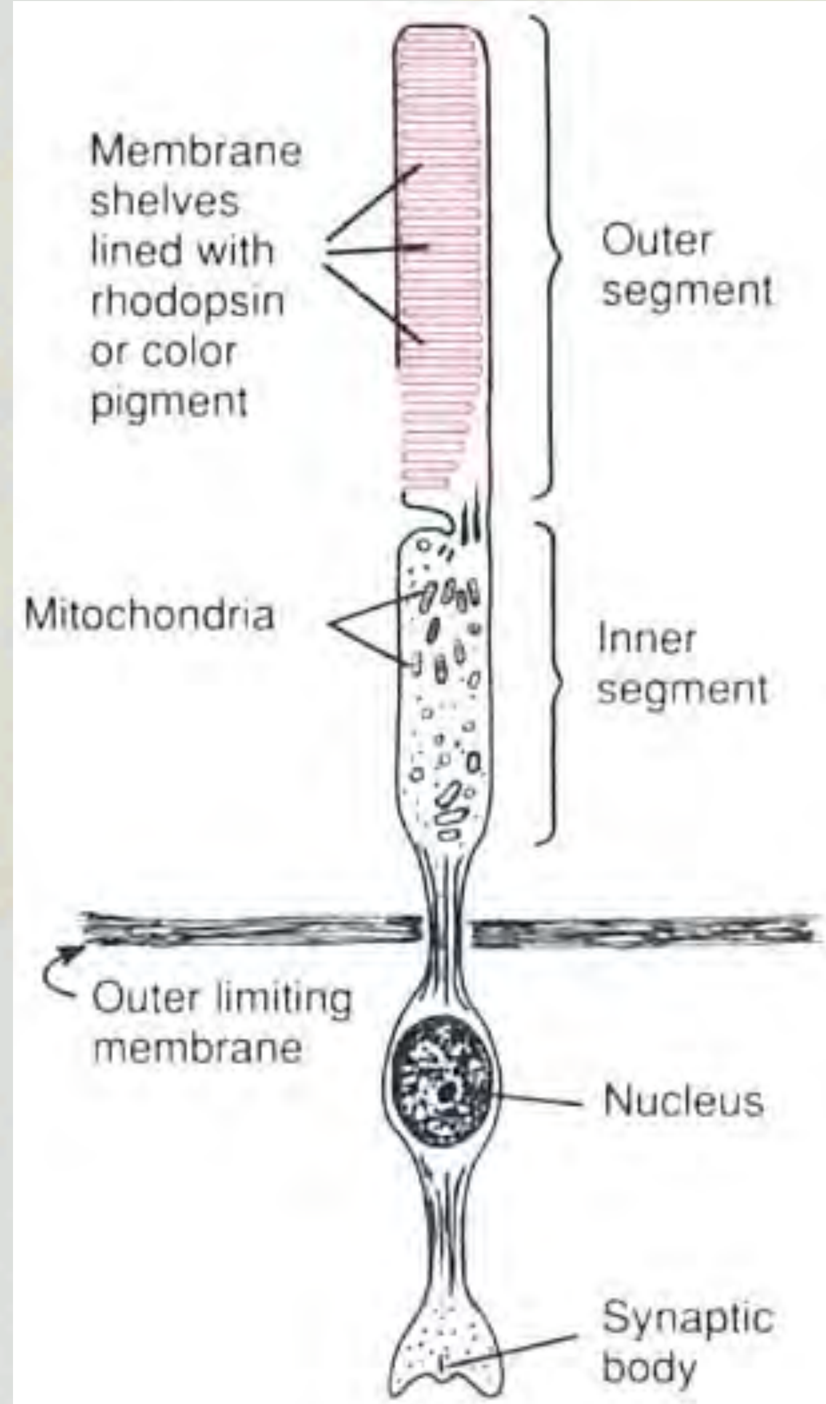
Functional parts of rods and cones

A rhodopsin molecule (yellow) with bound retinal (orange), embedded in a cell membrane (lipids shown as green, head groups as red/blue).

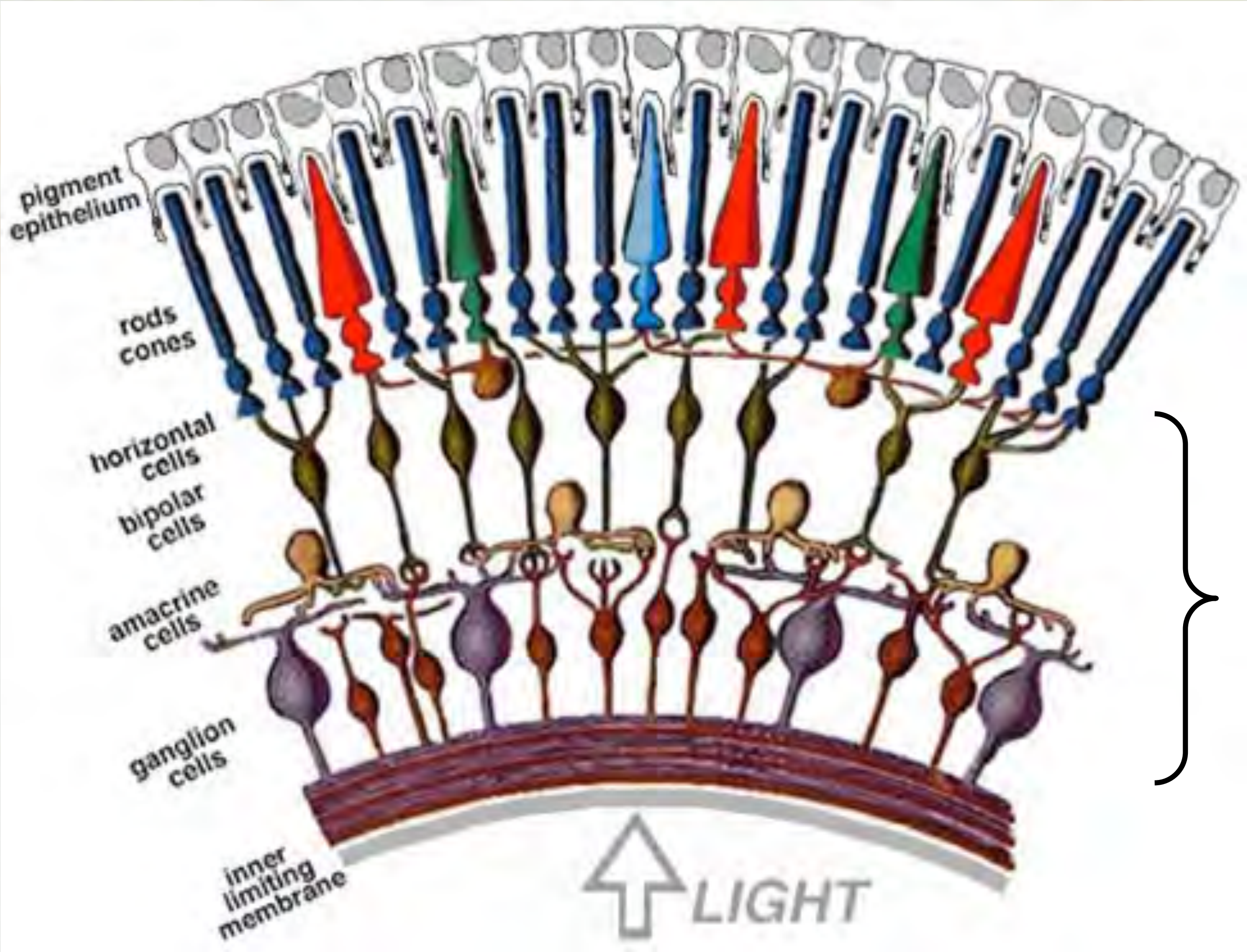


Vitamin A





Signal processing in the retina



Three types of cells between the photoreceptors and the ganglion cells, all interconnected (between layers and within each layer).

Each ganglion receives signals from many photoreceptors, signals are already processed by the cells in-between the photoreceptors and ganglions.

Neural function of the retina

Rods and cones, transmit nerve signal in a different way than all other nerve cells

Horisontal cells (not in fovea), inhibitory lateral signaling enhancing edge detection

Bipolar cells, two types excitatory and inhibitory

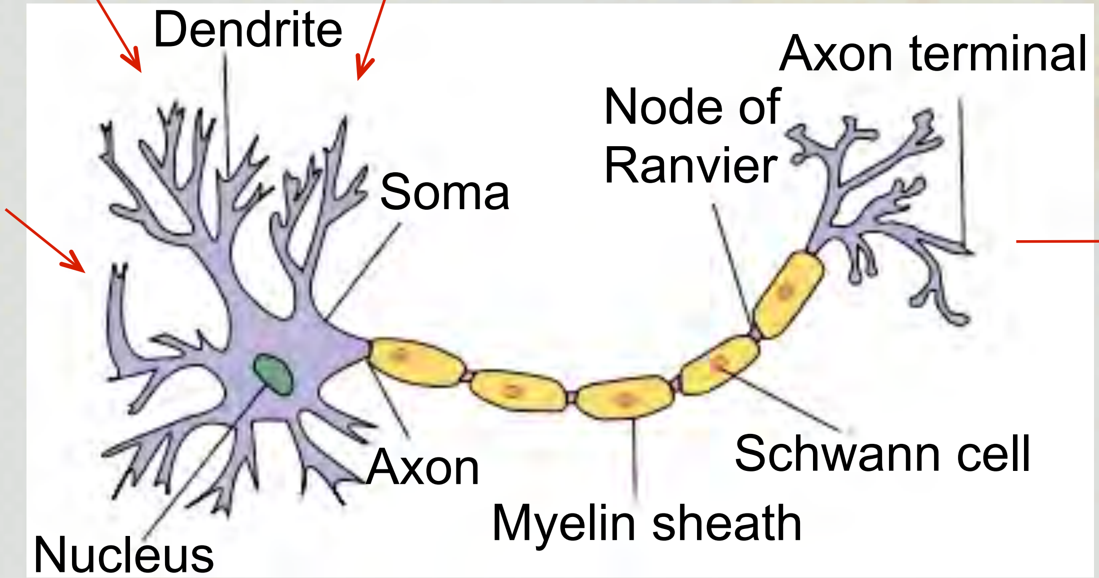
Amacrine cells, at least 30 types with various functions

Ganglion cells, three types; W Cells (rod night vision), X cells (color vision), and Z cells (change detection)

Nerve cell structure and function (e.g. ganglion cell)

Signals from other cells

Negative charge in the interior (soma): resting potential



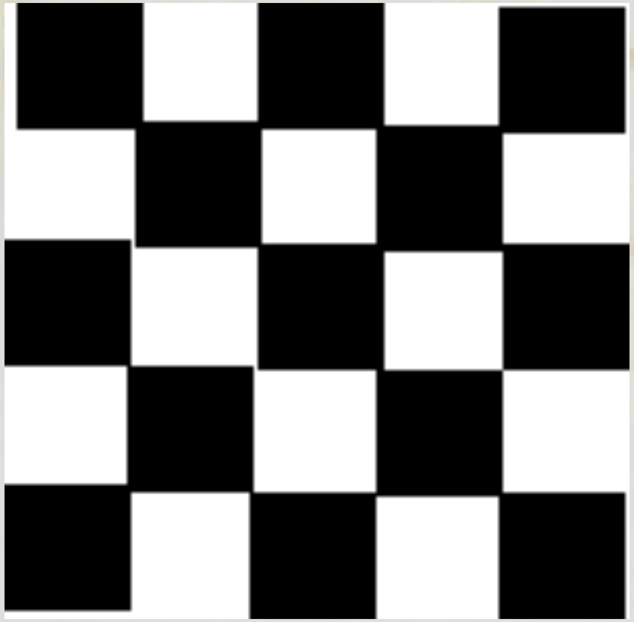
Signal to other cells - change in potential (a spike):
- less negative – excited cell
- more negative – inhibited cell

The neuronal message to the brain

the light intensity at each point on the retina

edges - areas of retina where light intensity changes

Why don't we see the same brightness at the center of both the black and the white squares, with only the borders between them looking different?



Knowing that there is a particular change of light intensity at a particular place and no change in light intensity until another particular place, the brain fills in the intensity between the two.

Ganglion cell responses

Stimulation of a point on the retina

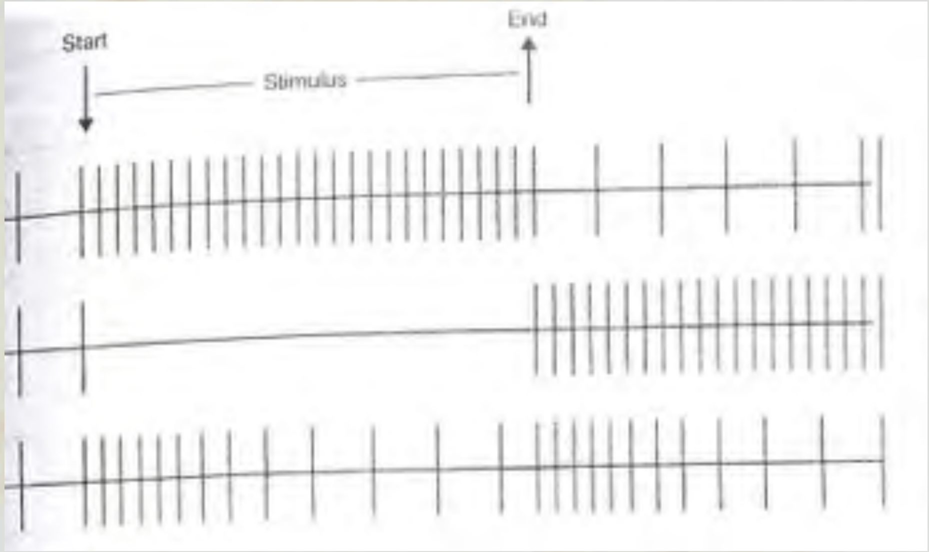
↓

3 types of ganglion cell responses

→ ON cell (excitatory)

→ OFF cell (lateral inhibition)

