

Pathological physiology of special senses

Petr Maršálek

Institute of Pathological Physiology
1st Medical Faculty CUNI

Vision



1 20/200

2 20/100

3 20/70

4 20/50

5 20/40

6 20/30

7 20/25

8 20/20

9

10

11

Snellen (N/36)
optotypes have (N/32)
letters with defined (N/28)

letter size, or number of points(N/26)

seen from a calibrated distance. (N/24)

This is written as fraction. (N/22)

The best vision is: 6/6 (N/20)

From distance six meters/ (N/18)

we see six points (B/16)

(one arch minute each). (B/14)

Functional classification of vision impairment

- | | |
|--|--|
| 1 normal vision | 6/6 |
| 2 low vision | worse than ($<$) 6/18 |
| (on the best eye with corrective lenses) | |
| 3 (practical) blindness | $< 3/60$ |
| or narrowing of visual angle less than | $< 10^{\circ} \times 10^{\circ}$ |
| other norm | $< 6/60, \quad < 20^{\circ} \times 20^{\circ}$ |
| 4 <i>amblyopia</i> | |

Causes of blindness

A ordered by frequency in the developed countries:

1 diabetes: retinopathy, 2 glaucoma, 3 disorders
– age related, like macular degeneration,
4 injuries, 5 other causes, neurologic

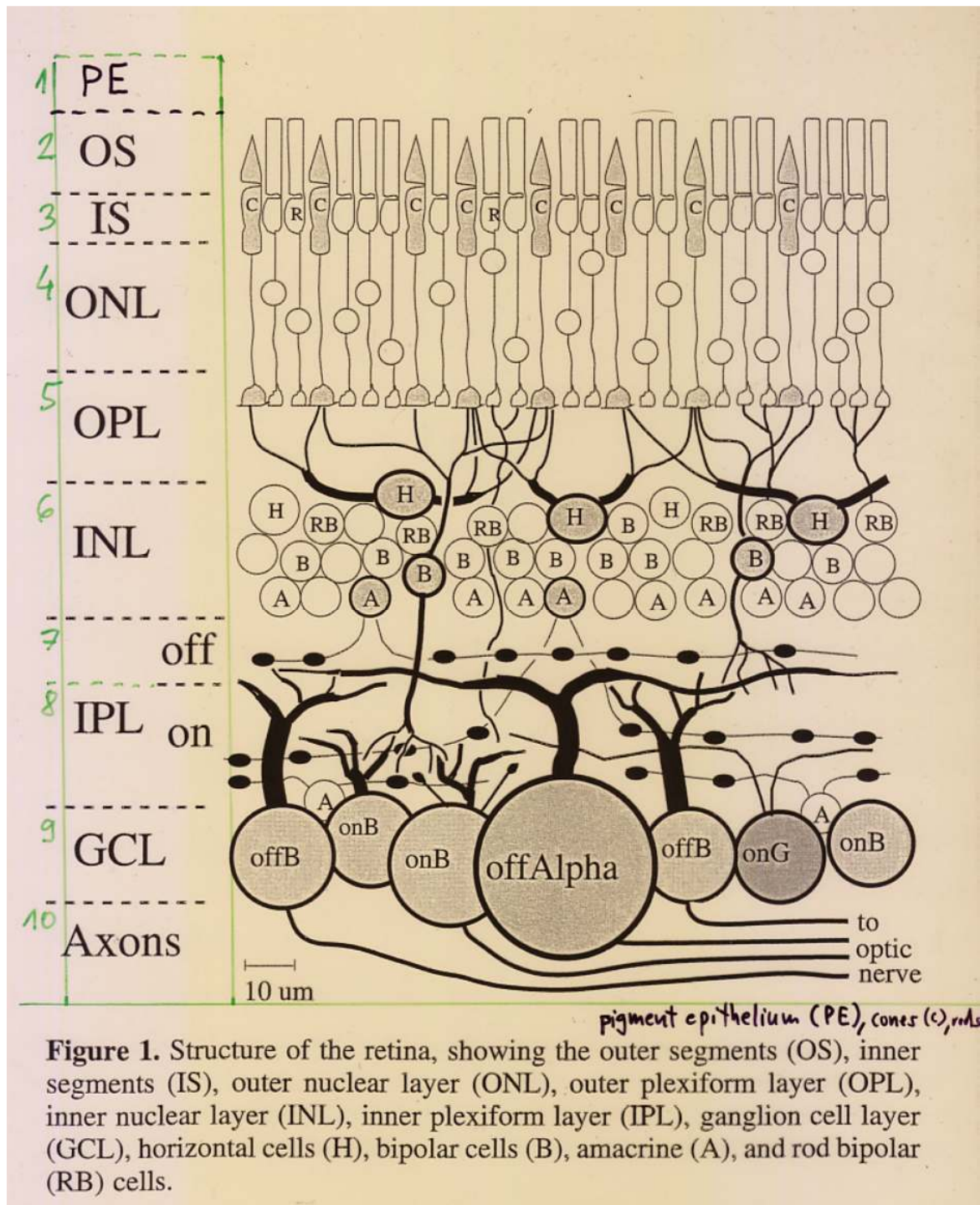
B ordered by frequency in the third world countries:

1 trachoma (chlamydia trachomatis), 2 onchocercosis
(onchocerca volvulus),
3 xerophthalmia (vit. A avitaminosis), 4 cataract, 5 glaucoma,
6 injuries, 7 senile macular degeneration, 8 diabetic retinopathy
9 genetic causes, 10 neurologic causes

C overall incidence:

