Agnosien und andere Sehstörungen

Manfred Fahle

7. Dezember 2006

„Wie es im Gehirn zugeht“

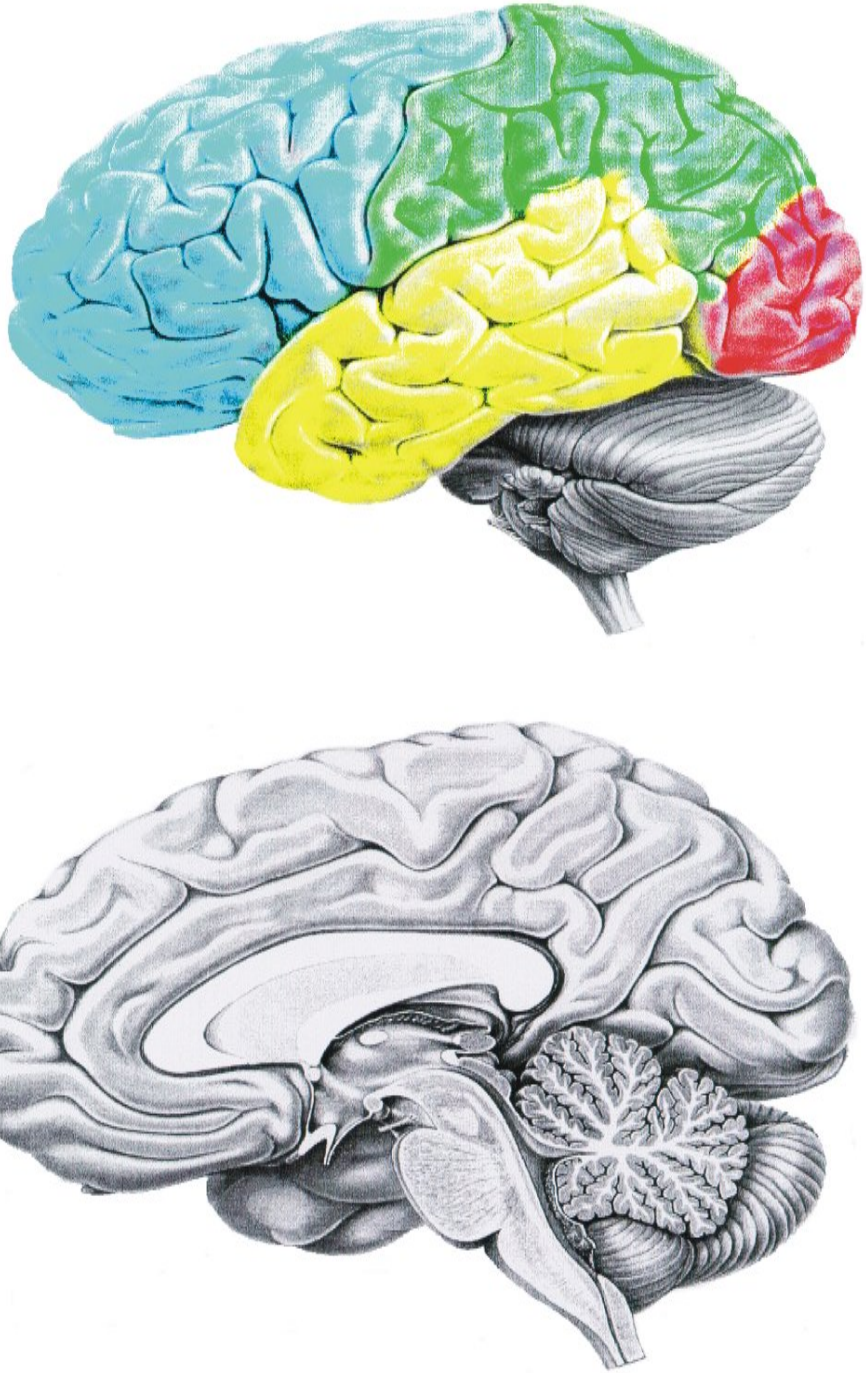
University of Bremen
Institute of Brain Research
Human-Neurobiology
Argonnenstraße 3
D-28211 Bremen
Germany

e-mail: mfahle@uni-bremen.de

Henry Wellcome Laboratories
of Applied Vision Research
City University
Northampton Square
London
England