→ ON/OFF cell

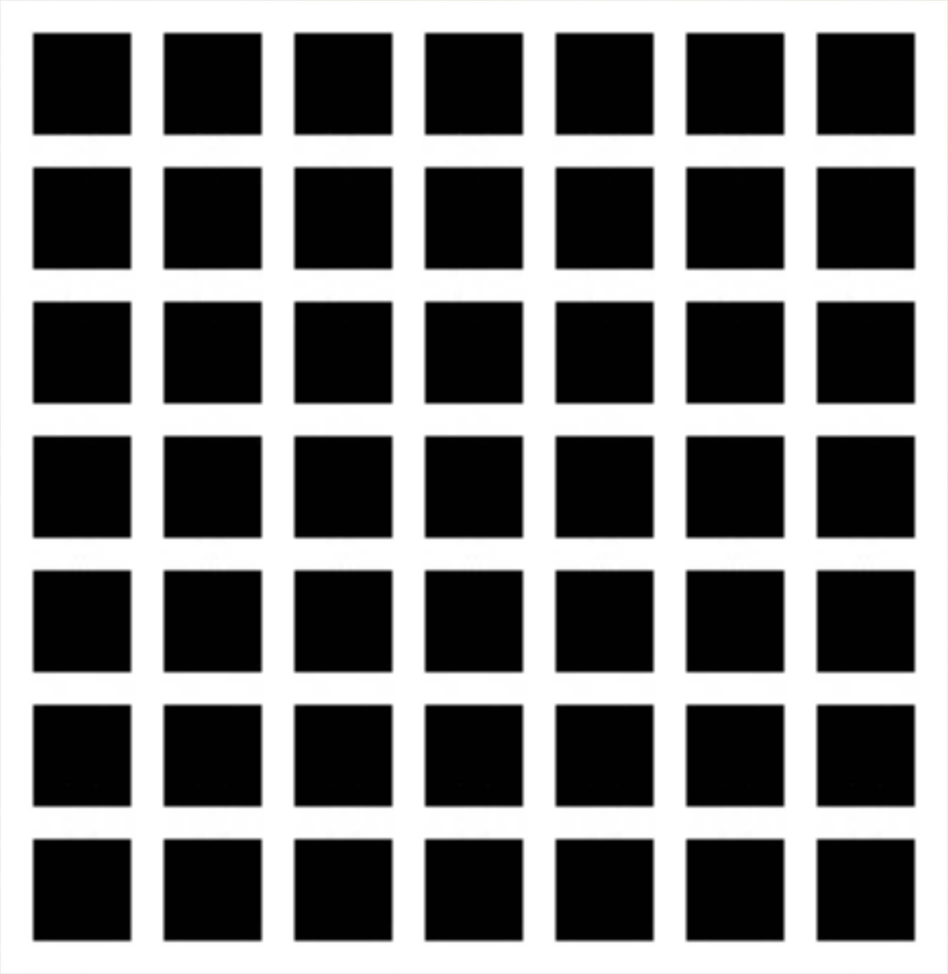


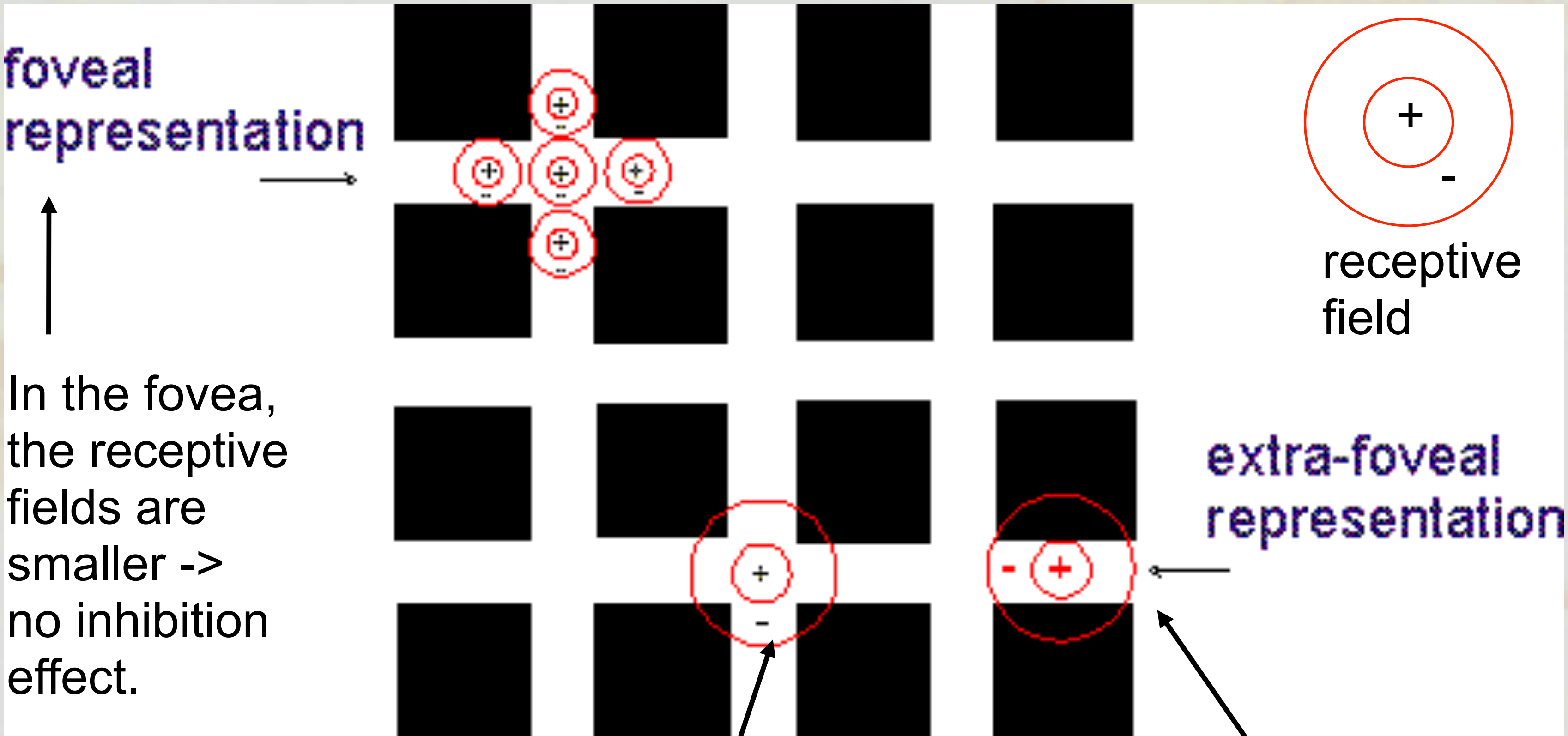
Interconnections between ganglion cells in the neural network and these three different responses cause the lateral inhibition phenomena.

Lateral inhibition

Activity in one area of the receptive field will inhibit activation in nearby photoreceptors. This affects the contrast that we see between black and white.

Hermann grid:





More light on the inhibitory outer circle of the receptive field -> the inhibition in the centre is stronger -> we see a gray square.

Less light on the Inhibitory outer circle -> no inhibition effect.

Greater effect in peripheral vision.

Brightness adaption and discrimination

- The typical observer can discern one to two dozen different intensity changes
  - i.e. the number of different intensities a person can see at any one point in a monochrome image

Brightness adaption and discrimination

- Overall intensity discrimination is broad due to different set of incremental changes to be detected at each new adaptation level.
- Perceived brightness is not a simple function of intensity
  - Scalloped effect, Mach band pattern
  - Simultaneous contrast

Simultaneous contrast

a b c

FIGURE 2.8 Examples of simultaneous contrast. All the inner squares have the same intensity, but they appear progressively darker as the background becomes lighter.

Perceived brightness

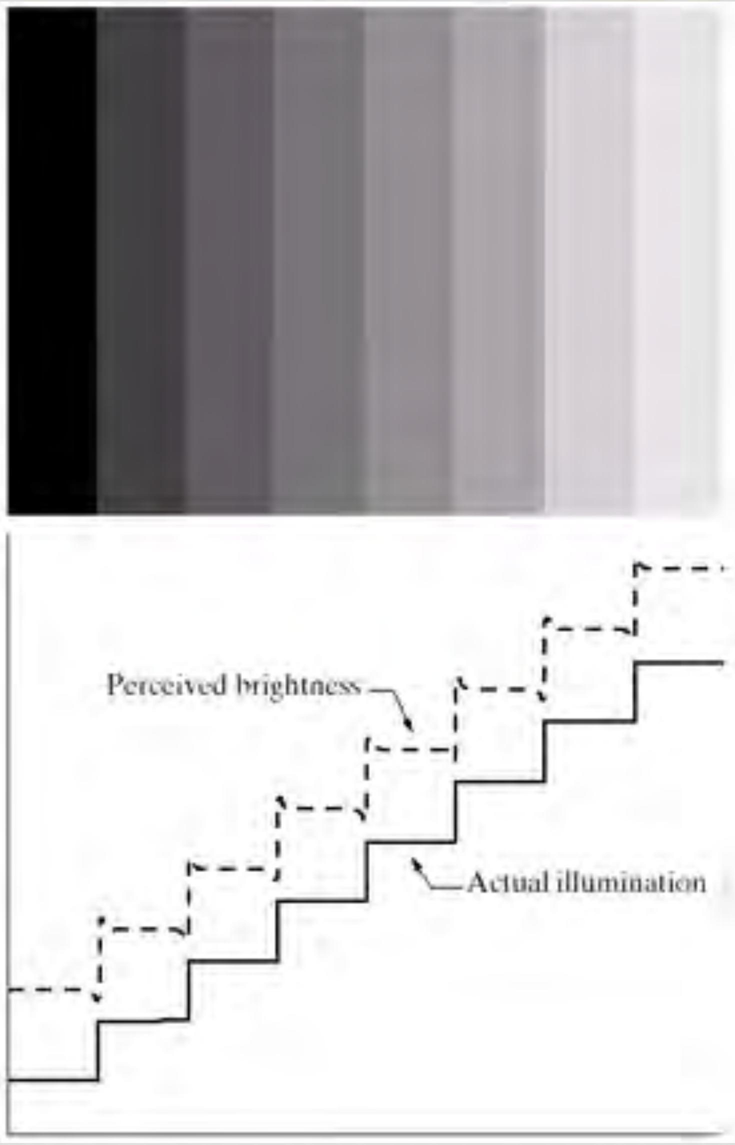
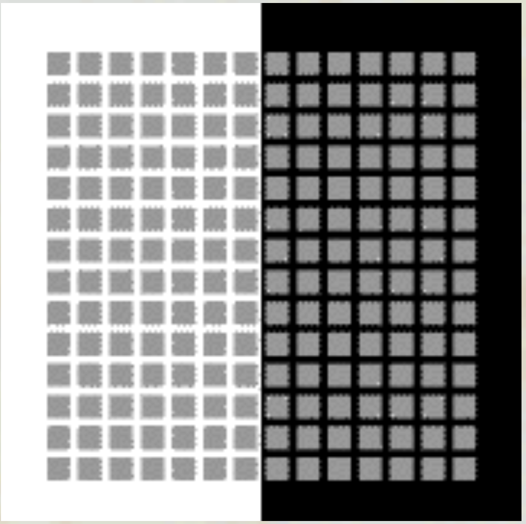


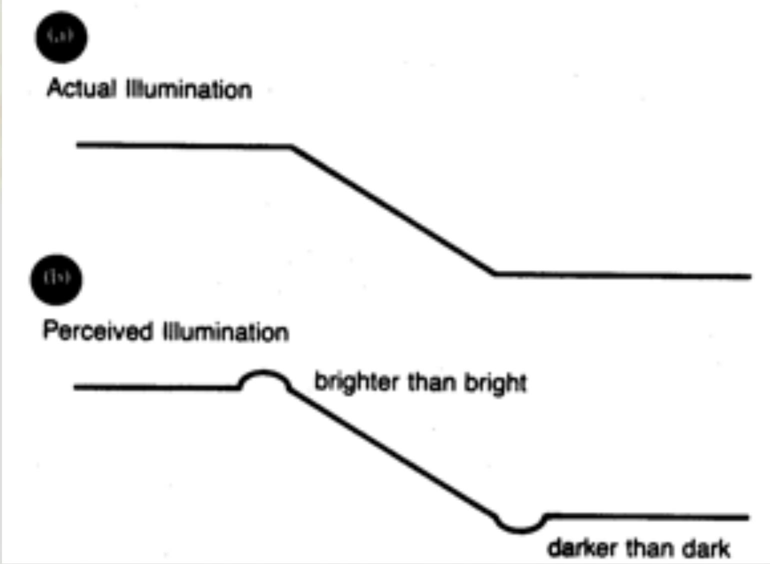
FIGURE 2.7 (a) An example showing that perceived brightness is not a simple function of intensity. The relative vertical positions between the two profiles in (b) have no special significance; they were chosen for clarity.

Effects of lateral inhibition:

- changes in contrast



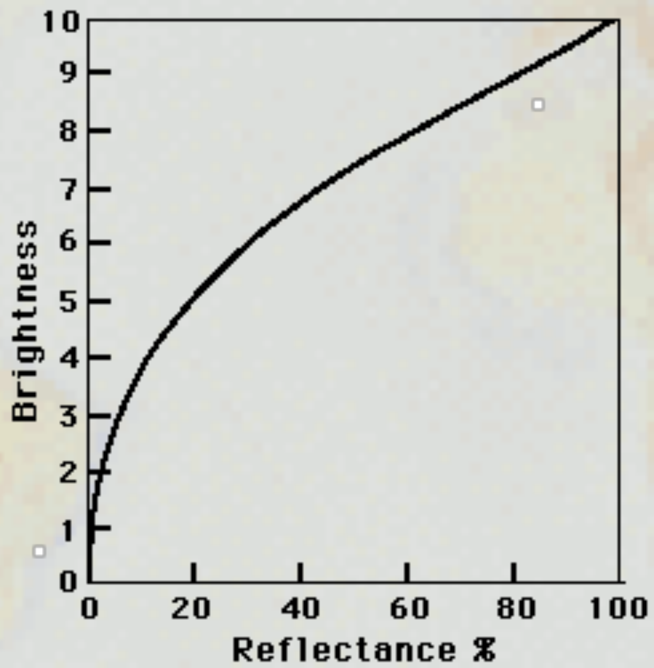
- edge enhancement illusion – Mach bands



Lateral inhibition and an example from thematic cartography

These two areas appear to have a different grey value, but it is in fact the same!