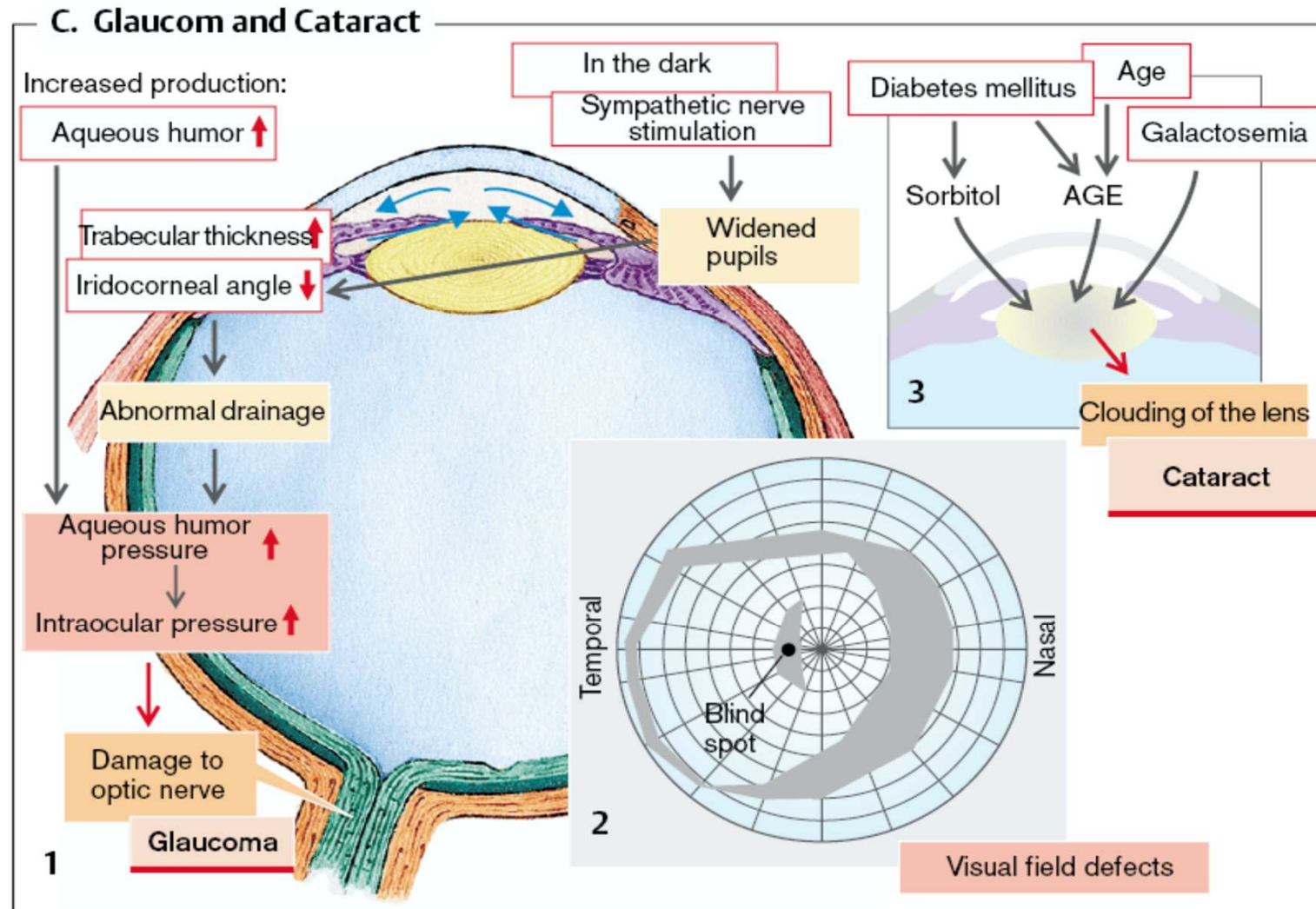
developed countries 0,2 %, worldwide 1 %,
some third world countries several %

Ten layers of retina

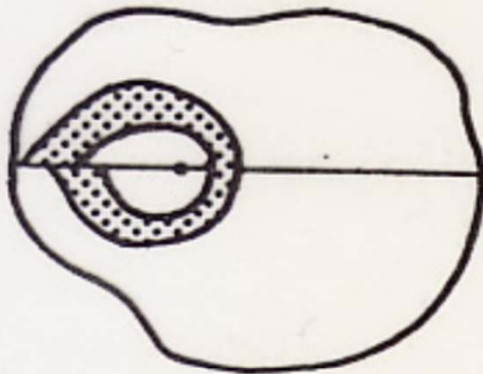


Glaucoma and Cataract

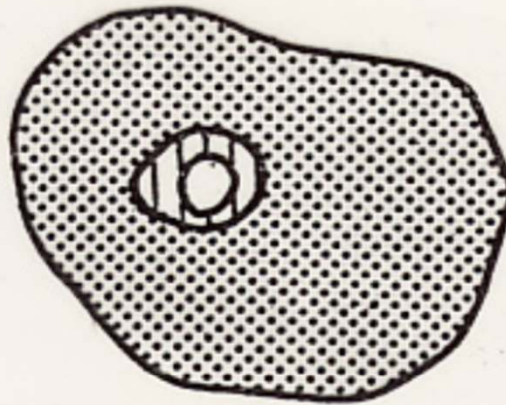
AGE – Advanced Glycation End products,
Age = as ageing



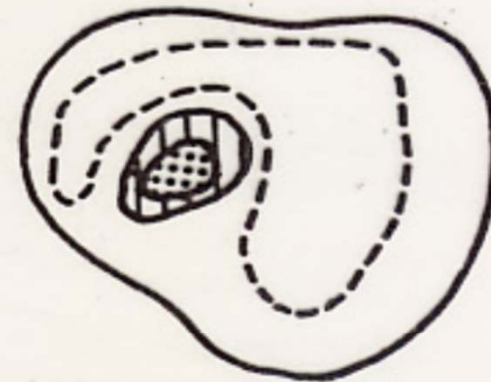
Other defects of perimeter



Obr. 11—1. Zorné pole při pokročilém glaukomu: kolem centrálního bodu probíhají obloukovité skotomy ze slepého bodu do temporální periférie (podle sítnice), nazální podle perimetrie. Končí v horizontálně rovnou hranici.