e-mail: m.fahle@city.ac.uk

A



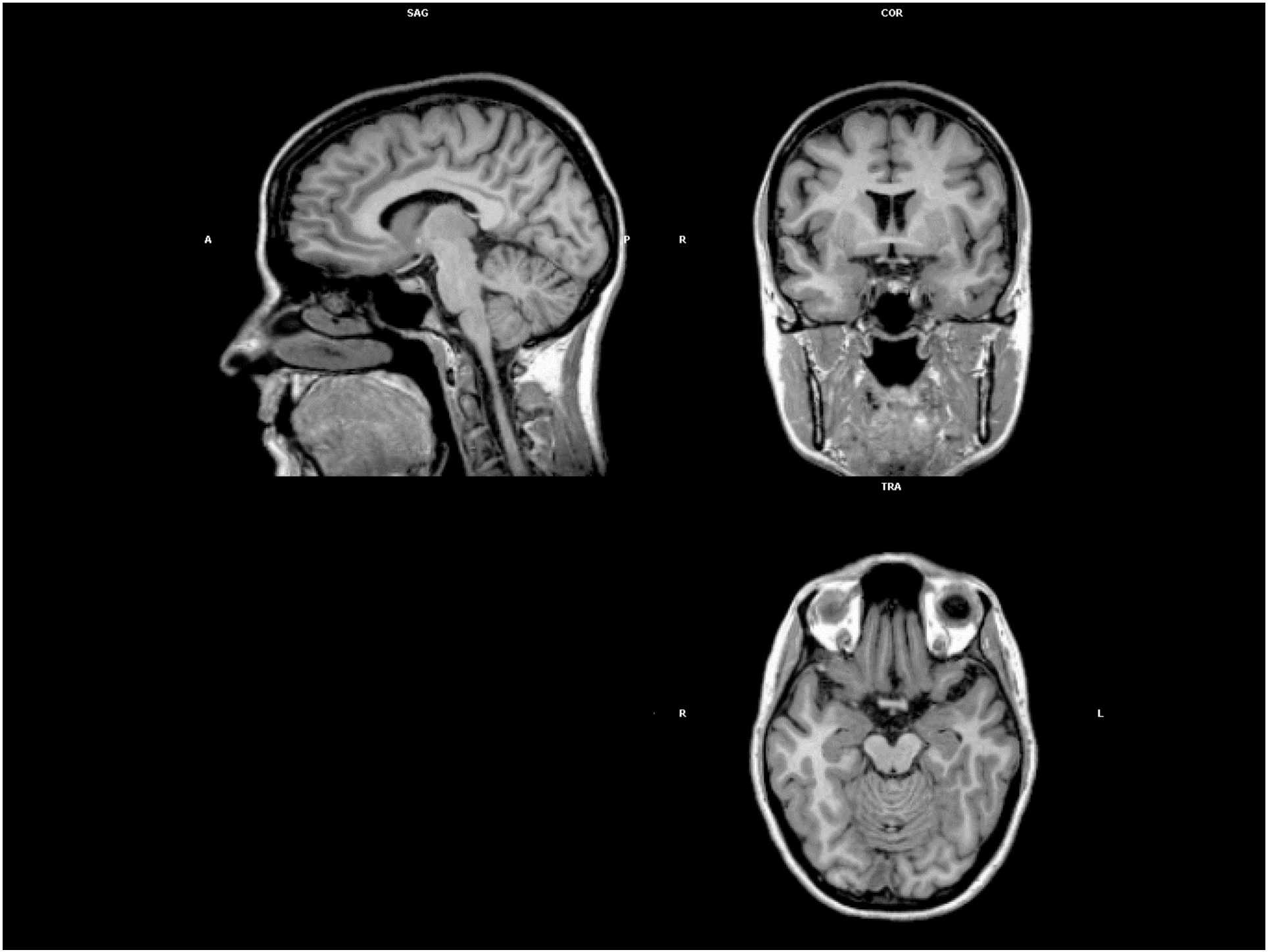
Zerebrale Sehstörungen

1. **Sehbahn-spezifische Gesichtsfeldausfälle**
2. Segmentierung der Sehfunktion: Physiologie
3. Segmentierung der Sehfunktion: Pathophysiologie