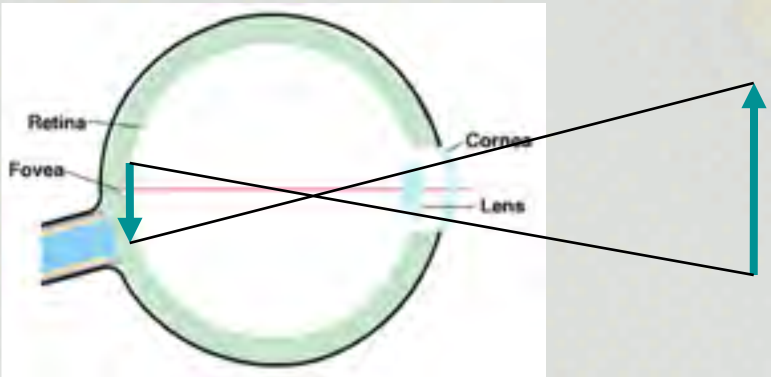
Perceived brightness



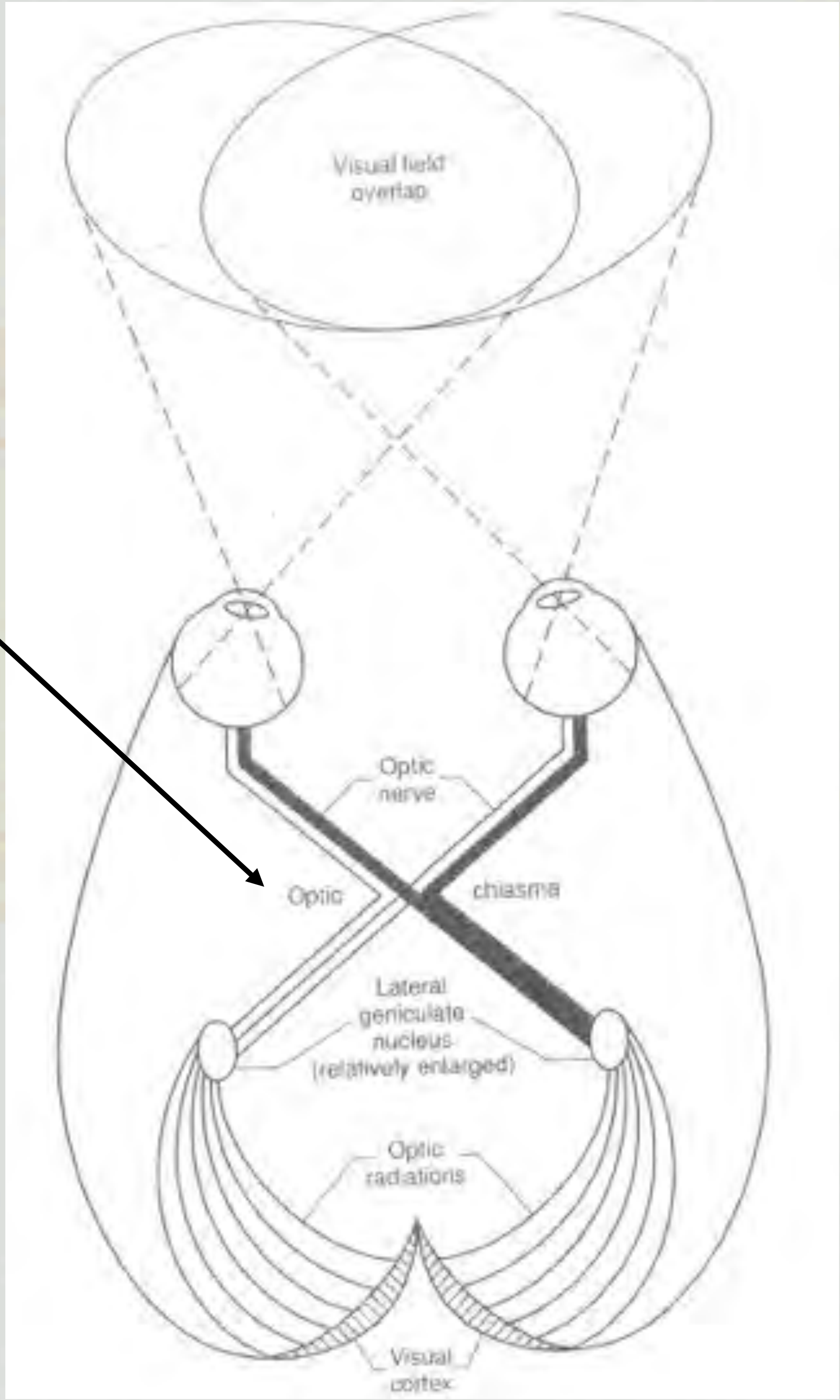
The perceived brightness of light diffusely reflected from a surface is not a linear function of the actual reflected light. Psychophysical experiments indicate that the perceived brightness increases approximately as the logarithm of the luminous flux. With a doubling of the flux leads to an increase of about 1.5 units on the arbitrary brightness scale at left.

Visual processing in the brain

Optic chiasma: information from one side of each eye is directed to the same side of visual cortex.

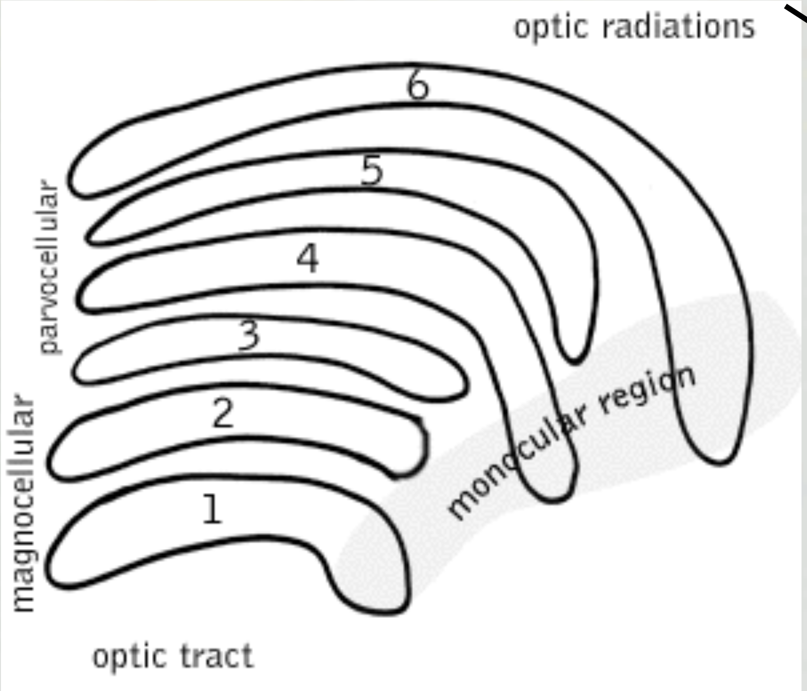


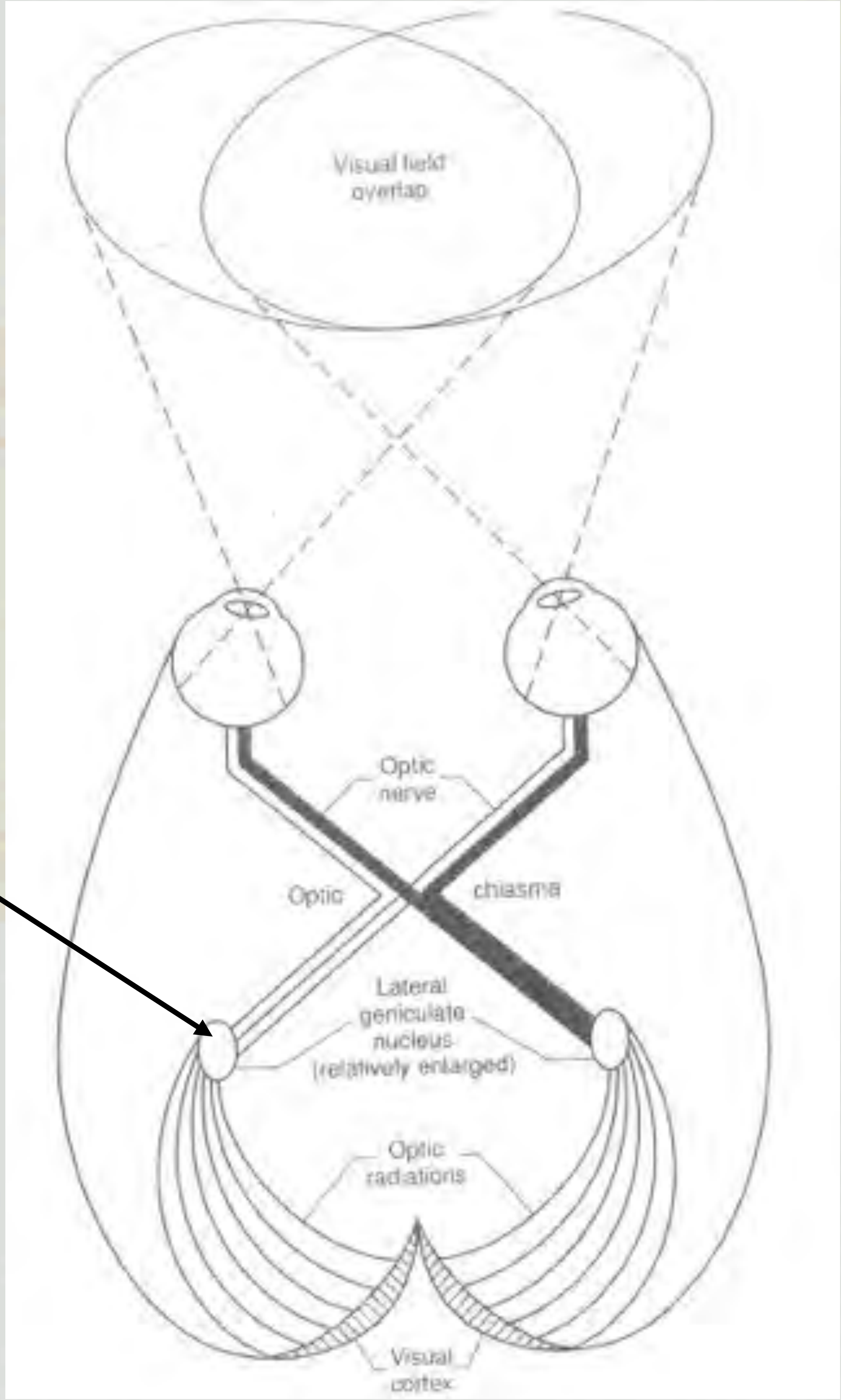
Retinal image reversed -> left cortex deals with information from the right side of the visual field.



Lateral Geniculate Nucleus

Further processing of information by cells in Lateral Geniculate Nucleus (LGN):
1. Relays information from the optic tract to the visual cortex
2. Gating information flow to visual cortex in response to contrast, movement and colour (red-green and blue-yellow responses).

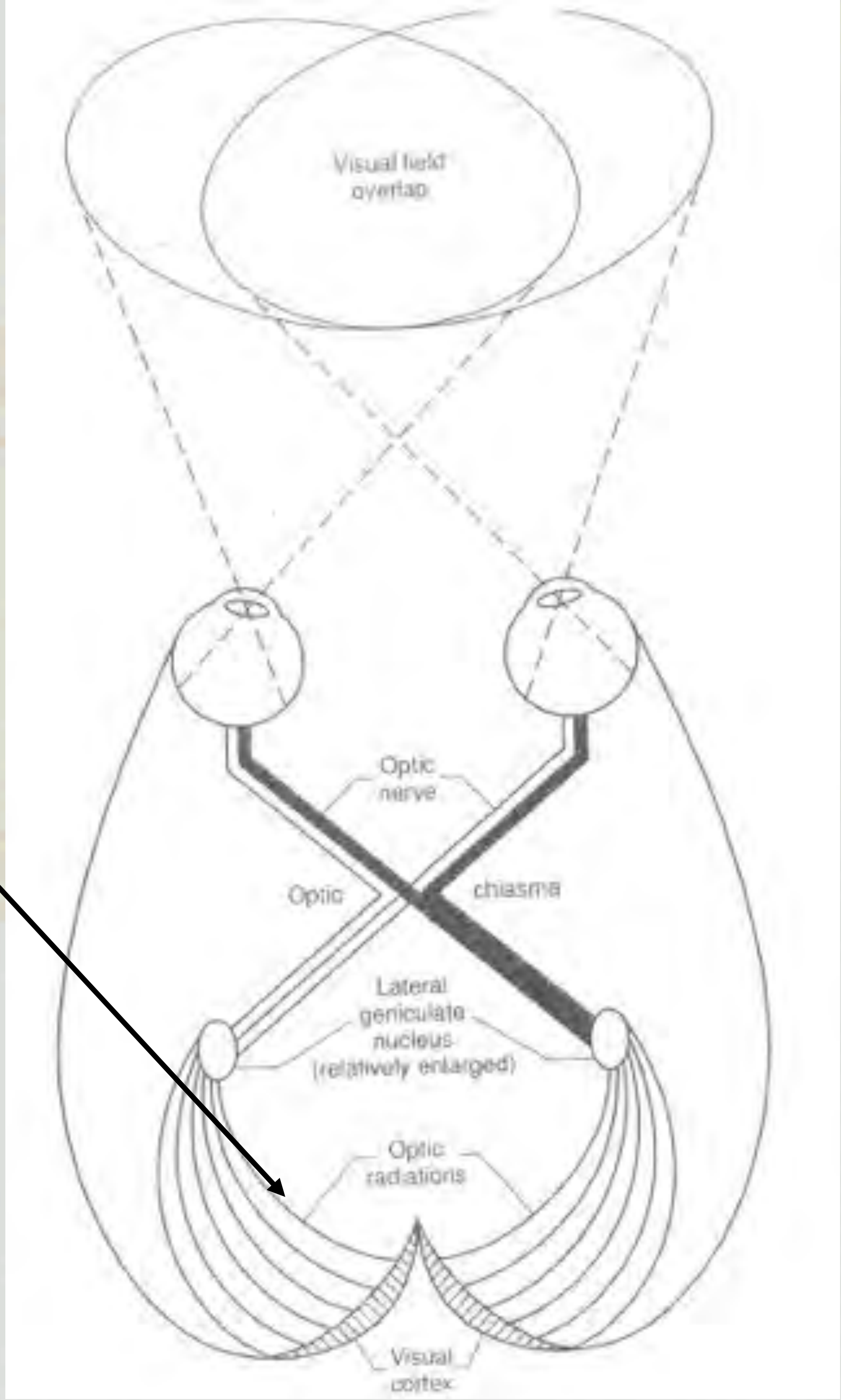


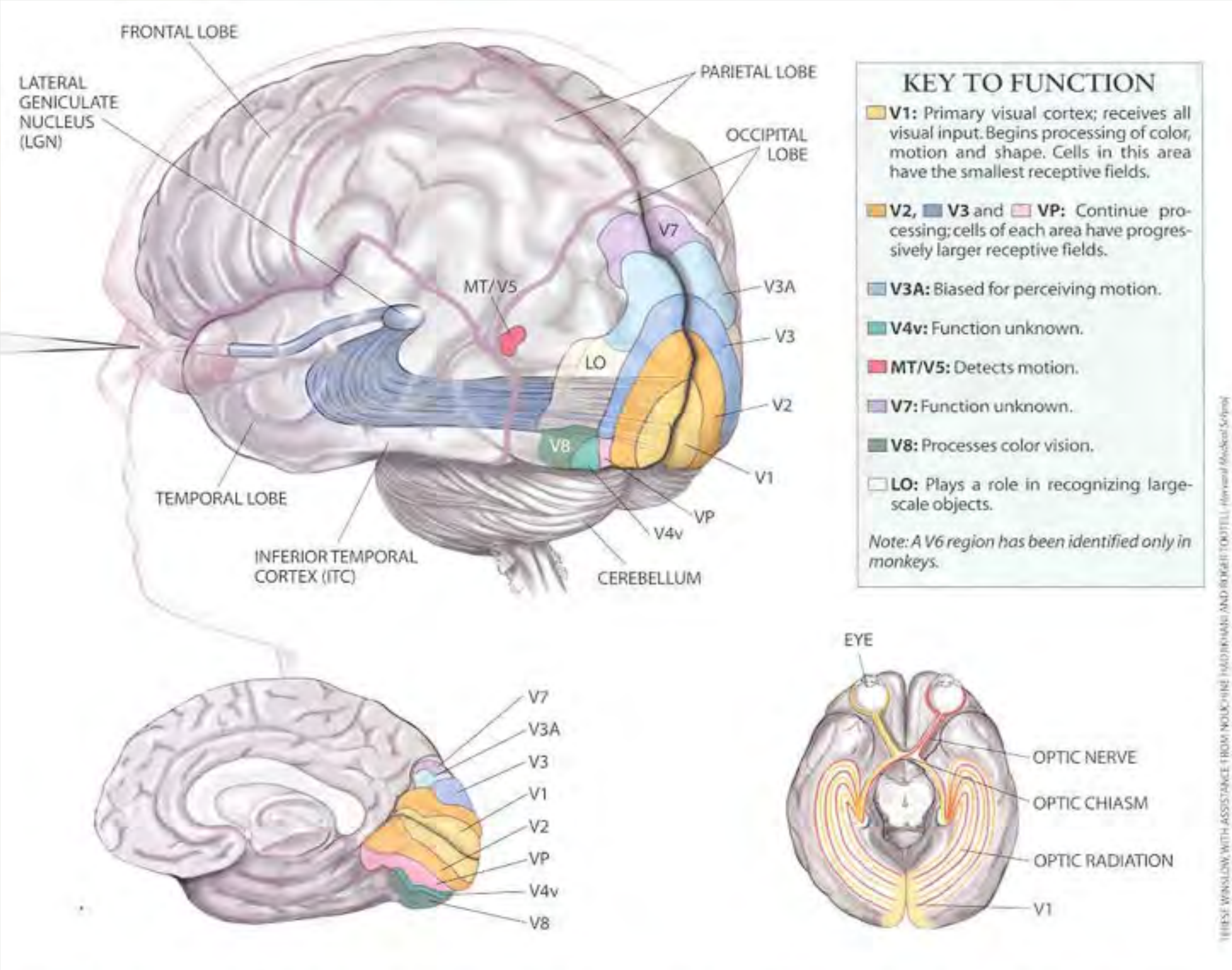


Visual cortex

Visual cortex – complex processing:
- complex shapes and arrangements
- detect visual units (line widths, lenghts, angles, etc.)
- detect shapes and patterns.