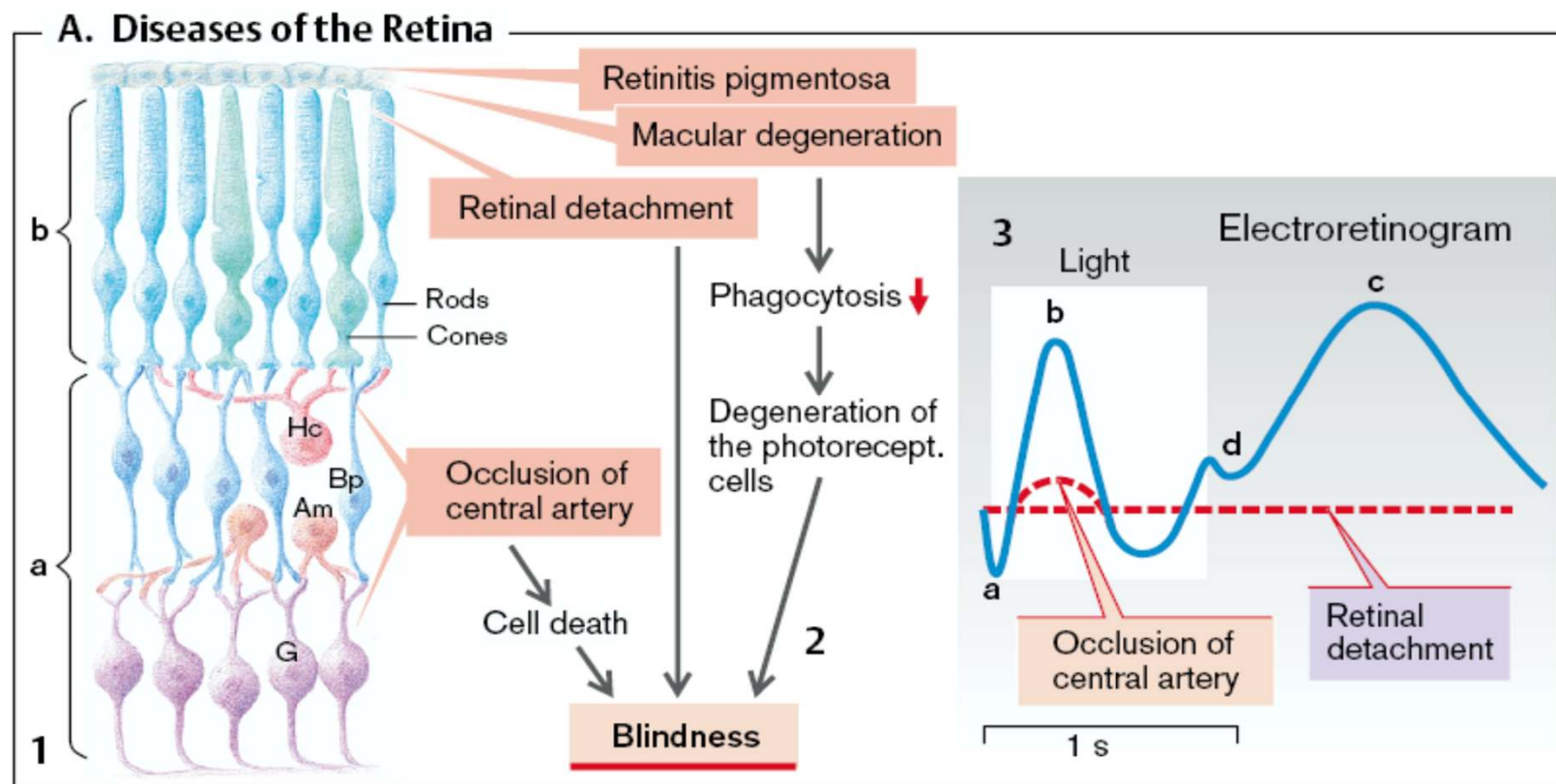


Obr. 11—2. Zorné pole při otravě chininem (podobné vidíme u tabes dorsalis nebo v konečných stadiích tapetoretinálních degenerací sítnice). Koncentrické zúžení zorného pole okolo centrálního bodu: centrální vidění může být dobré po nějakou dobu.

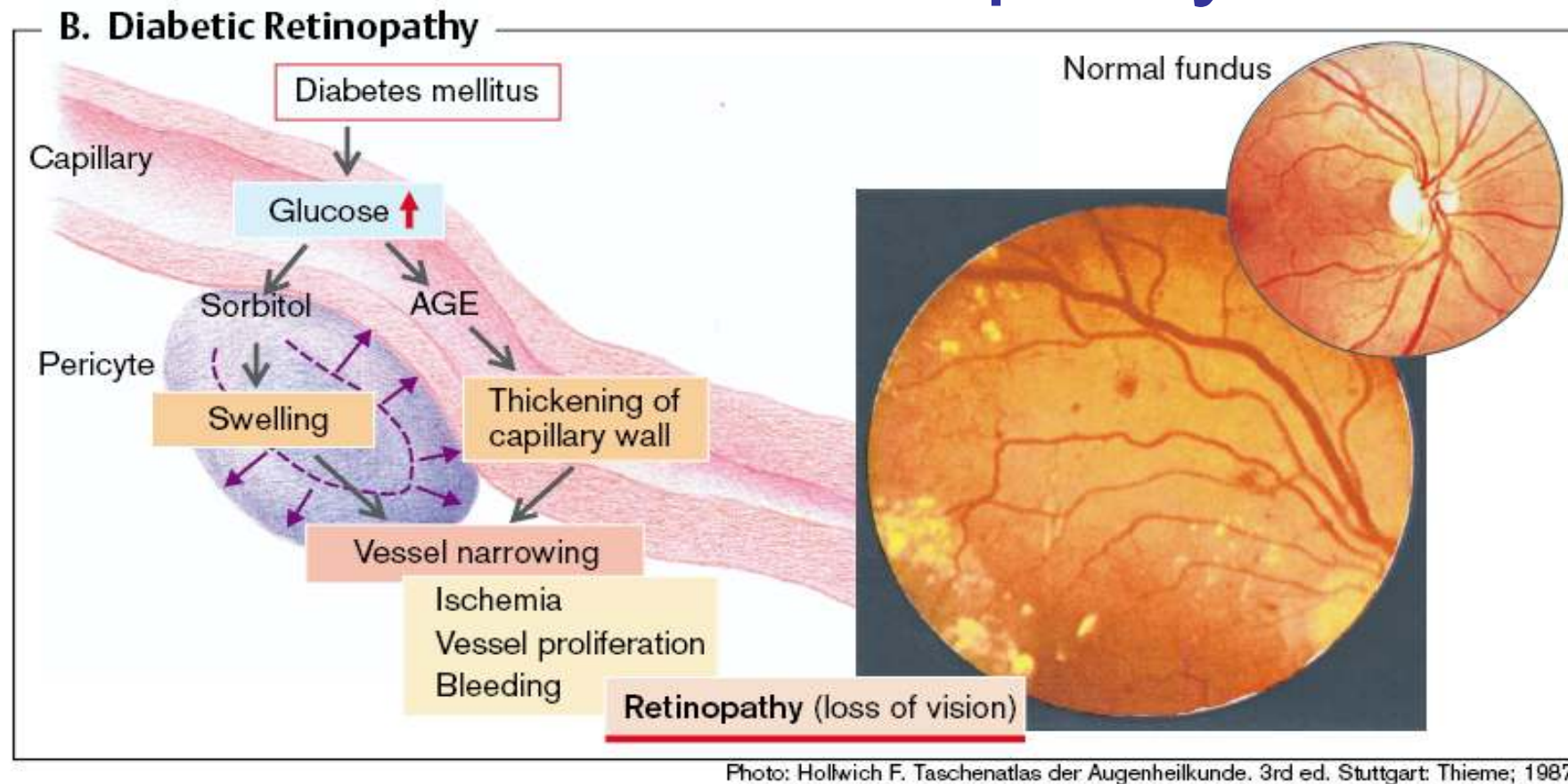


Obr. 11—3. Zorné pole při retrobulbární neuritidě. Zbývá ještě absolutní centrální skotom, okolo širší relativní skotom, periferní izoptera je vyhnutá.