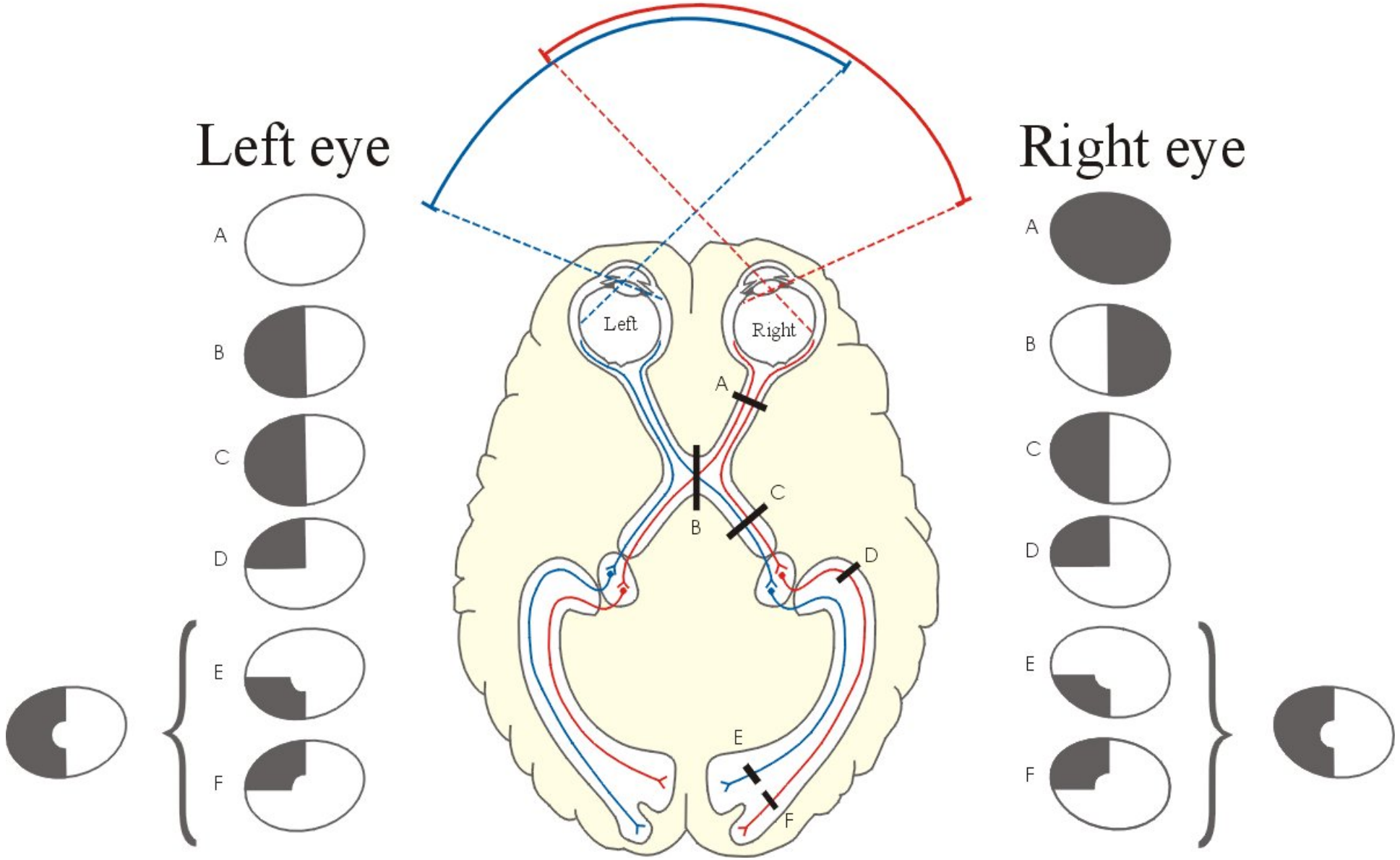
   3.1 „Adiskriminationen“

   3.2 Störungen der Objektkonstanz

   3.3 Apperzeptive und assoziative Agnosien
4. „Blindsight“, Simultanagnosie und Neglekt