Information passed on to the other areas in the brain, but we still do not know enough about how the processes in the brain operate in order to convert such analytical patterns into meaning.




FRONTAL LOBE
LATERAL GENICULATE NUCLEUS (LGN)
PARIETAL LOBE
OCCIPITAL LOBE
MT/V5
V7
V3A
V3
LO
V2
V8
V1
VP
V4v
TEMPORAL LOBE
INFERIOR TEMPORAL CORTEX (ITC)
CEREBELLUM
KEY TO FUNCTION
V1: Primary visual cortex; receives all visual input. Begins processing of color, motion and shape. Cells in this area have the smallest receptive fields.
V2, V3 and VP: Continue processing; cells of each area have progressively larger receptive fields.
V3A: Biased for perceiving motion.
V4v: Function unknown.
MT/V5: Detects motion.
V7: Function unknown.
V8: Processes color vision.
LO: Plays a role in recognizing large-scale objects.
Note: A V6 region has been identified only in monkeys.
V7
V3A
V3
V1
V2
VP
V4v
V8
EYE
OPTIC NERVE
OPTIC CHIASM
OPTIC RADIATION
V1
THERESE WINSLOW, WITH ASSISTANCE FROM NOUCHINE HADJIKHANI AND ROGER TOOTELL Harvard Medical School

Colour vision

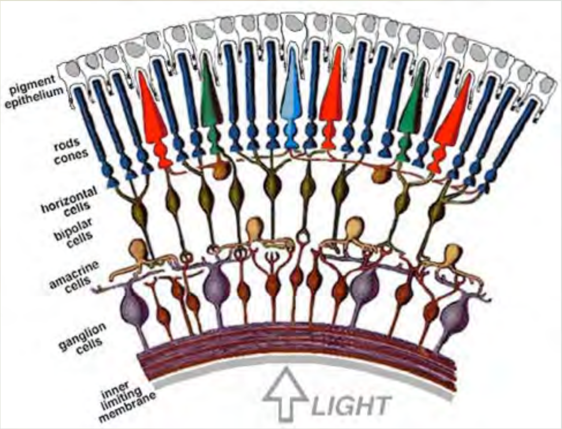
Colour – physical stimulus +
physiological reaction of the eye +
psychological interpretation in the brain.

Physical stimulus: wavelength of incoming light.

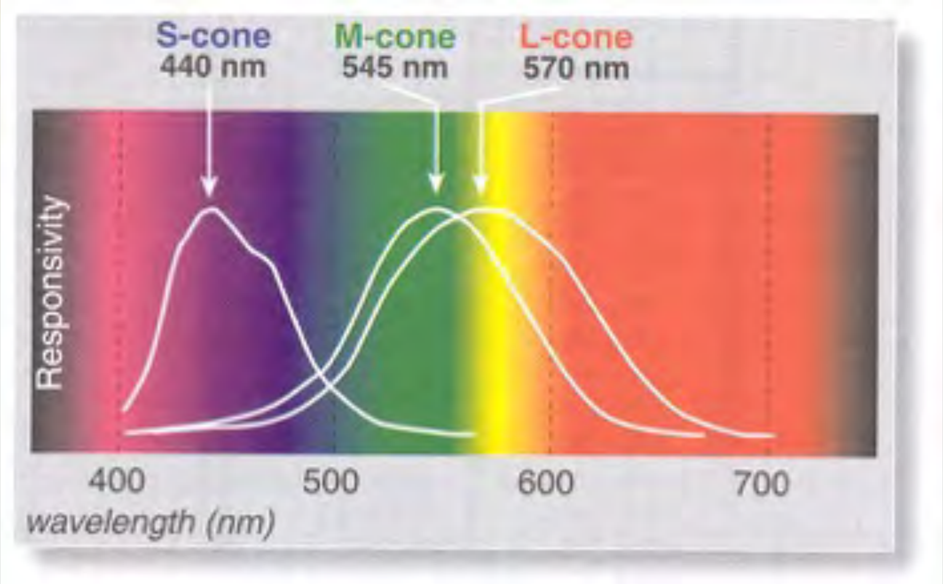
approximate wavelength (nm)	hue
380 - 470	reddish blue
470 - 475	blue
475 - 480	greenish blue
480 - 485	blue-green
485 - 495	bluish green
495 - 535	green
535 - 555	yellowish green
555 - 565	green-yellow
565 - 575	greenish yellow
575 - 580	yellow
580 - 585	reddish yellow
585 - 595	yellow-red
595 - 770	red

Physiological reaction of the eye: the response of the cones

3 types of cones, responding to 3 different wavelengths:
L-cones -> long wavelenghts -> red
M-cones -> medium wavelenghts -> green
S-cones -> short wavelenghts -> blue



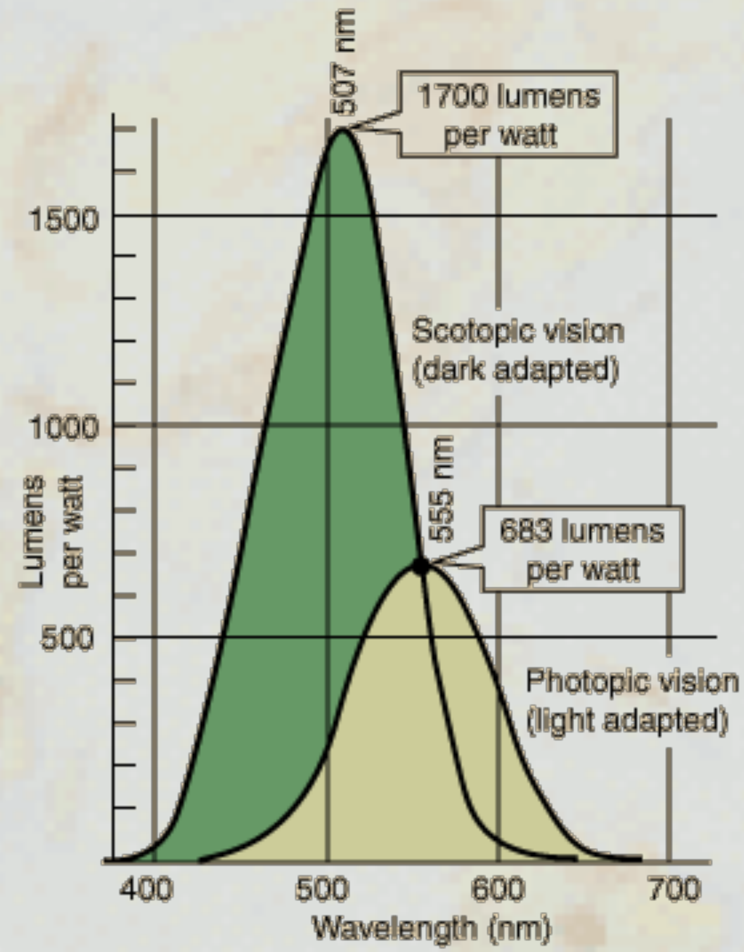
Colour perception:
each wavelength of the spectrum is a unique linear combination of the stimulations of the three cone types.

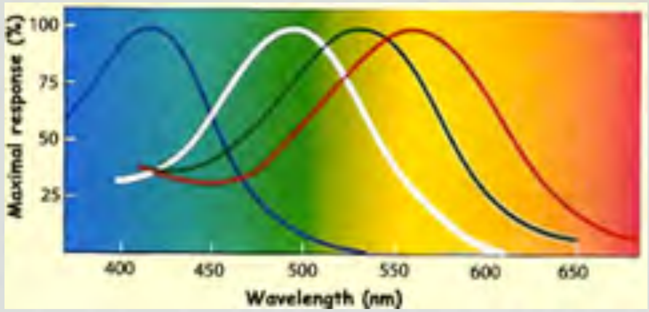


If all cones are equally stimulated, we see white for maximum stimulation, grey for intermediate stimulation and black for low stimulation.

Light sensitivity of the eye

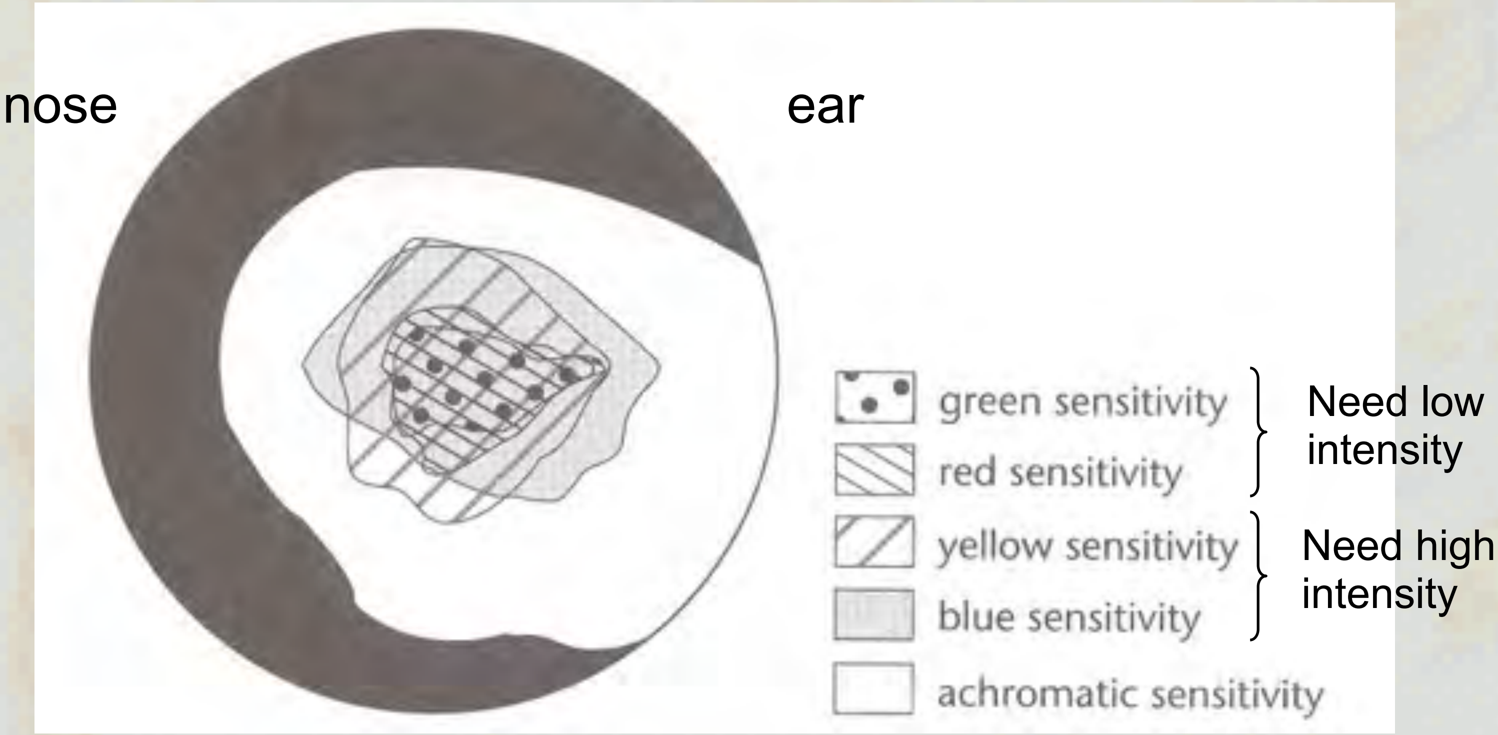
The light sensitivity of the normal human eye has been studied extensively. The response of the eye as a function of frequency is called the luminous efficacy of the eye. It has been tabulated for both the light-adapted (photopic) case and the dark-adapted (scotopic) case.





Field of vision

The distribution of field of vision of different colour cones in the right eye (perimetry chart):



Cartographical significance: blue cones cover a large part of the retina, but their sensitivity is lowest from all three cones. Therefore blue is a bad colour for small map features.

Dark adaption

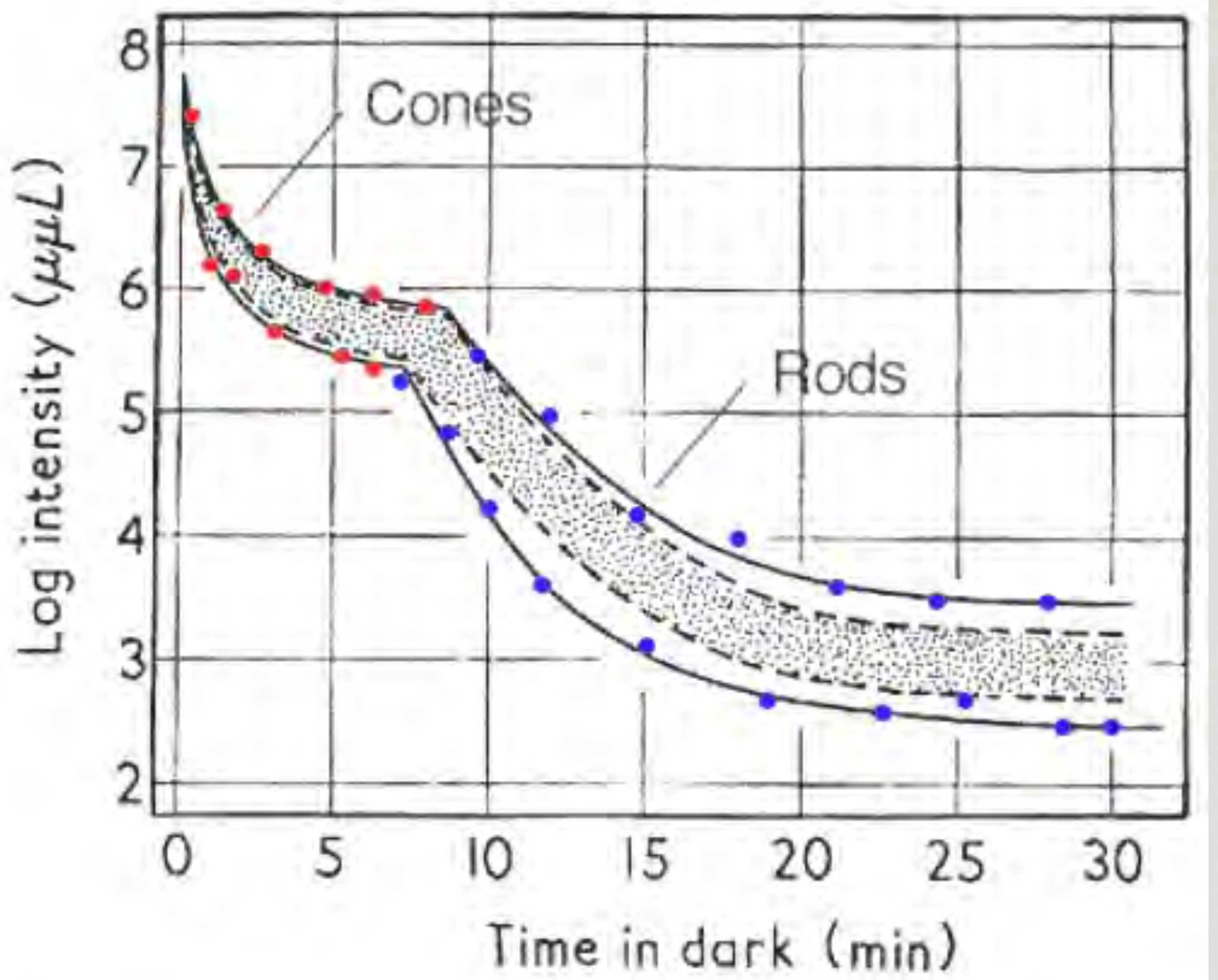


Figure 1. Dark adaptation curve. The shaded area represents 80% of the group of subjects. Hecht and Mandelbaum's data from From Pirenne M. H., Dark Adaptation and Night Vision. Chapter 5. In: Davson, H. (ed), The Eye, vol 2. London, Academic Press, 1962.