Other defects of retina

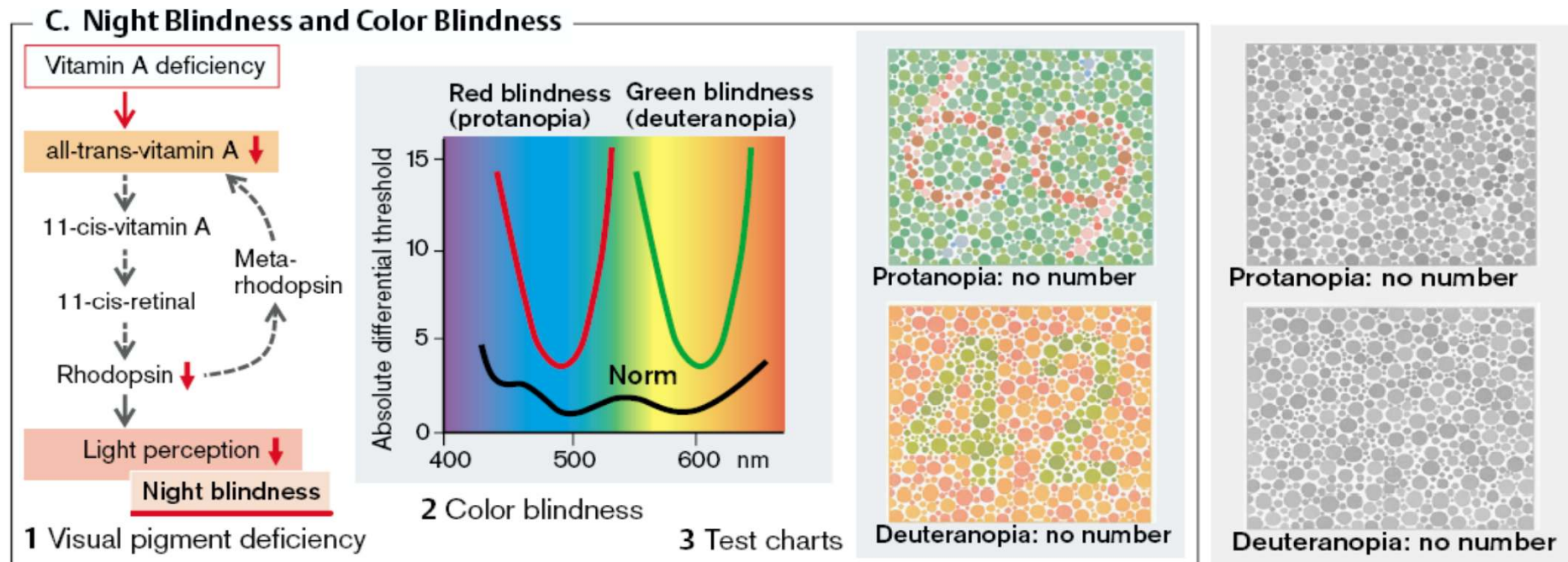


Diabetic retinopathy

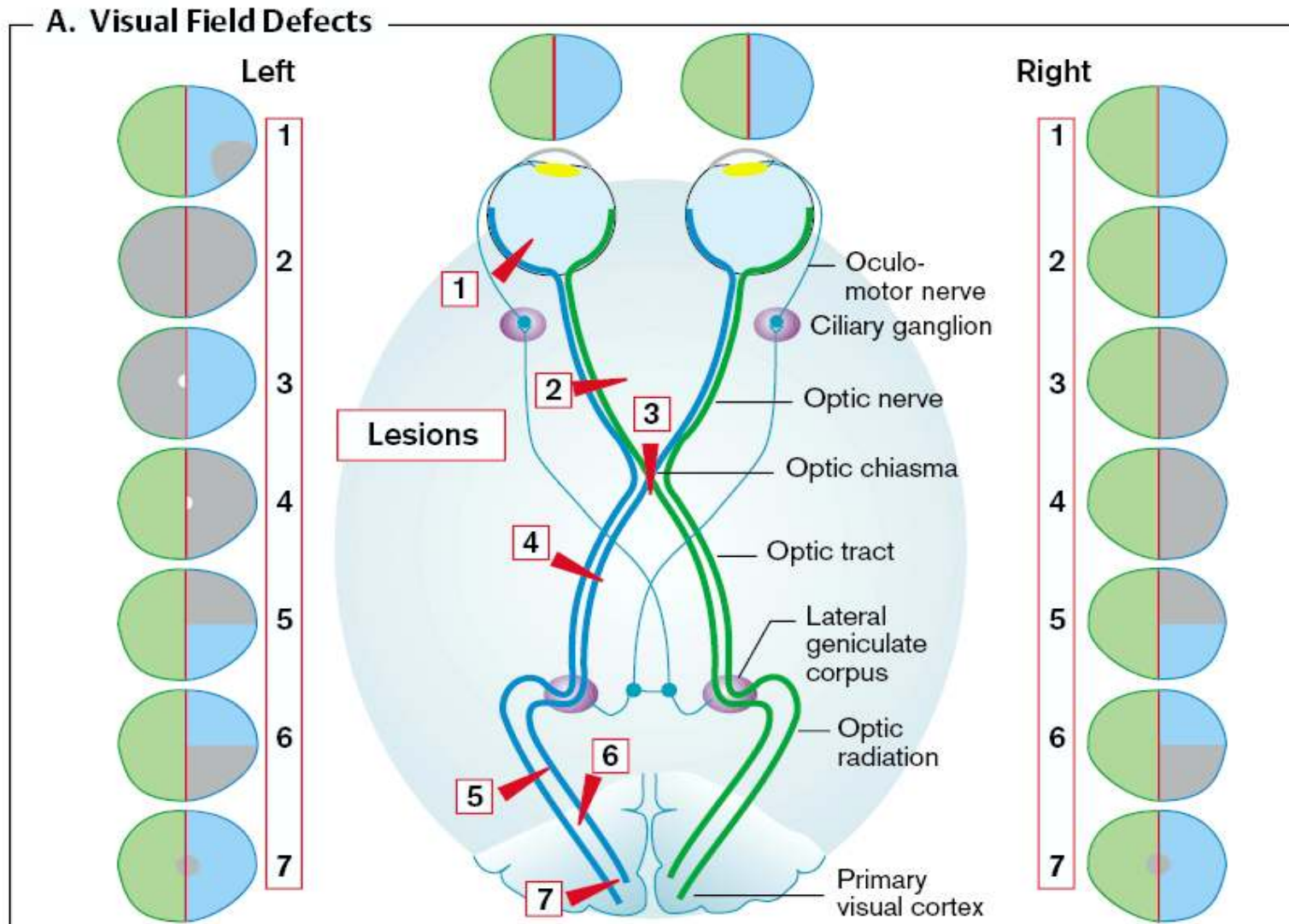


AGE – advanced glycation end products