SAG
A
P
COR
R
TRA
R
L

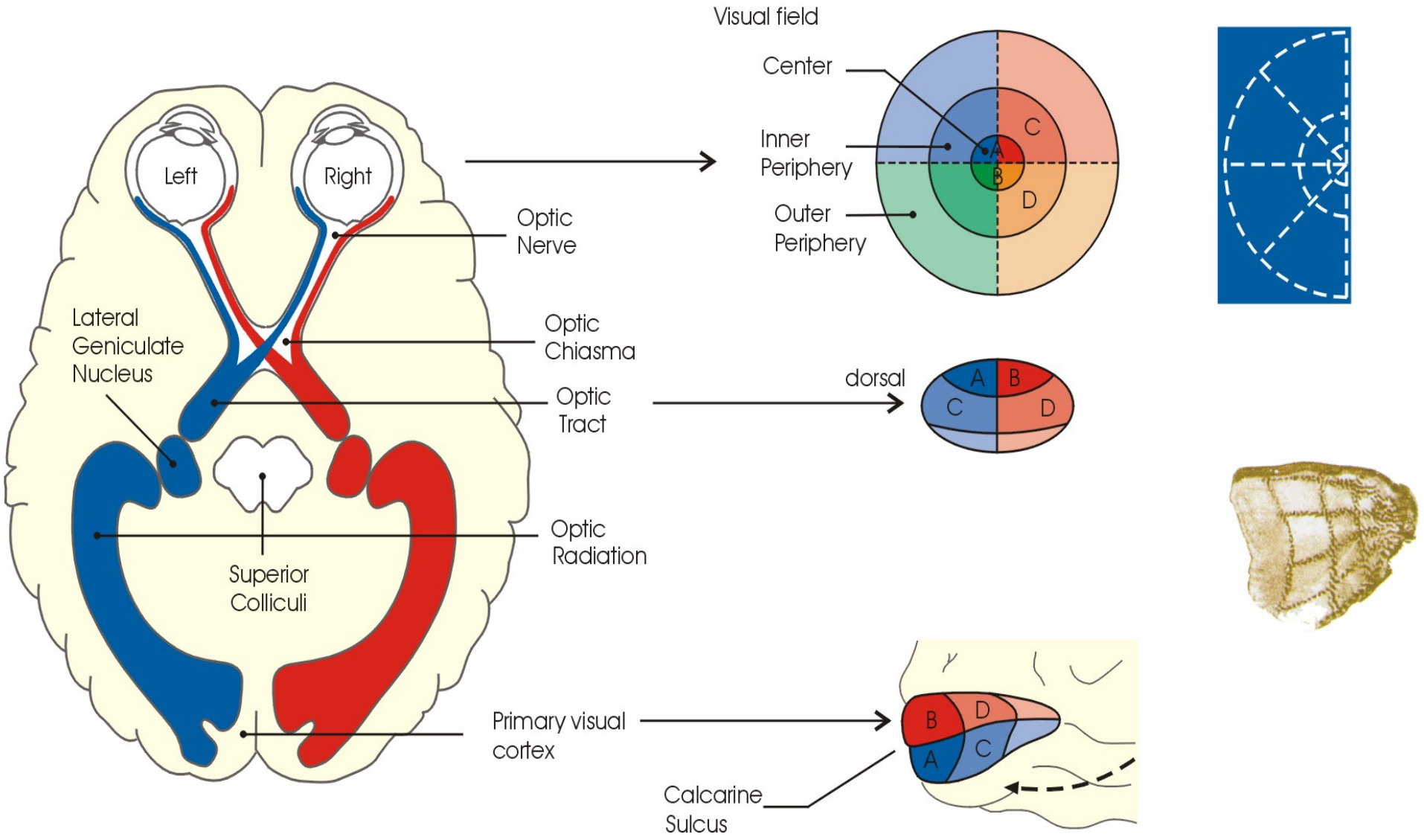
1

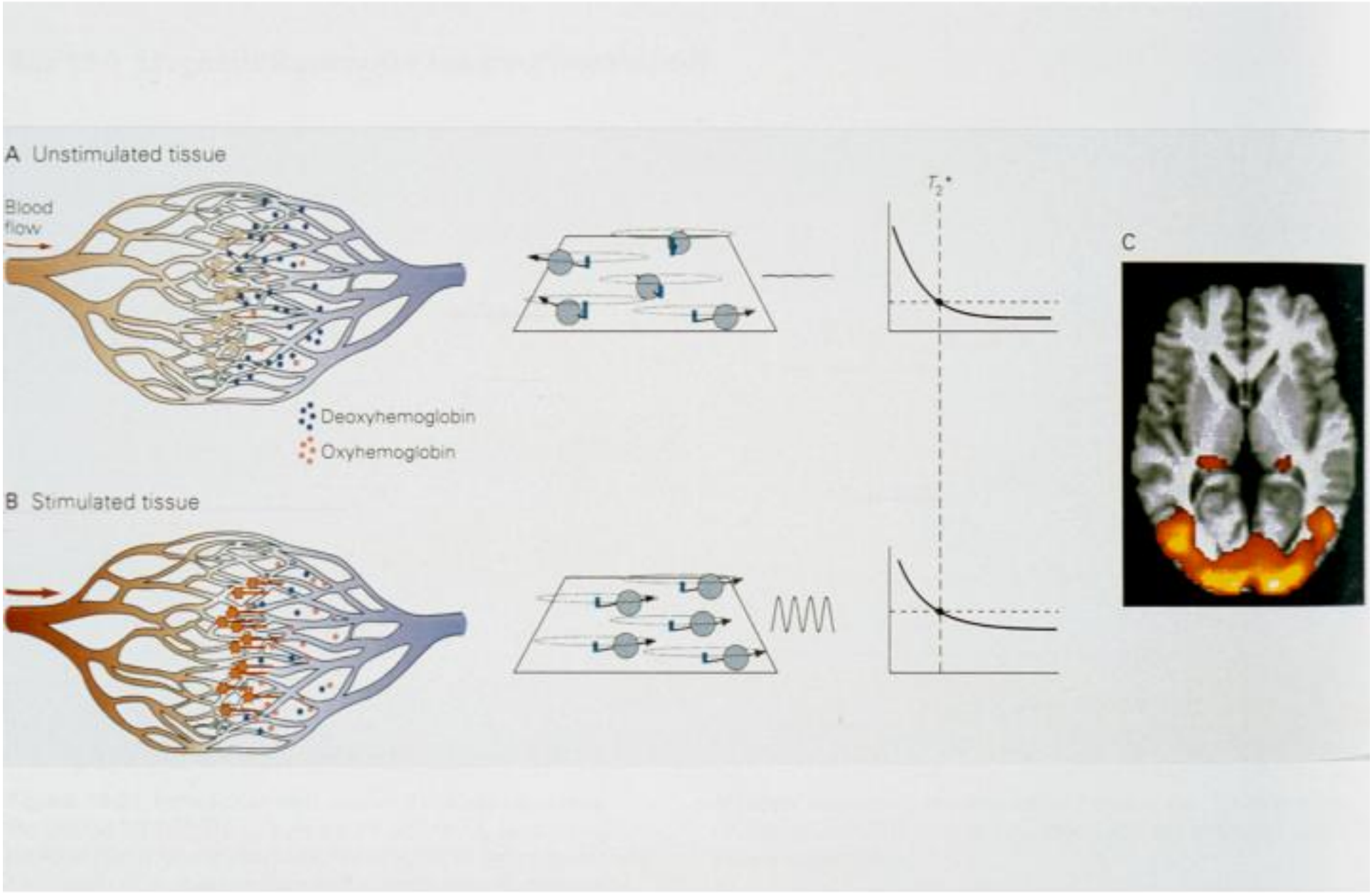


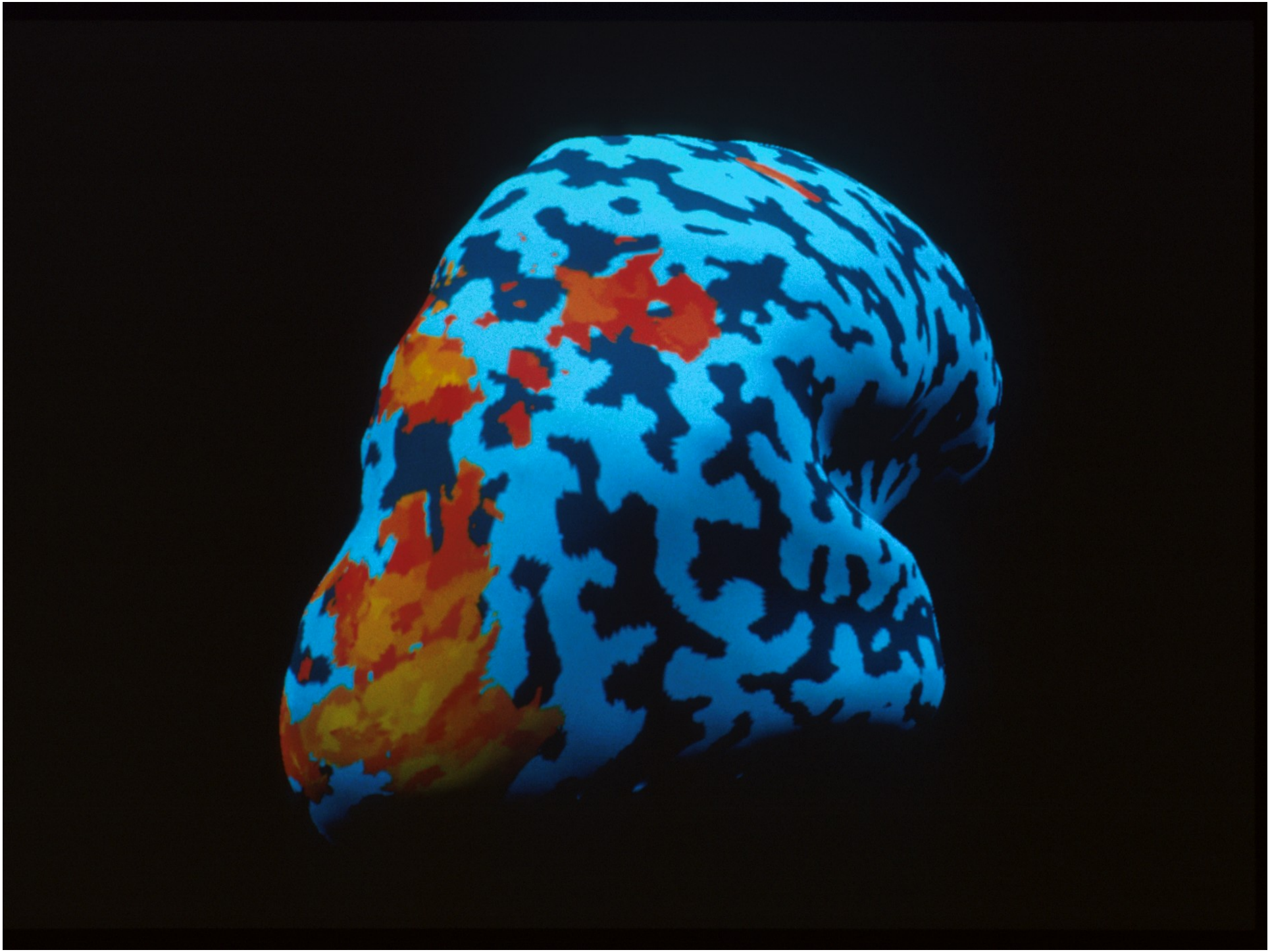
2a

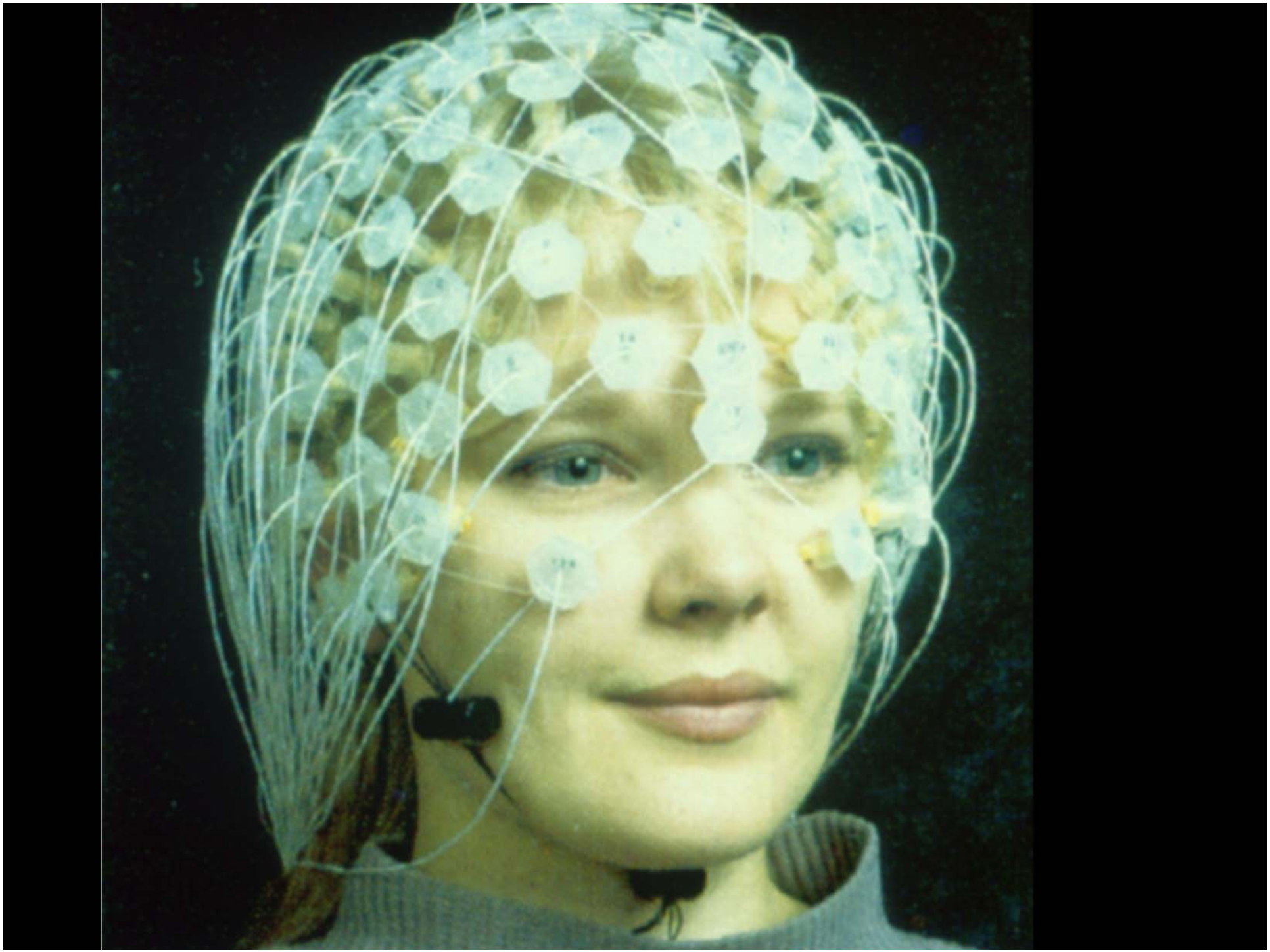