Dark adaption of different wavelengths

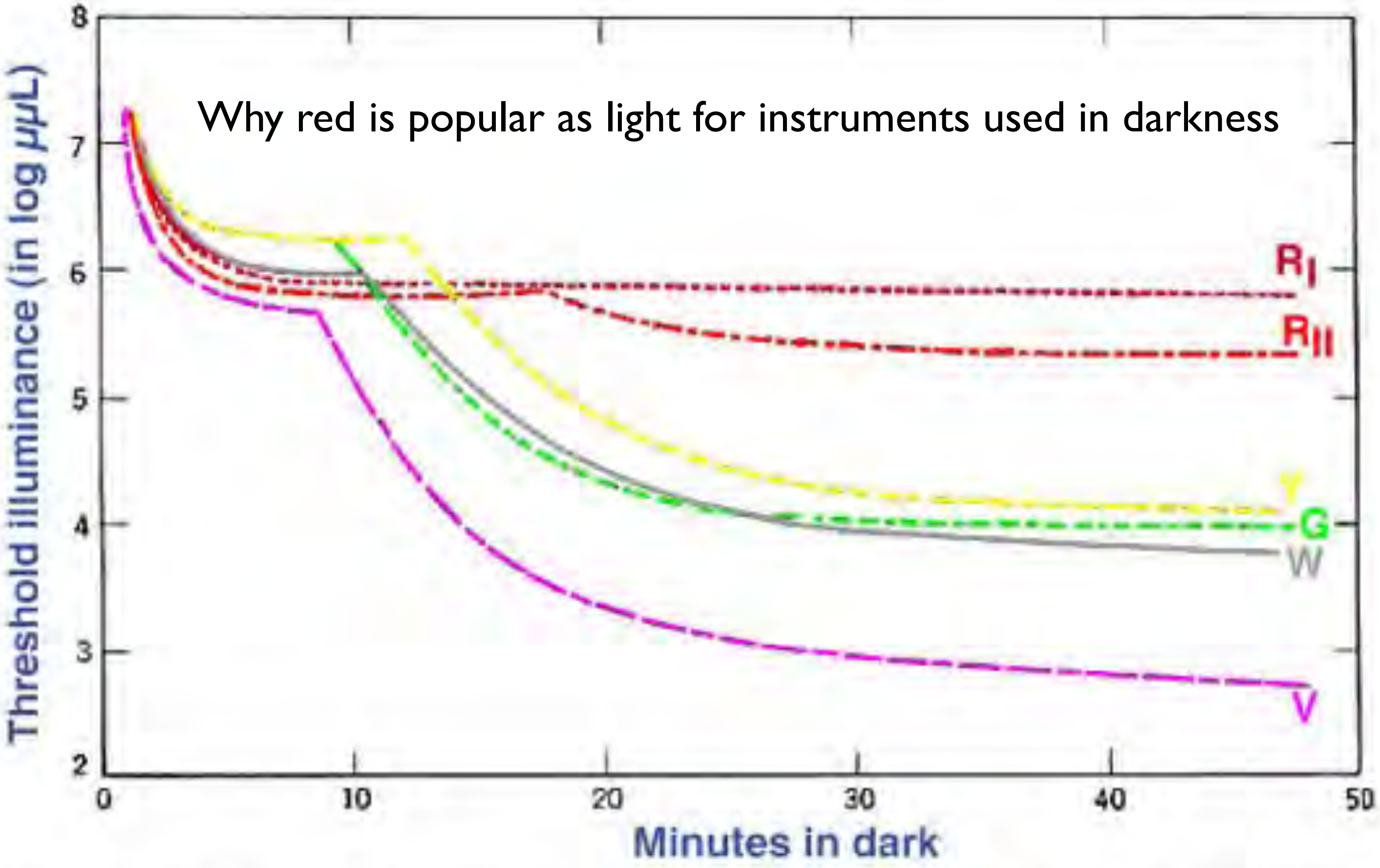


Figure 7. Dark adaptation curve using different test stimuli of different wavelengths. Subjects were pre-adapted to 2000mL for 5 minutes. A 3 degree test stimuli was presented 7 degrees on the nasal retina. The colours were: RI (extreme red)=680 nm; RII (red)=635 nm; Y (yellow)=573 nm; G (green)=520 nm; V (violet)=485nm and W (white). Chapanis' data from Bartlett N. R., Dark and Light Adaptation. (Chapter 8. In: Graham, C. H. (ed), Vision and Visual Perception. New York: John Wiley and Sons, Inc., 1965).

Sensitivity range

The eye can adjust from 1 to 1000000; that is from seeing a star to viewing bright sunshine

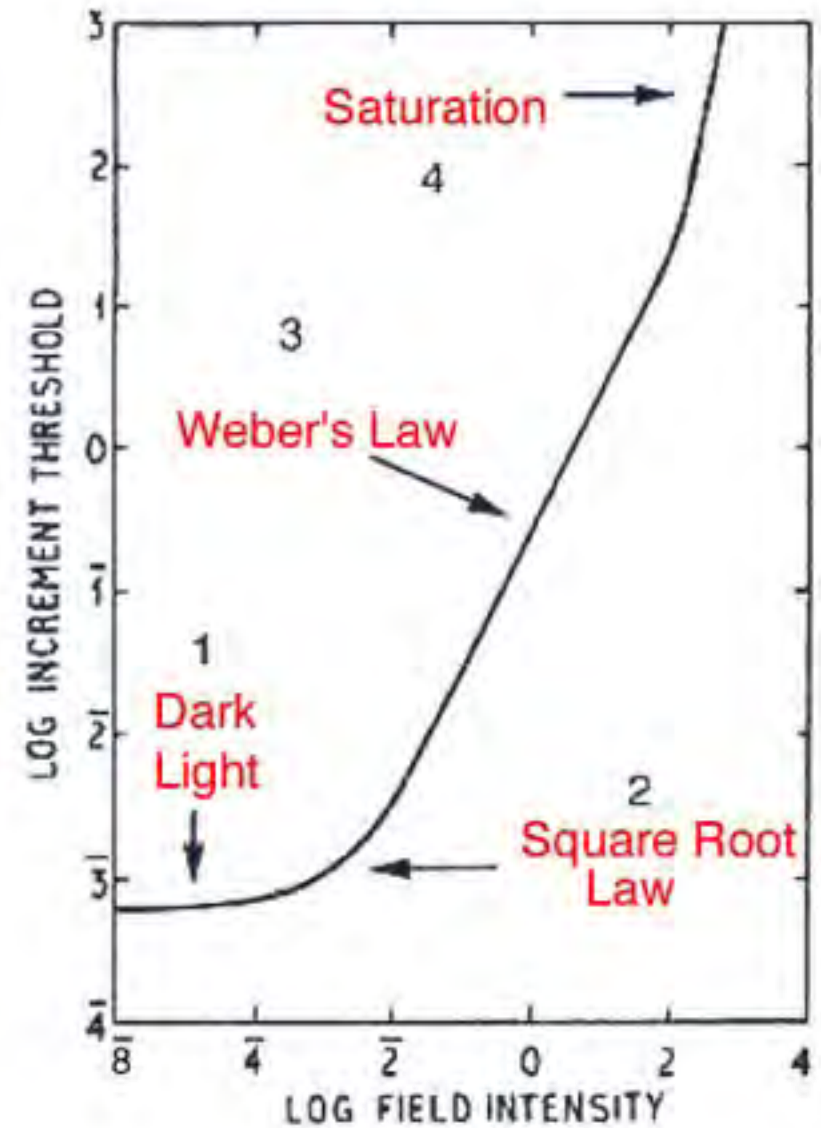
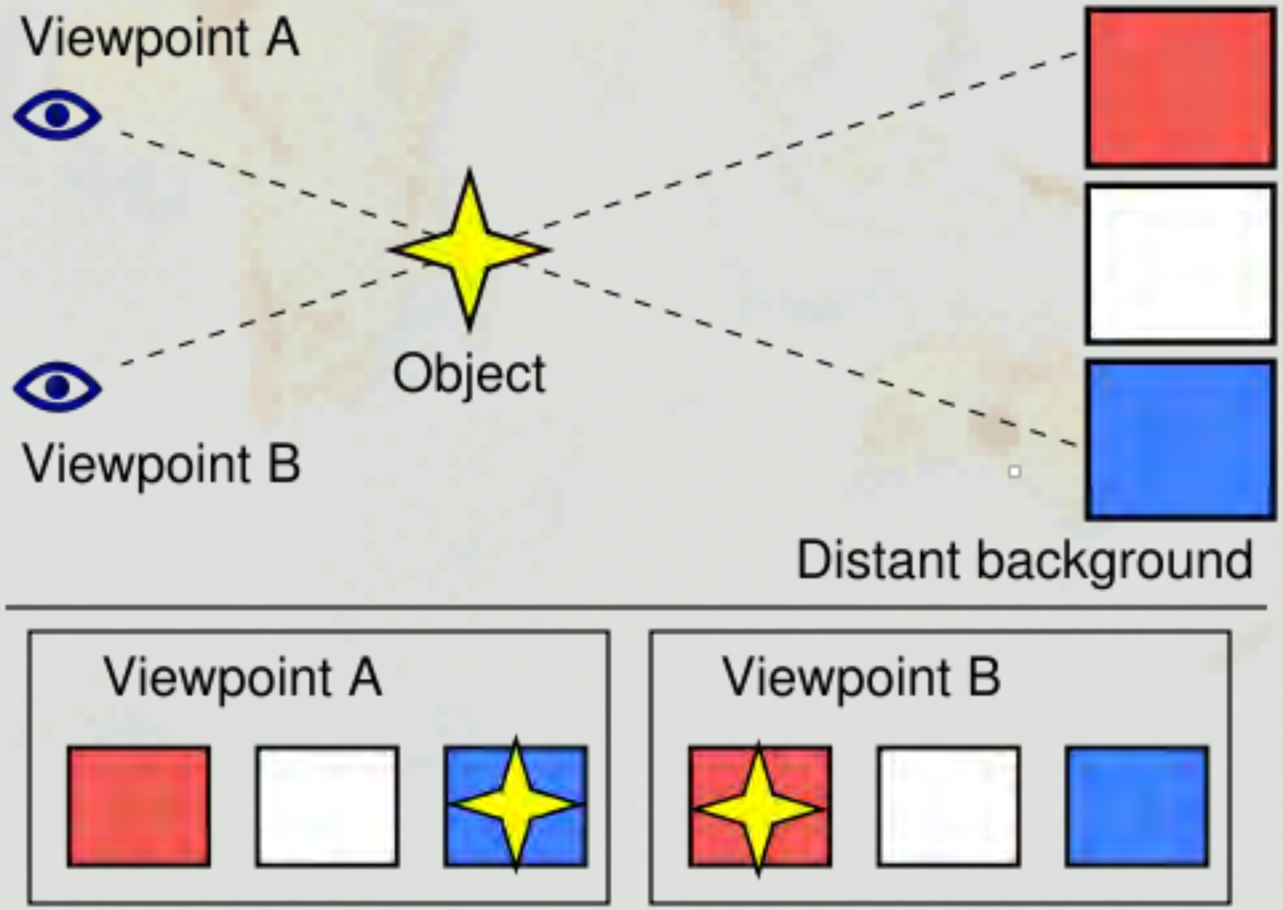


Figure 12. Schematic of the increment threshold curve of the rod system. Aguilar and Stiles' data from Davson (Davson's Physiology of the Eye, 5th ed. London: Macmillan Academic and Professional Ltd, 1990).

Depth perception

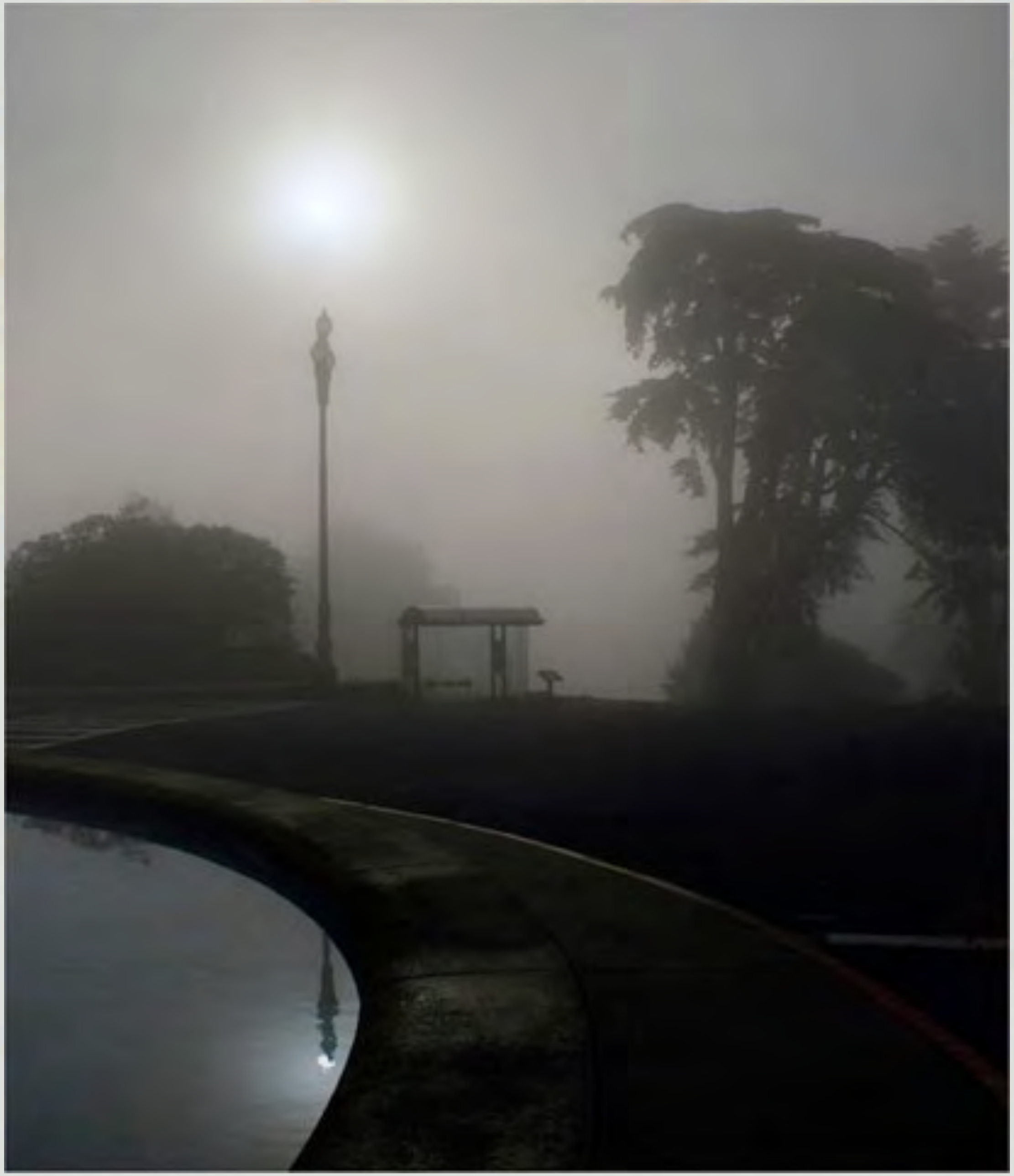
- Size of image of known objects
- Moving parallax
- Stereopsis

Illustration of parallax

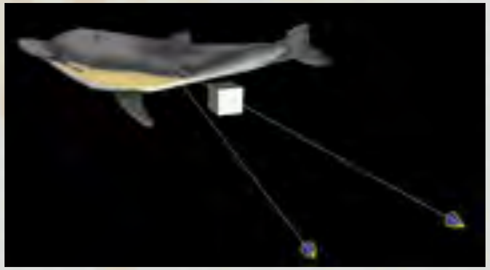


Parallax in 2D image

The mirrored view in the water offers a second parallax for the pole and the sun, hinting for the difference in distance from the viewer.