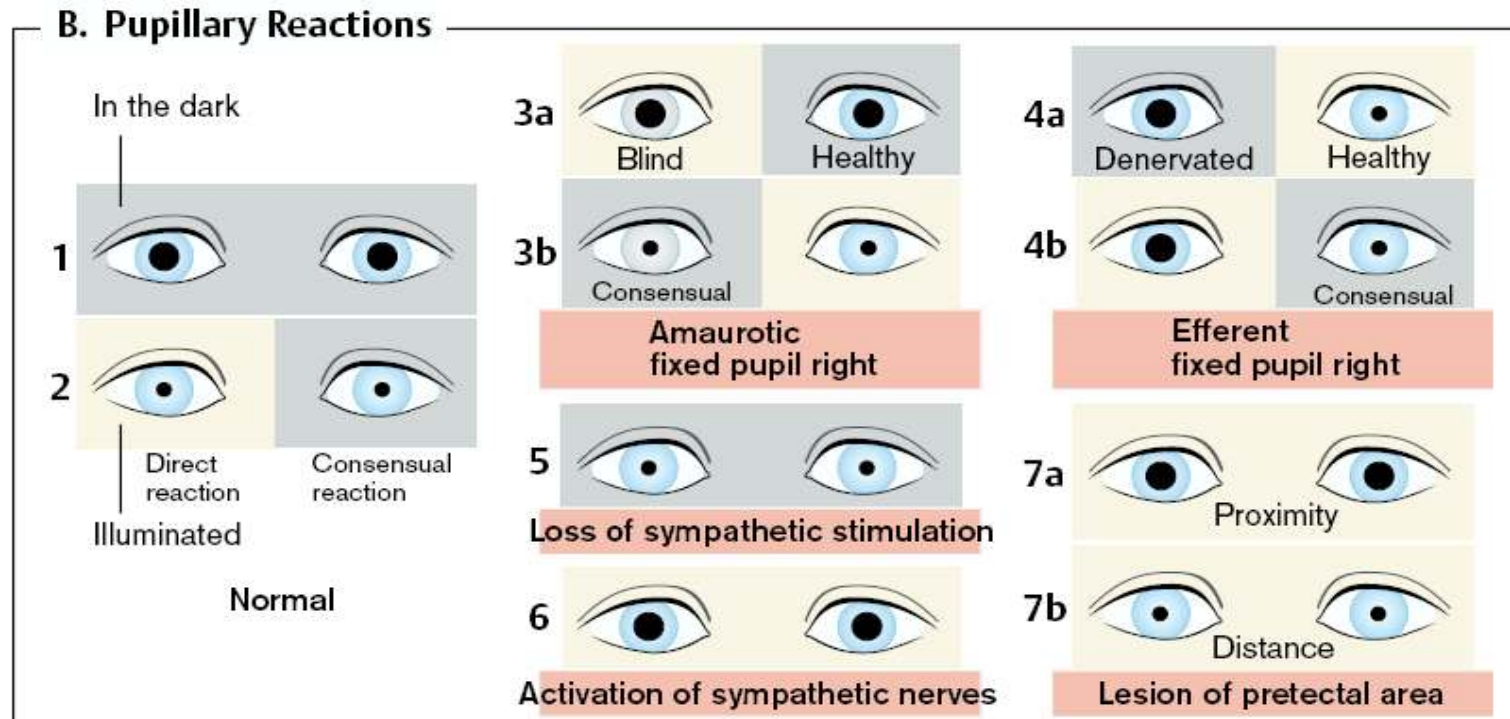
Night blindness **and** color blindness

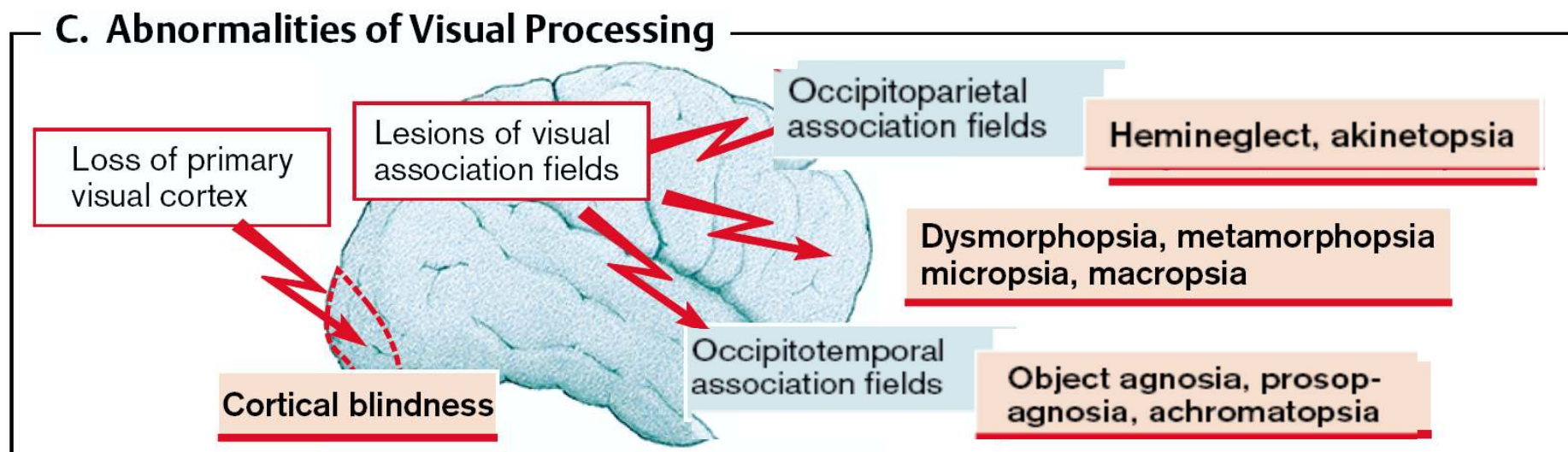
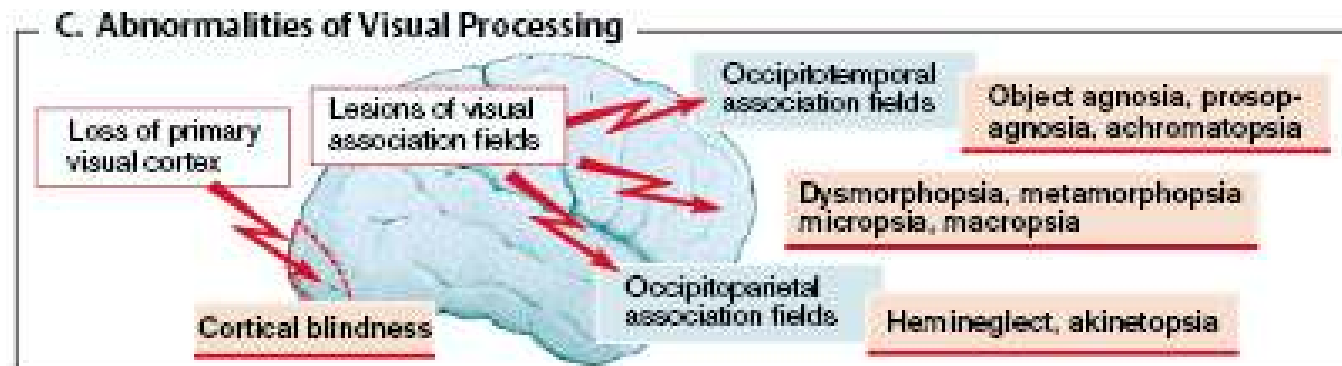