2b

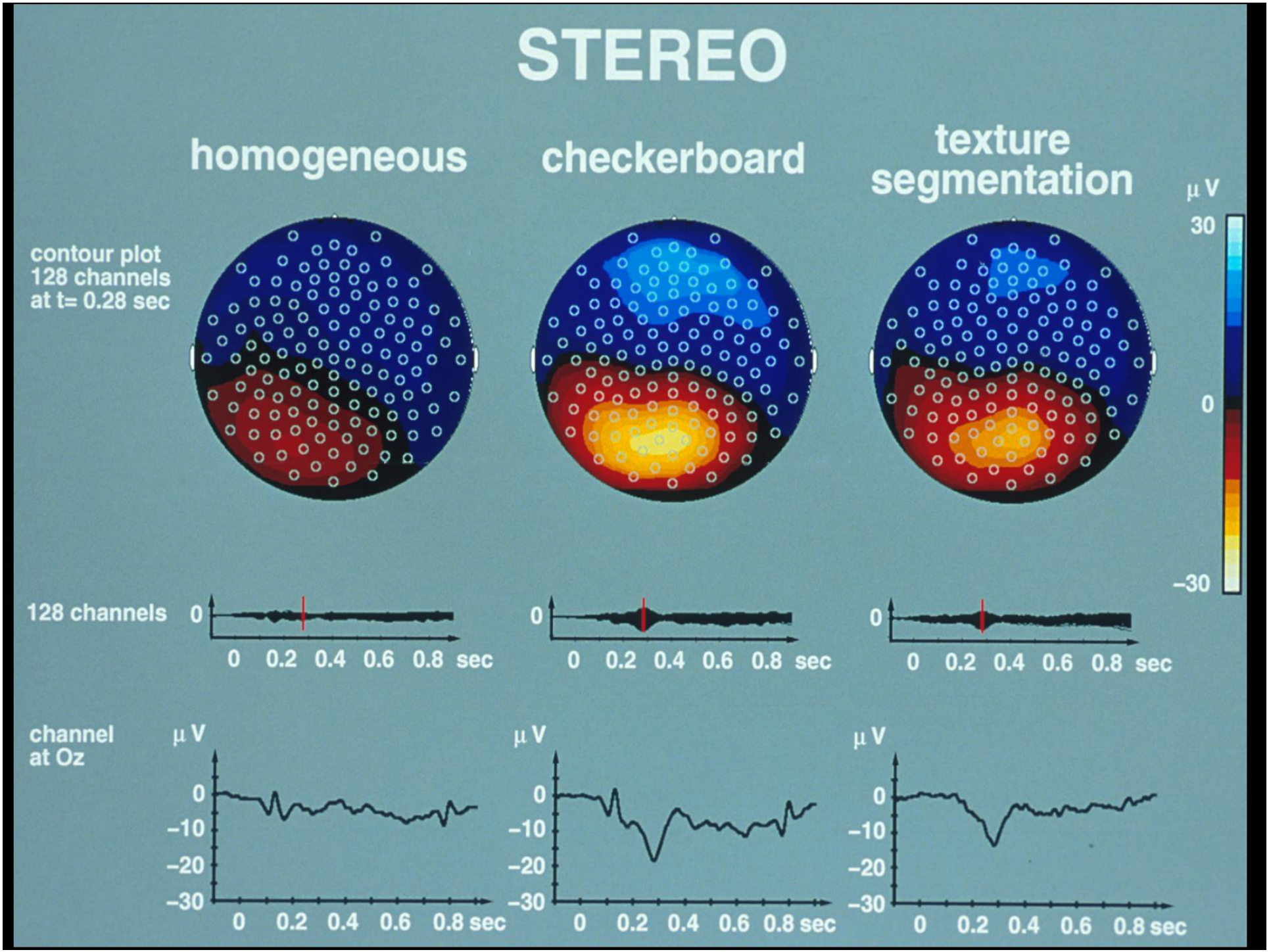
2c


Left visual field
Visual field
Center
Inner Periphery
Outer Periphery
A
B
C
D
Left
Right
Optic Nerve
Optic Chiasma
Optic Tract
Lateral Geniculate Nucleus
Superior Colliculi
Optic Radiation
dorsal
Primary visual cortex
Calcarine Sulcus


A Unstimulated tissue
Blood flow
Deoxyhemoglobin
Oxyhemoglobin
B Stimulated tissue
T_2^*
C






STEREO
homogeneous
checkerboard
texture segmentation
μV
30
0
−30
contour plot
128 channels
at t= 0.28 sec
128 channels
0
0 0.2 0.4 0.6 0.8 sec
channel
at Oz
μV
0
−10
−20
−30
0 0.2 0.4 0.6 0.8 sec