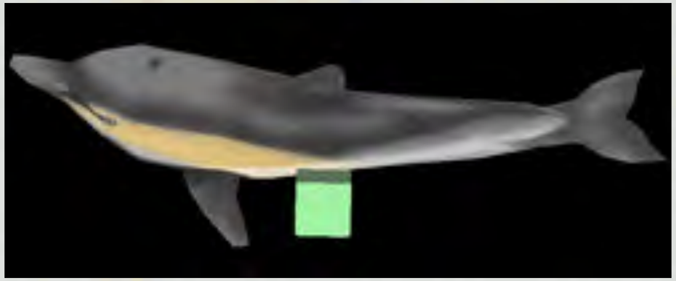


Stereopsis

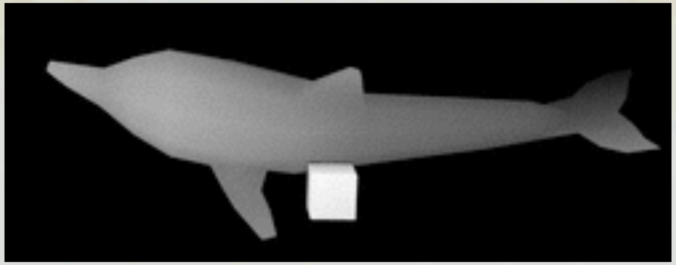


The cube is shifted to the right in left eye's image.

The cube is shifted to the left in right eye's image.



We see a single, Cyclopean, image from the two eyes' images.



The brain gives each point in the Cyclopean image a depth value, represented here by a grayscale depth map.

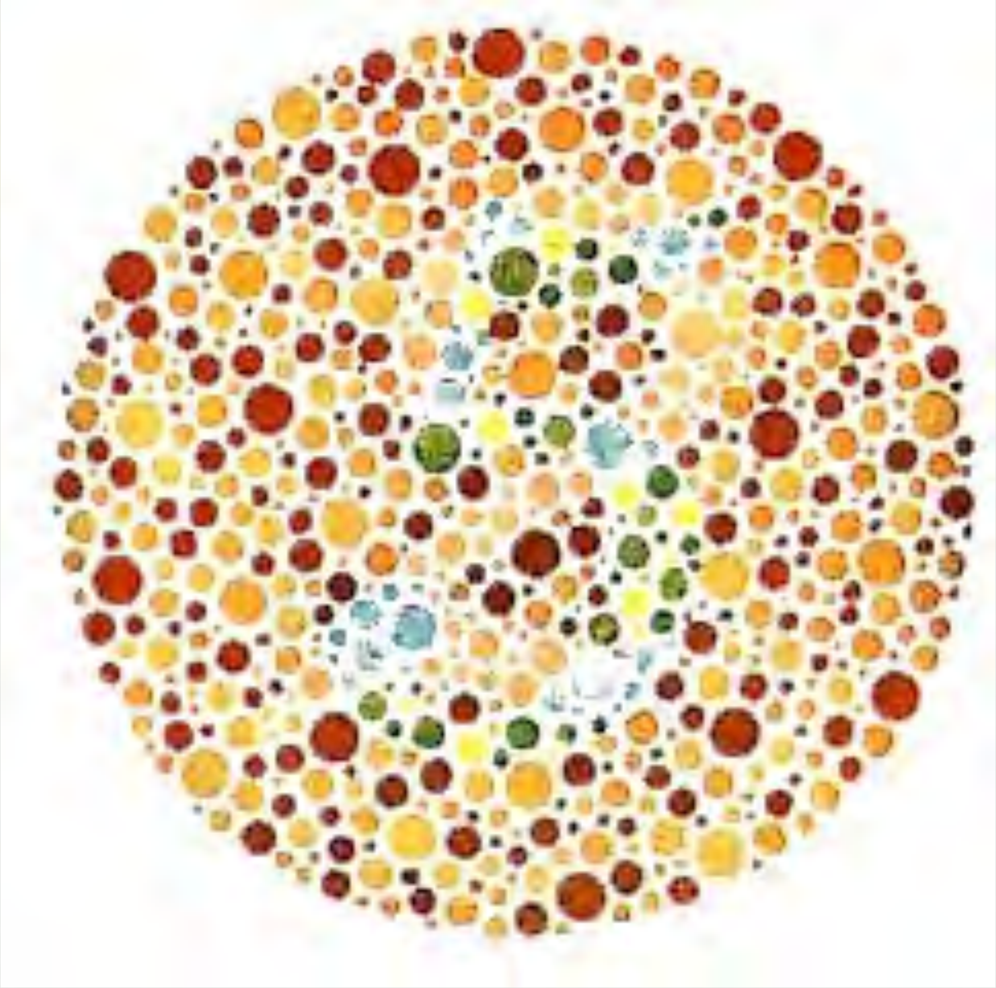
Color blindness

Red-green colour blindness: caused by missing cones.
(about 10% of white males, while white females and non-whites of both genders are very rarely affected), but color blindness is transmitted from mother to son (resides in the X-chromosome)

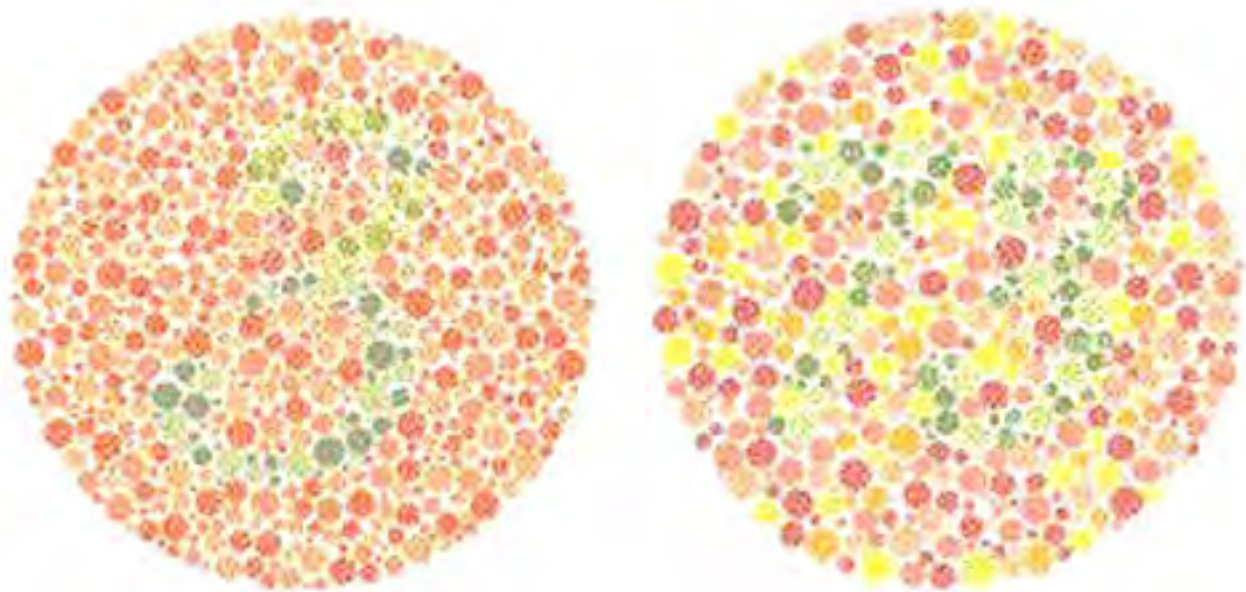
2 common types:
- protanopia –> missing L-cones
- deuteranopia -> missing M-cones

Inability to distinguish blue-yellow:
tritanopia, is extremelly rare.

What number do you see?



Color blindness



(a) (b)

Figure 21. (a) The transformation plate of the Ishihara. Normal should see 3 while a CVD person should see 5. (b) The vanishing plate of the Ishihara. Normal should see 73 while a CVD will not read the figures correctly.

Color blindness

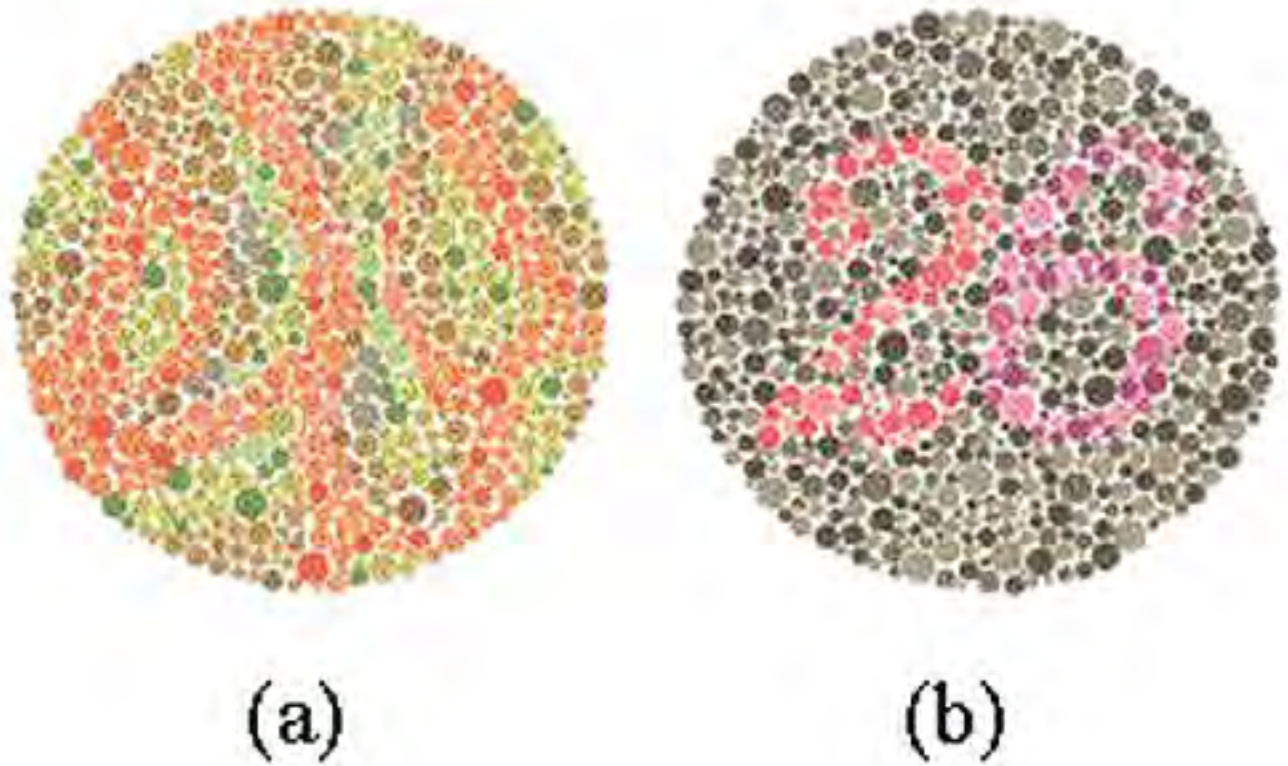


Figure 22. (a) The hidden-digit plate of the Ishihara. Normal should not see anything while a CVD person should see 5. (b) The diagnostic plate of the Ishihara. Normal should see both the 2 and the 6. Deutan type colour vision deficiency should see 2 more easily while a protan type colour vision deficiency should see the 6 more easily.