Visual field defects

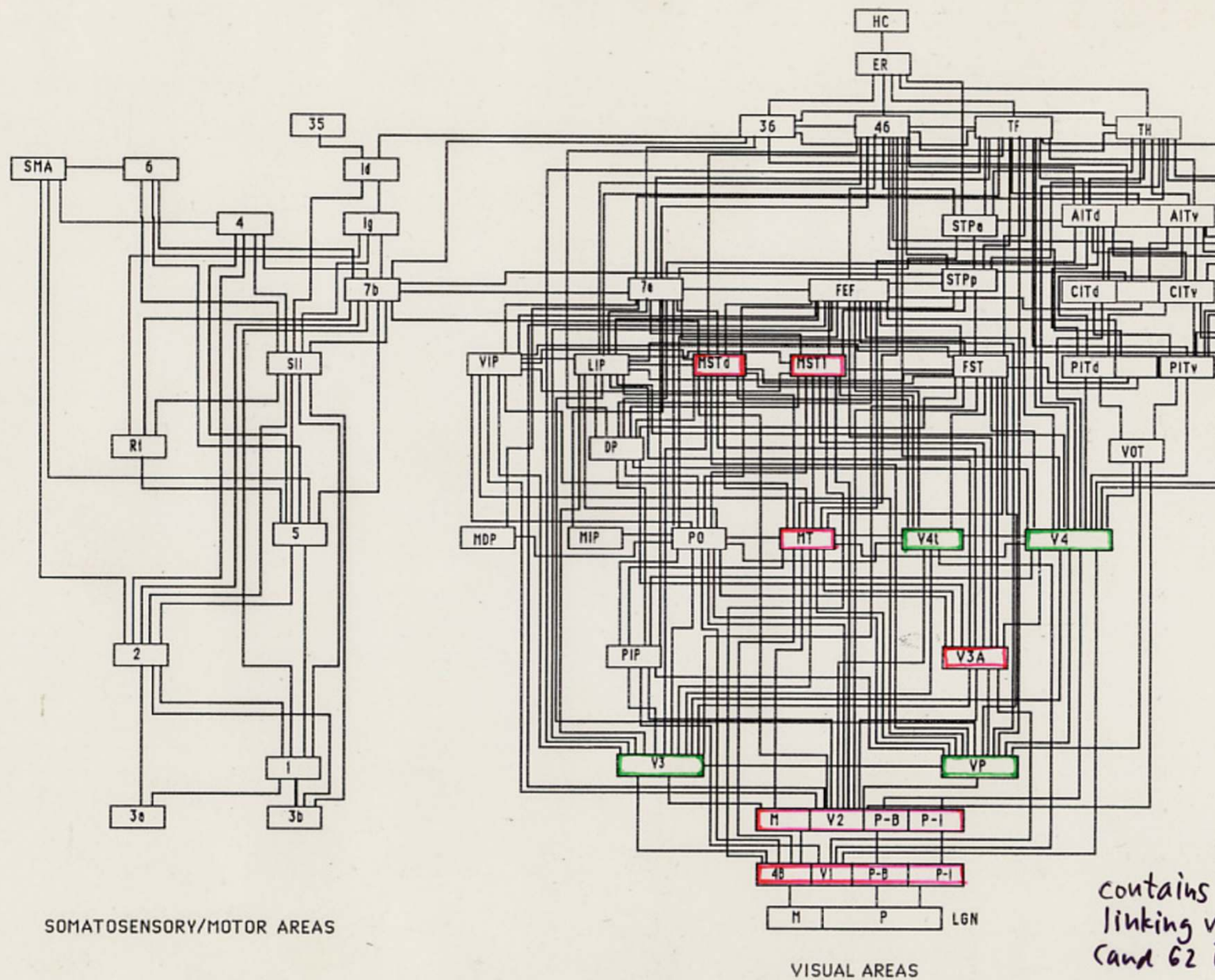


Pupillary Reactions





Cognitive defects (C) (find differences)

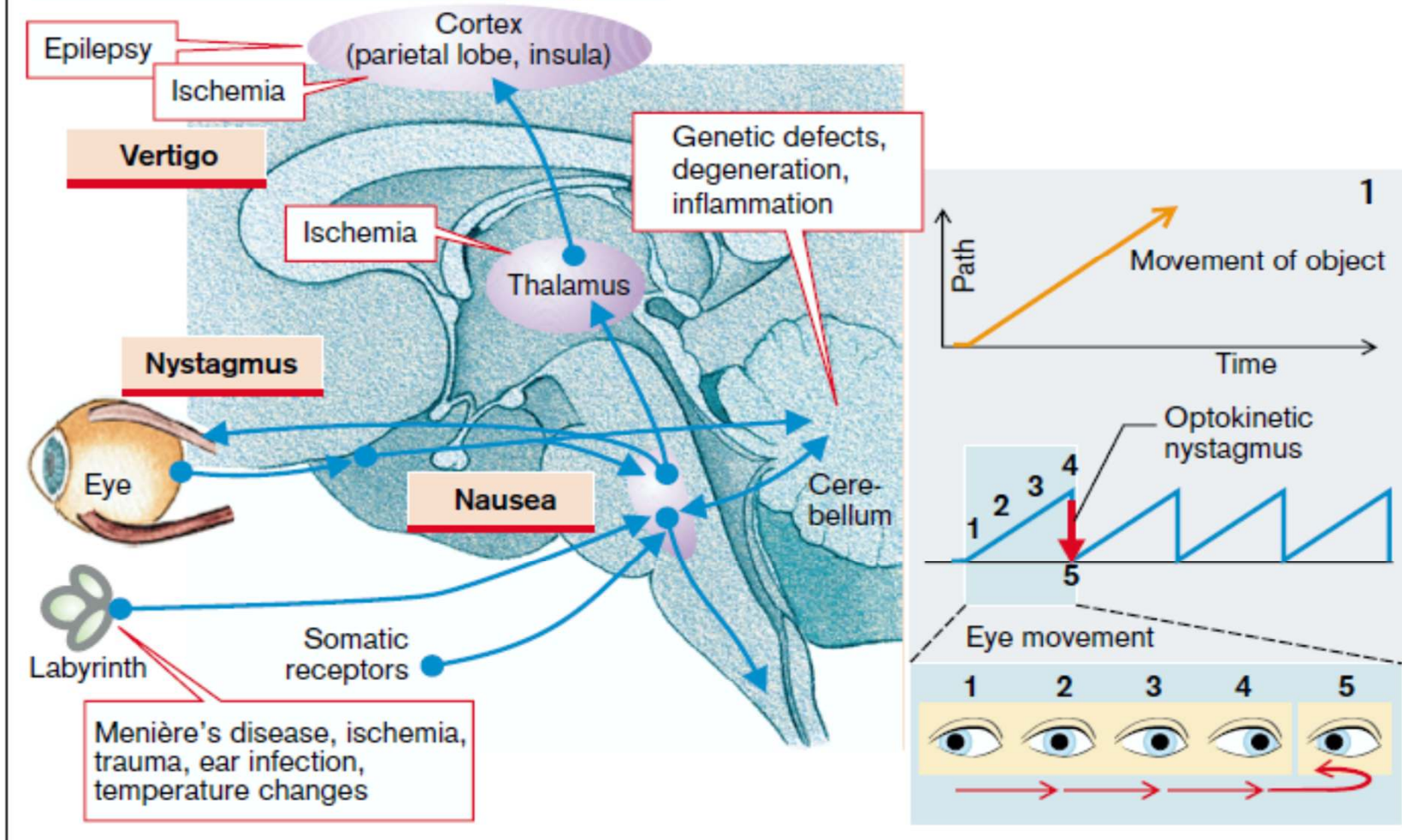


contains 305 pathways
linking visual areas
(and 62 in somatos./motor a.)

Figure 8. (See facing page for legend.)
 Van Essen D.C. et al., 1990, Cold Spring Harbor Symp. Quant. Biol., 55:679-696

Nystagmus

A. Disturbance of Balance, Nystagmus



Face recognition – to recognize these blurred faces, some degree of visual acuity is needed



Blurred faces, however these famous people are recognizable from the context

2G. Bush Sr.[+] - 5B. Obama - 4G.W. Bush - 3B. Clinton - 1J. Carter



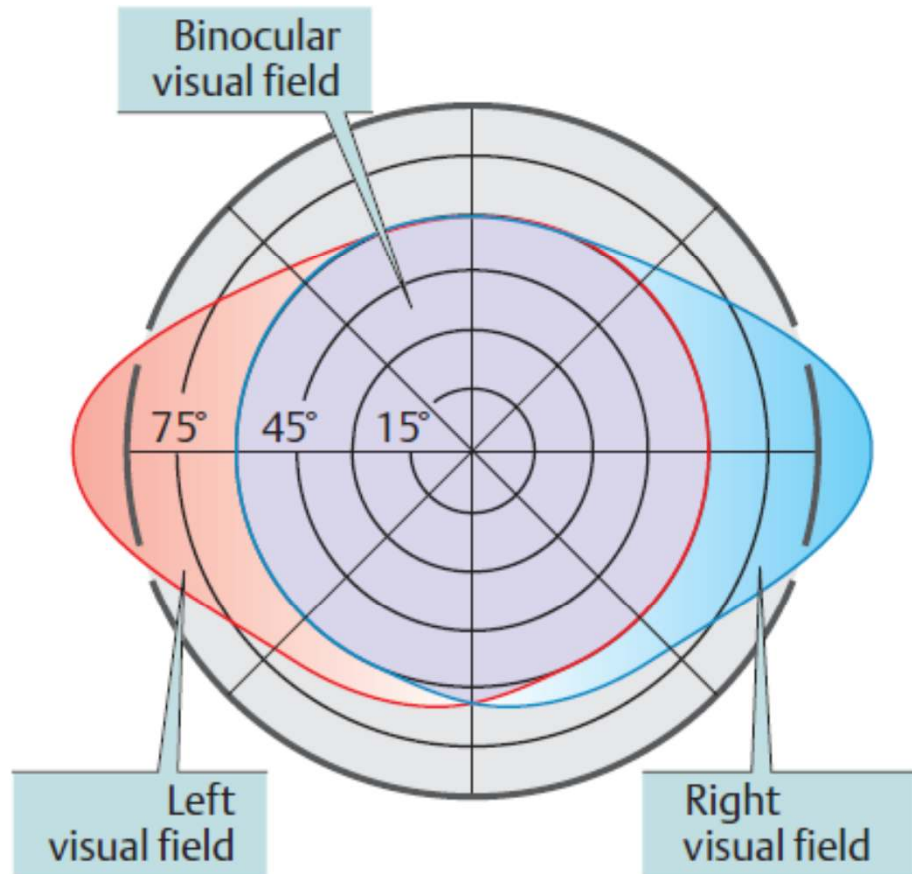
— . . .