Color blindness

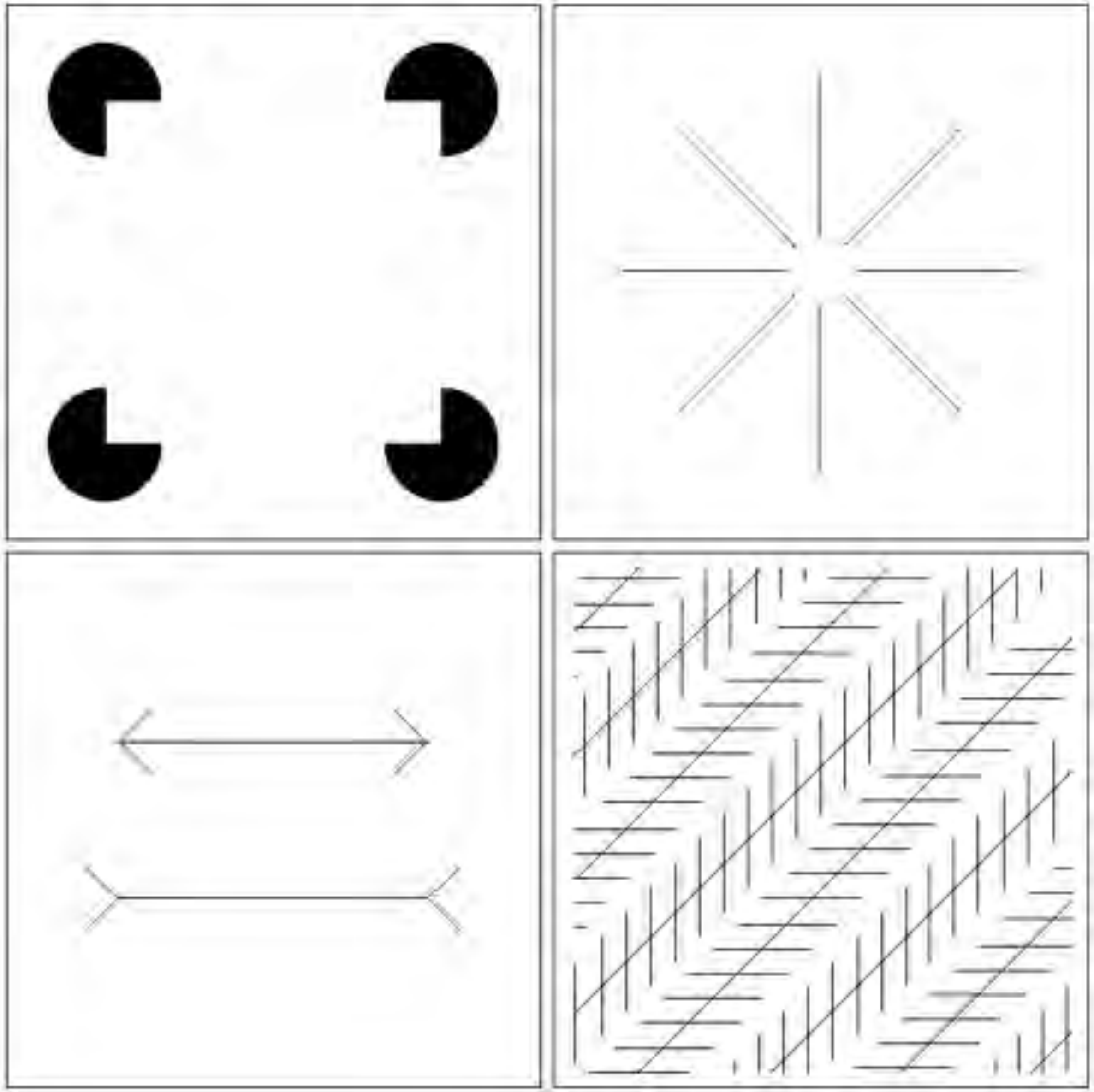
Normal

Protanope

Deuteranope

Tritanope

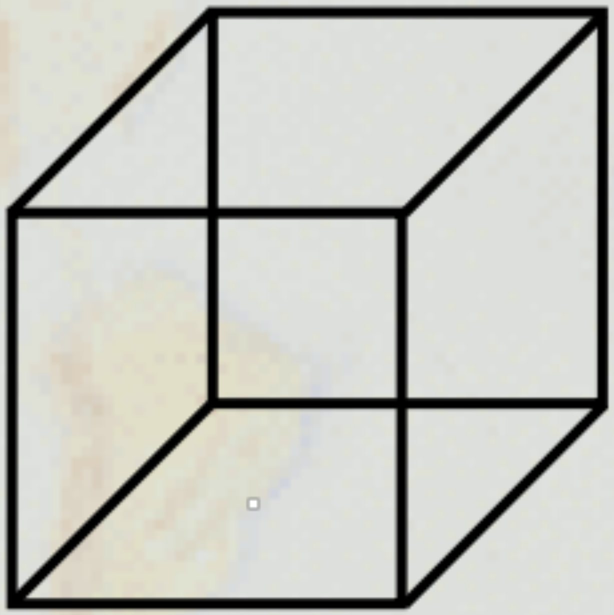
Optical illusions



a b
c d

FIGURE 2.9 Some well-known optical illusions.

Optical illusions



Psychological reaction of the brain to colour

Interpretation of the neural signals from the retinal photoreceptors.

How do I know that I perceive the same colours as you do when looking at the same scene?

I can't know!!

I describe as green what most of the other people describe as green (because I learnt it as I child), but I can't be sure that it is the same colour.

Map reading

Eye movements

Detection + discrimination

Maps contain small and detailed images. → Foveal vision

Map is viewed at the correct distance and focusing is ok.

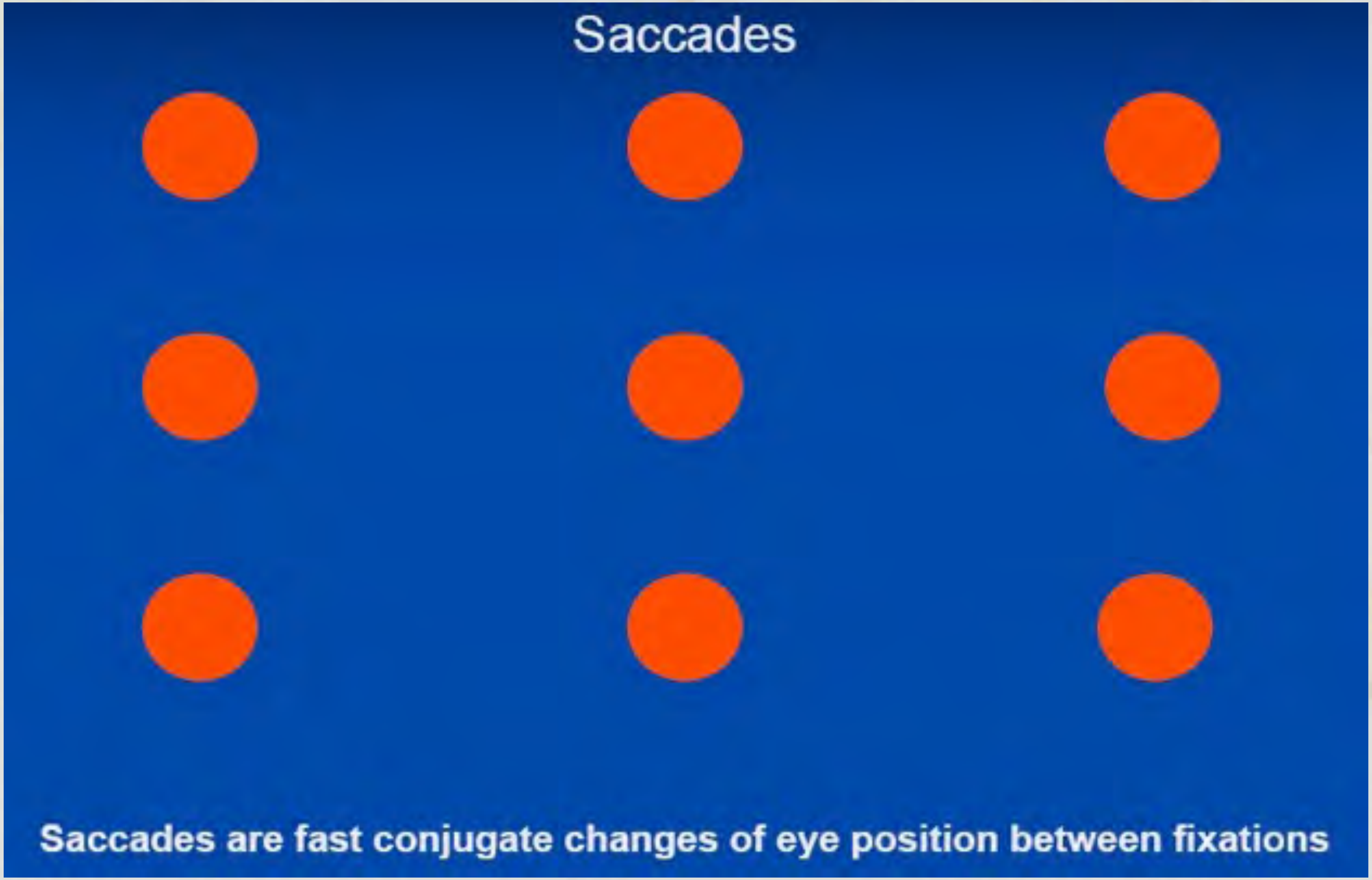
↓ Necessary eye movements

Saccadic eye movements: extremely fast, small, jerky, voluntary eye movements to redirect the line of sight, allowing the eyes to fix on a still object as the head turns or the person moves – eye fixations.

↓

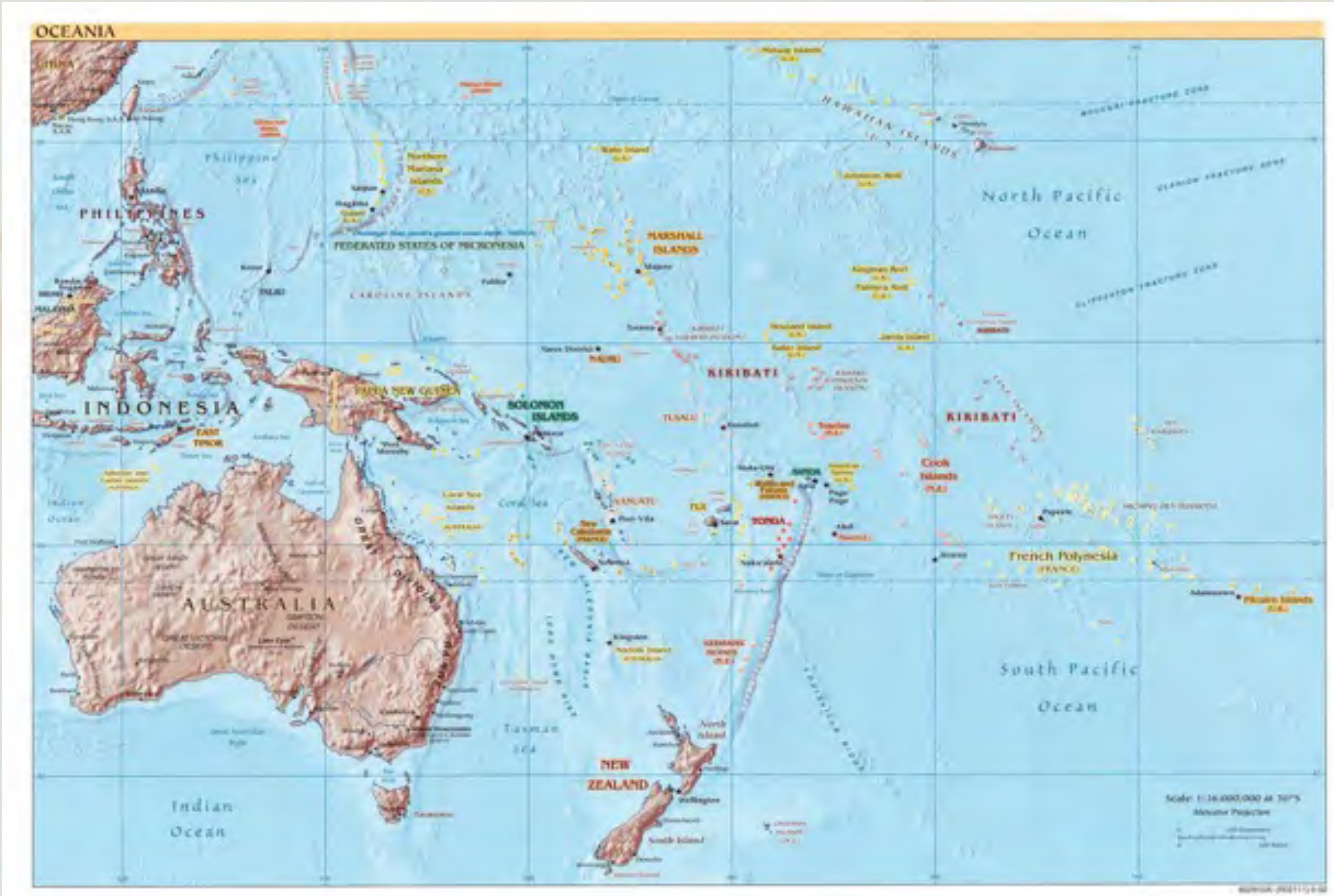
Look at your neighbour's face. Can you see both of his/her eyes clearly at the same time?

Saccades



Can you focus and see all these points clearly at the same time?

Map reading



The inspection of map details is performed one bit at a time.
Brief retinal images are stored in the brief sensory memory (15-30s), before it is processed by the visual system.

Map reading

Map perception and interpretation

Stages in map perception:

1. Detection - Detect a symbol
2. Discrimination - Discriminate a symbol from other symbols
3. Identification - What does the symbol mean?
4. Interpretation - Using the knowledge about a symbol in regard to the map-using task

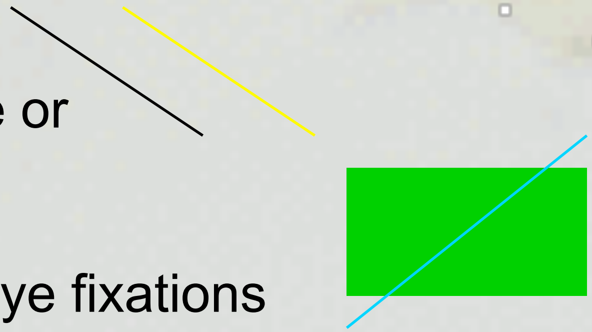
Map reading

Detection – to detect a symbol

Depends upon:
- the optical system of the eye -> the lense
- the receptor system of the retina -> the ”photographic film”

Visual acuity: the minimum object size that can be detected at a given distance under certain conditions of contrast.
- depends on the visual angle, covered by the object
- maximal in the fovea, only about 2º around the centre of the visual field
- NOT a major problem in the use of maps -> maps are not constructed with symbols that are too small to be seen.

Map using issues:
- contrast (a thin black line vs. a thin yellow line or a thin blue line on a green background)



- detection problems during a visual search – eye fixations

Map reading

Discrimination

More critical than detection in map-using process.

Discrimination: to detect a difference between symbols or to discriminate one map symbol from the others.

Requirements for a map:
- symbols that represent two different things, even though they might be similar, must be slightly different or
- although in different surroundings, the two symbols that represent the same thing, must be the same.

Comparison

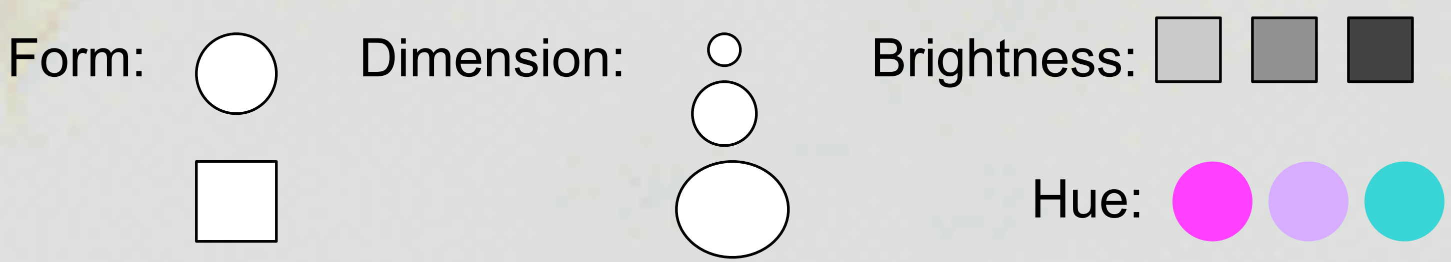
Symbol on the map ⟷ Symbol in the legend

Map reading

Physiological factors in discrimination

A perceptible stimulus →
- intensity →
  - hue
  - brightness
- extent →
  - dimension
  - form
- duration →
  - negligible for a map symbol

Minimum condition for discrimination: sufficient difference in form, dimension and contrast (either achromatic or in hue, saturation and brightness) between two symbols.



Map reading

Psychological factors in discrimination

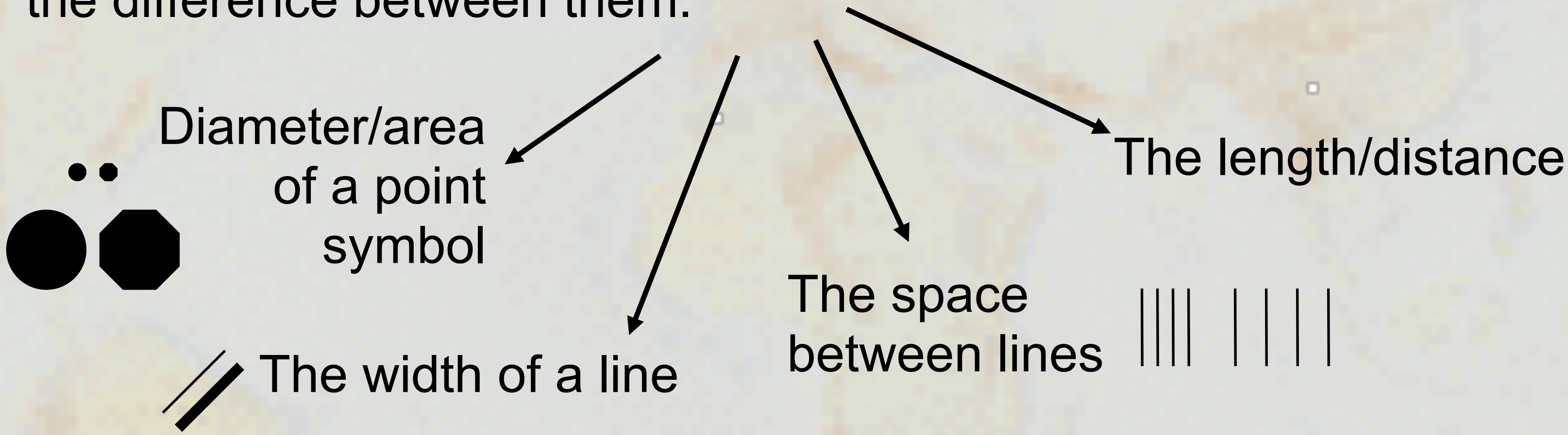
Maps can be perceived on two levels:
- in their entirety -> peripheral + central (fovaeal) vision, → broader forms
- selecting particular details for closer attention -> central vision. → selected details, ignoring irrelevant things

However, as situation/task of the map-user changes, previously irrelevant details may become relevant to the task.

Map reading

Discrimination of dimension

Ability to make judgements about the relative sizes of objects and the difference between them.

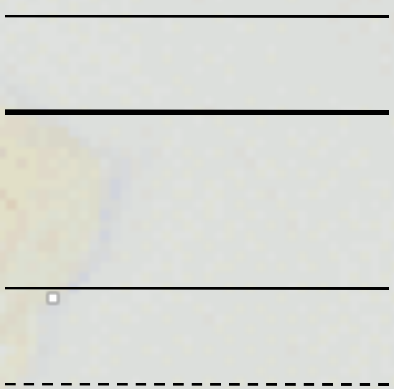


Two types of discrimination problems:

- for most maps: difference in dimension shows a qualitative difference (i.e. a thicker line represents a different geographical feature than a thinner line) -> no problems
- problems: if the difference in dimension represents a quantitative difference (the user should judge how much the symbols differ, what is the smallest still perceivable difference?)

Map reading

Easier to perceive differences in form than small differences in dimension:



1px

2 px

Different forms, both 0.75 pt wide

Map reading

Quantitative discrimination

Using graphic elements – form, dimension and colour – of the map symbols to represent characteristics of the geographic object/ phenomena.

↓

L3: Graphic variables

Problem:
Human vision is good in discrimination of symbols, but not adequate for objective size judgement.

Map reading

Discrimination of form

Form is not the same as shape!

Form: the form of point/line symbols, important for discrimination.
Shape: the spatial arrangement of geographical features, important for identification.

Regular, simple geometrical figures are easier to discriminate than complex ones.

But they have to be sufficiently large:
-ok to discriminate between a circle and a square with diameter 2mm, but if they are more reduced in size, that becomes difficult -> a problem of discrimination, not detection.

Another issue is separation:
- if two small different symbols are side by side, they are easier to discriminate than if they are far apart.

Map reading

Discrimination of colour: hue, saturation and lightness

↓

L3: Graphic variables

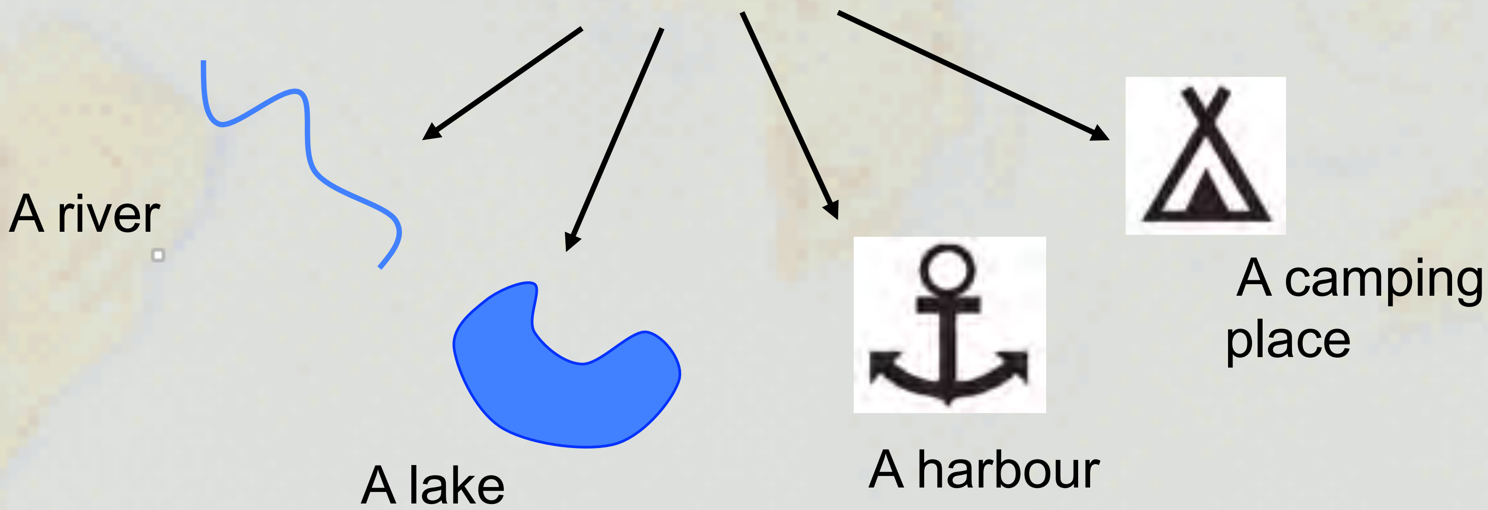
Map reading

Identification - What does the symbol mean?

Identification is not the same as recognition!

Recognition: something looks familiar.
Identification: we can say what it is or name it.

Ability to tell what the observed geographical symbol represents.



Once the meaning of a symbol is understood, interpretation becomes possible.

Map reading

Interpretation depends on previous knowledge and culture.

What is this?

What is this?

Map reading

A castle on the topographic map in Sweden&Austria.

Map reading

Interpretation

Involves user's previous knowledge, not only visual perception. While the processes of visual perception are well researched, we still do not know very much about how we ”know” and learn things and what mental processes are involved in the map interpretation process.

Cognitive psychology:

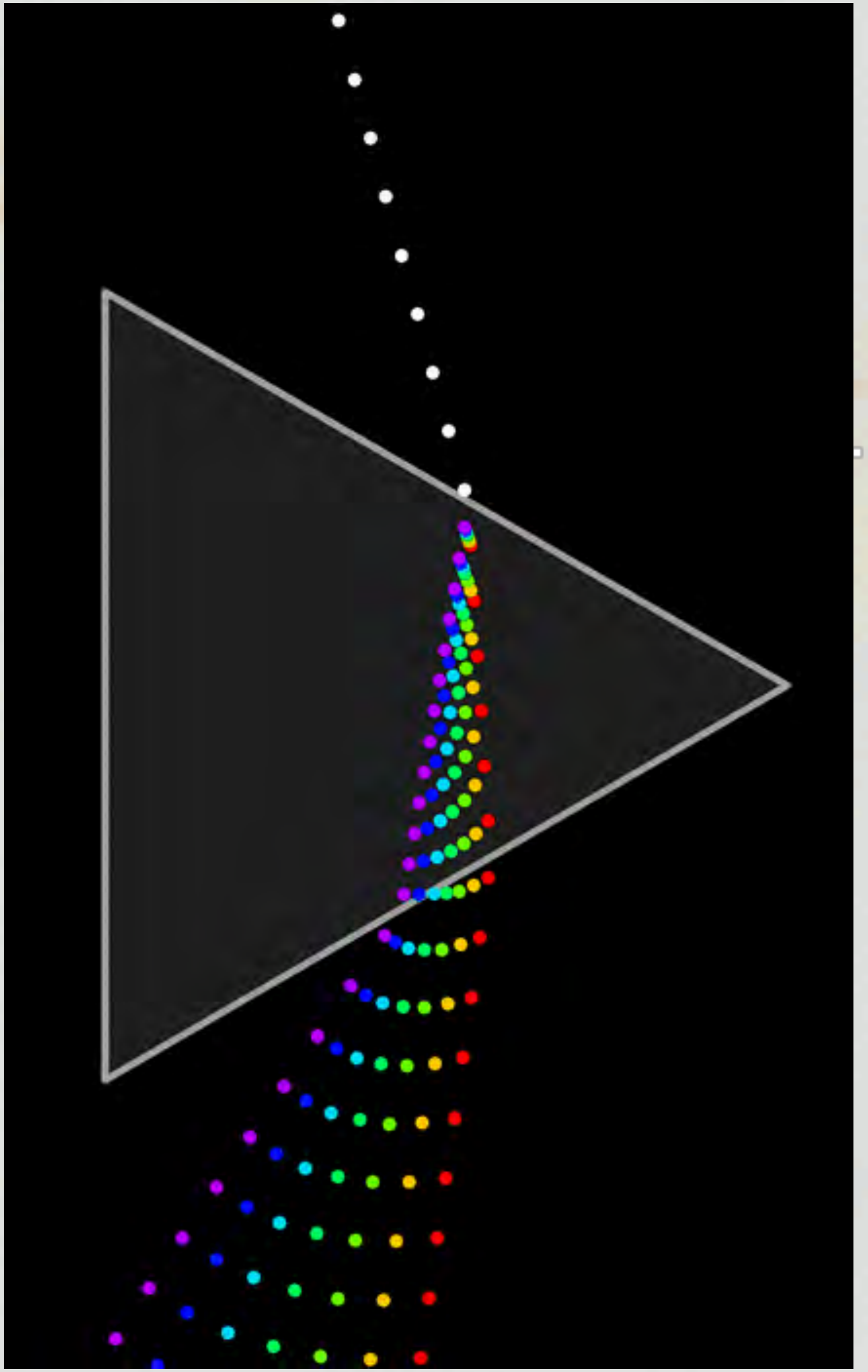
psychological study of human knowledge acquisition, not only by input through the sensors, but by internal mental factors.

- attitude
- learning
- memory

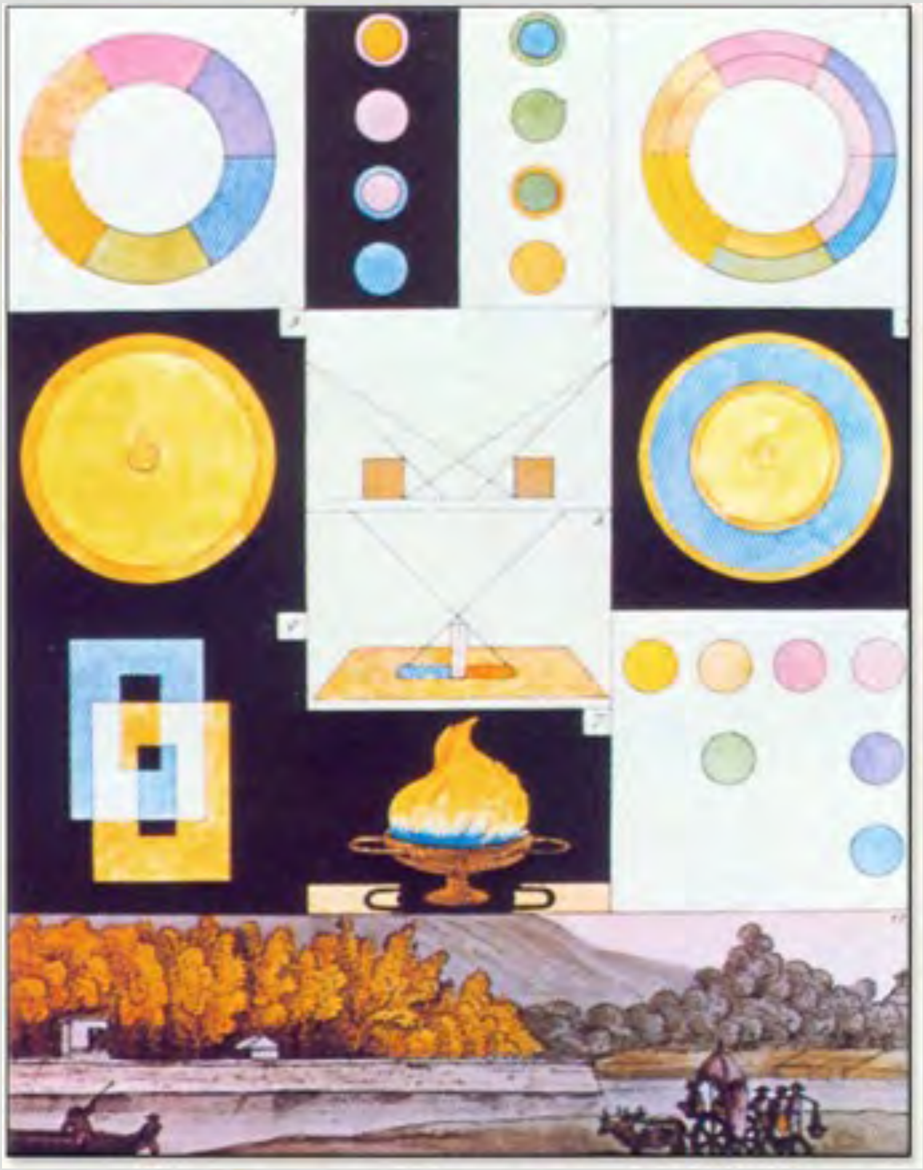
Further reading

http://thebrain.mcgill.ca

http://webvision.med.utah.edu/



Newton viewed color as a physical problem, involving light striking objects and entering our eyes.



Goethe's diagrams in the first plate of Zür Farbenlehre (Theory of Colors) include a colorwheel and diagrams of distorted color perception.

Goethe reformulates the topic of color in an entirely new way. He suggested that the sensations of color reaching our brain are also shaped by our perception — by the mechanics of human vision and by the way our brains process information. Therefore, according to Goethe, what we see of an object depends upon the object, the lighting and our perception.

Exercise 2: Designing cartographic symbols

Symbol	Object	Size on the map	Symbol	Object	Size on the map
	A castle *Ett slott* 737			A lighthouse *En fyr* 365	
	A church *En kyrka* 741			A ruin *En ruin* 745	
	A cemetery *En begravningsplats* 762			A tower *Ett torn* 759	
	A farm *En gård* 731			A TV/radio antenna, a phone mast *En mast* 373	
	A football field *En fotballsplan* 766			A sport facility *En idrottsplats* 763