2G. Bush Sr.[+] - 5B. Obama - 4G.W. Bush - 3B. Clinton - 1J. Carter

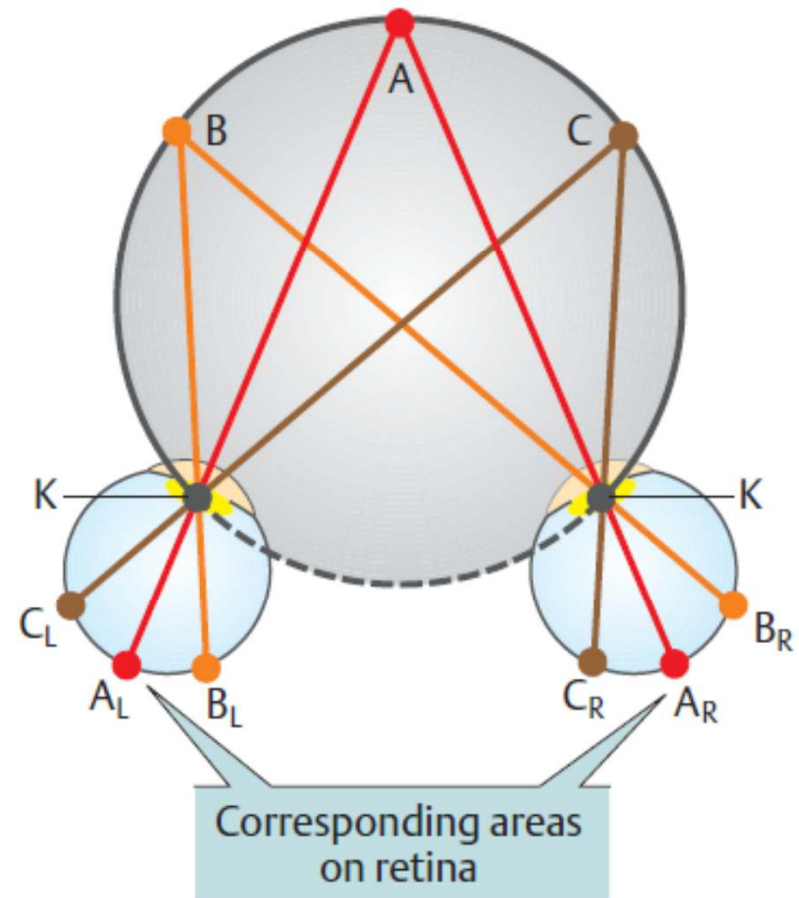


Binocular/ stereoscopic vision

A. Binocular visual field



B. Horopter



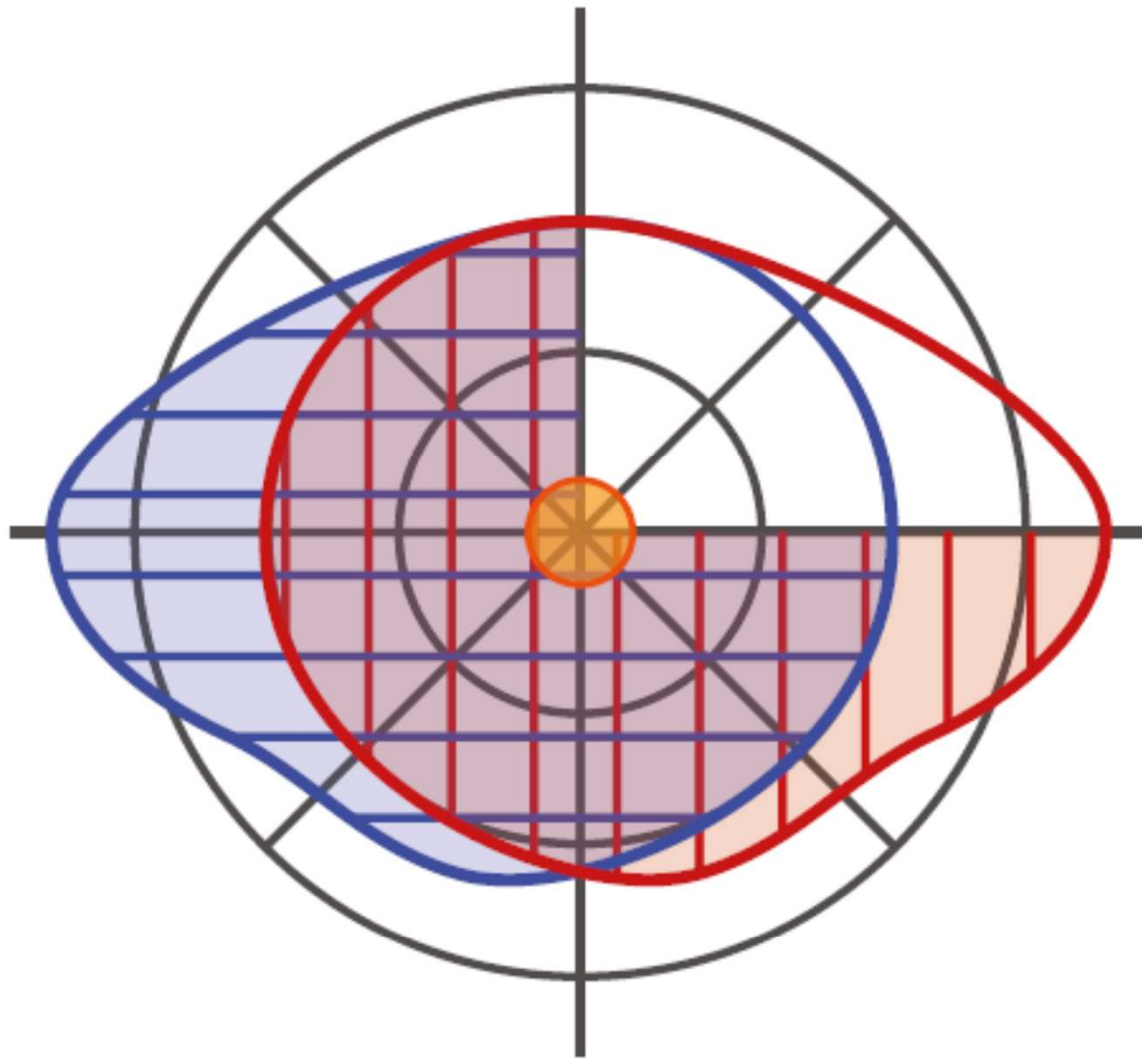


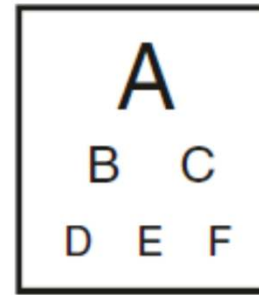
Fig. 2.3 Binocular visual field, subjective view. The binocular visual field spans $40,000 \text{ deg}^2$. The homonymous visual defect typically affects one quadrant (here top right) while the region of best visual acuity (fovea) is spared, due to the overlap of left and right optic radiation

Alternative way in explaining vision...

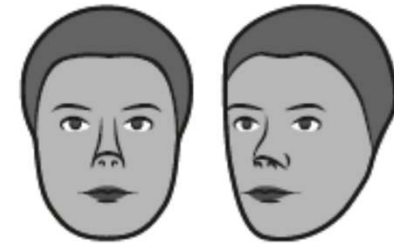
Overview of higher functions of visual cortex



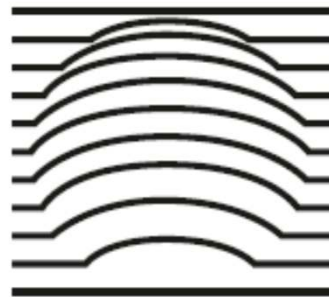
Navigation



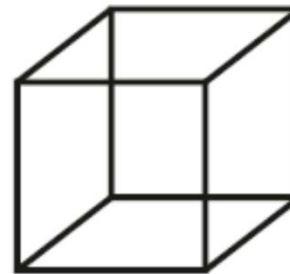
Reading



Face recognition



Shades

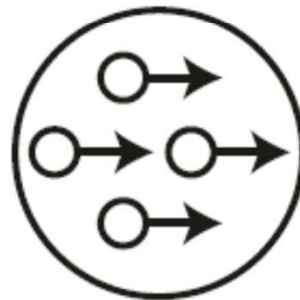


Contours



Stereo disparity

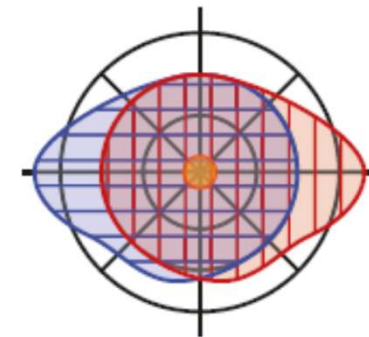
Early vs. Late vision



Motion

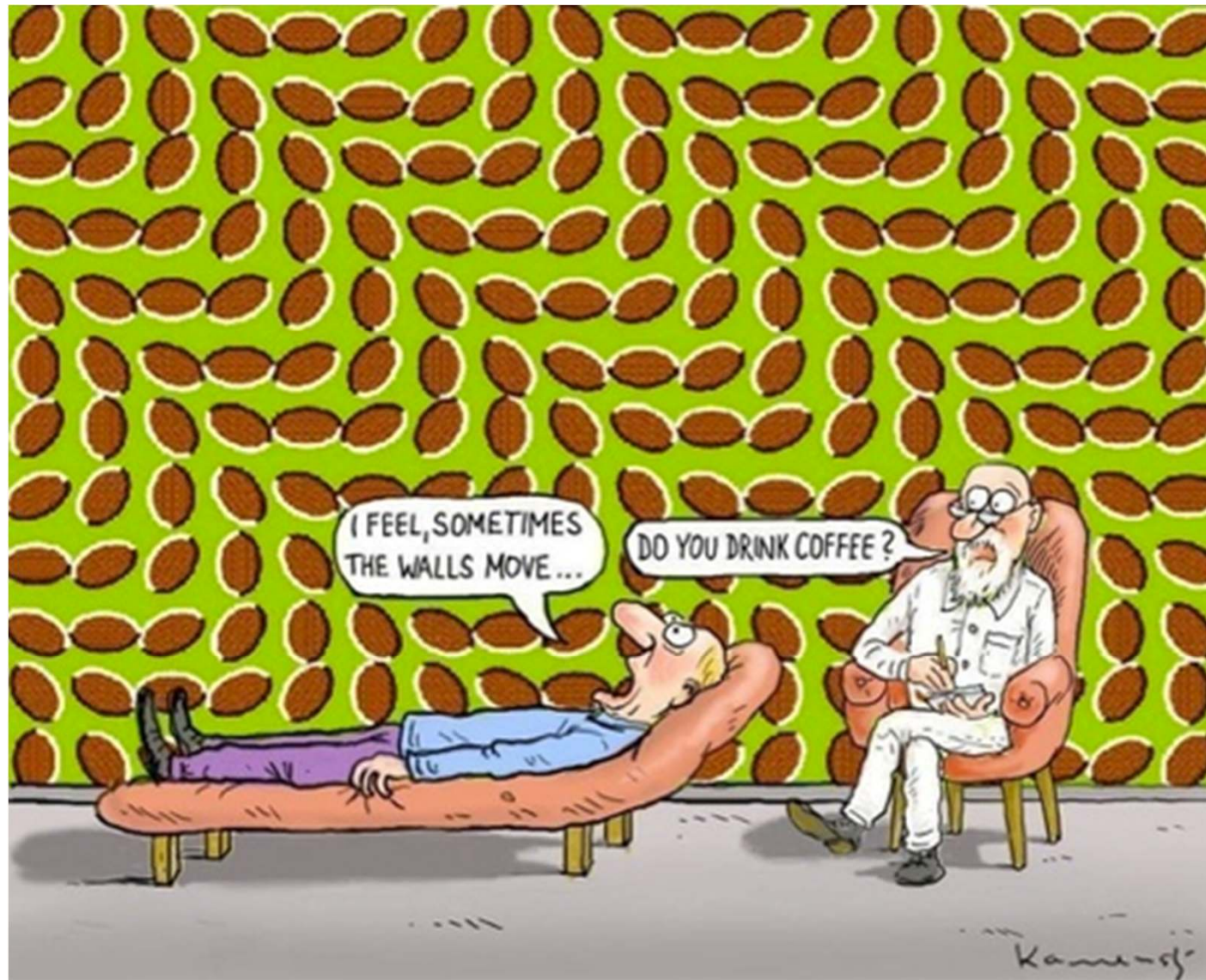


Color



Form

Cartoon: Drinking coffee and illusions



No Copyright/ Disclaimer/ Warning

lectures and seminars

Petr Marsalek, and others

warning: the PDF version of this
presentation is not an official study material

First Medical Faculty, Institute of Pathological Physiology