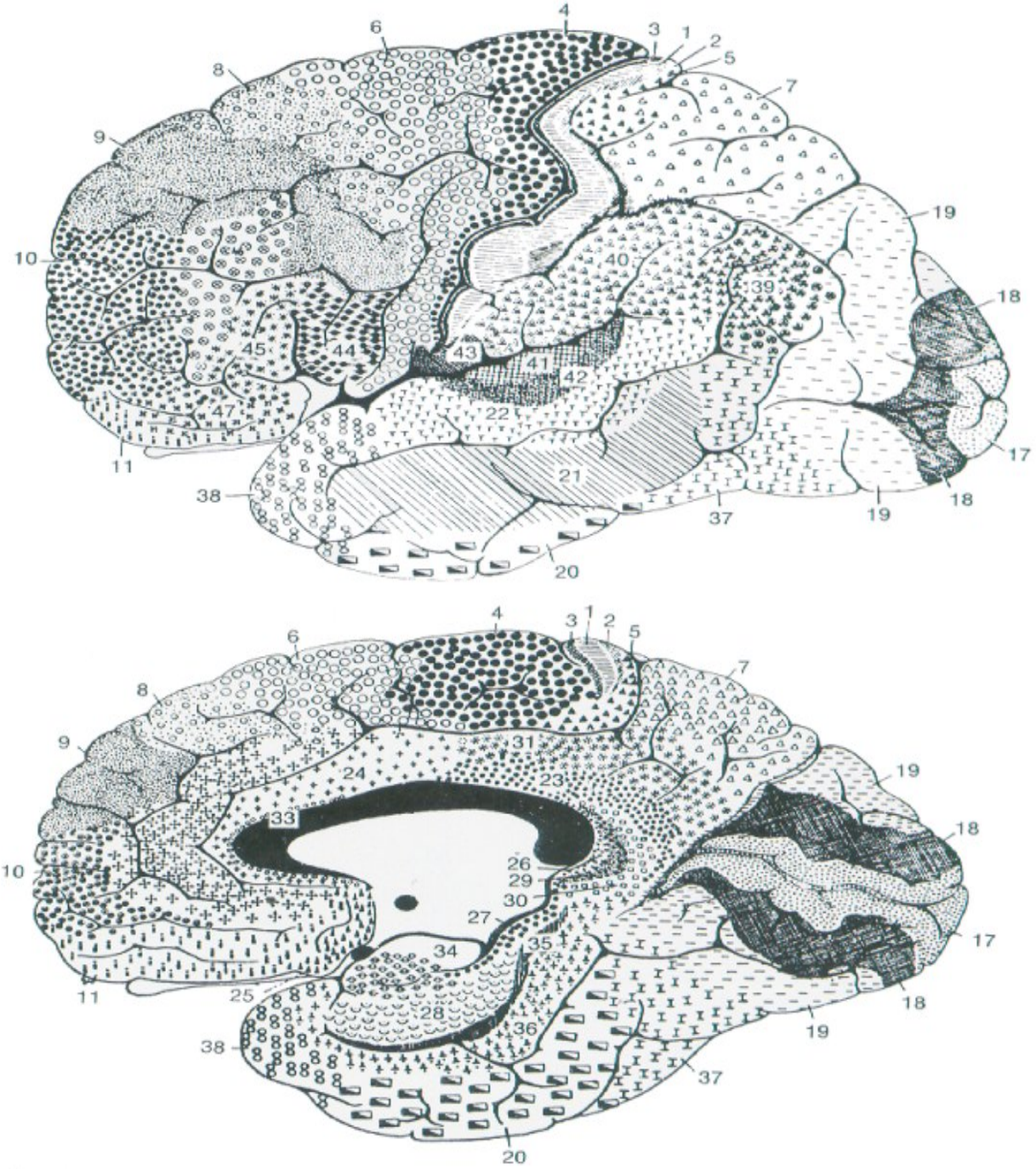
Zerebrale Sehstörungen

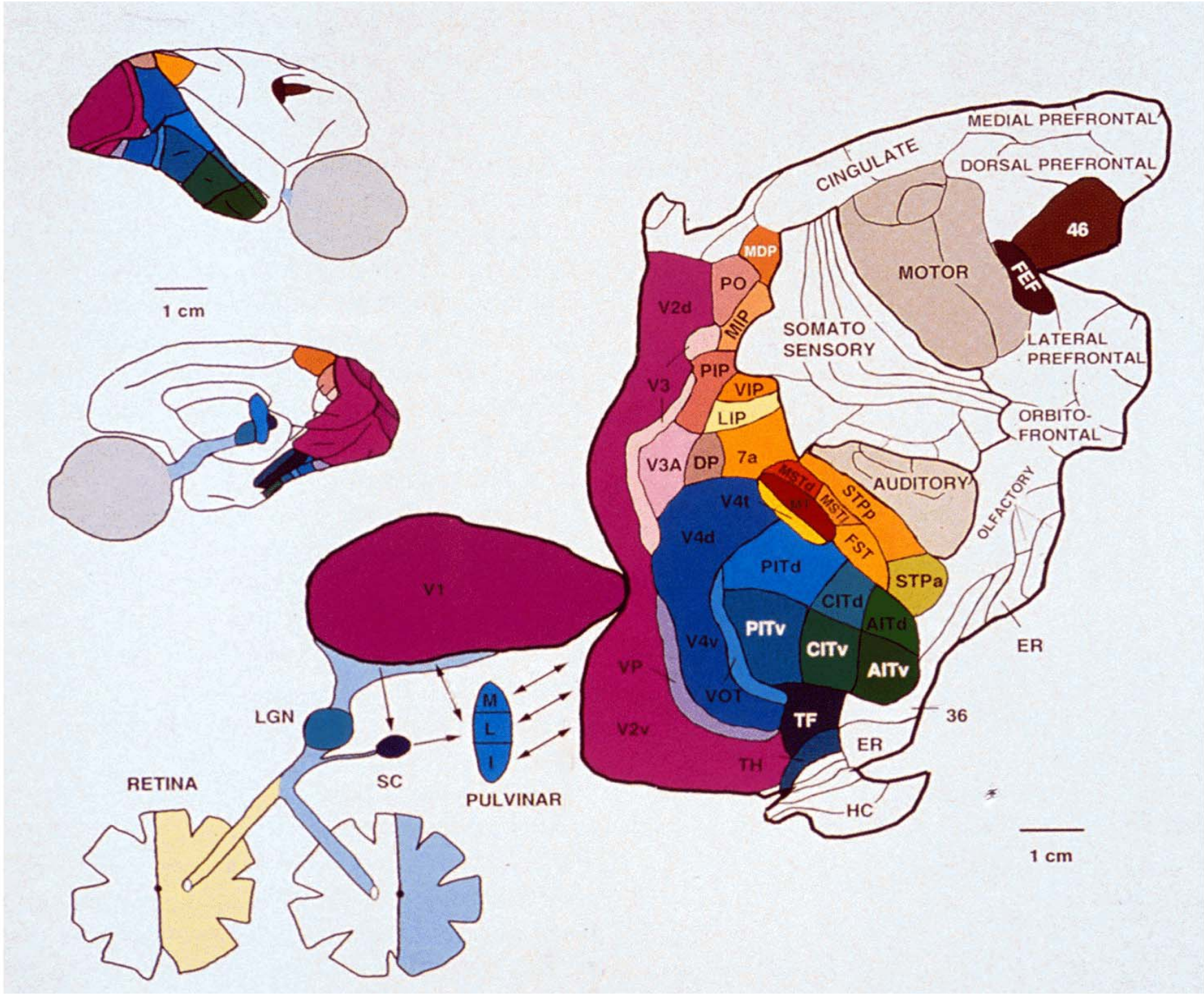
1. Sehbahn-spezifische Gesichtsfeldausfälle
2. **Segmentierung d. Sehfunktion: Anatomie & Physiologie**
3. Segmentierung der Sehfunktion: Pathophysiologie

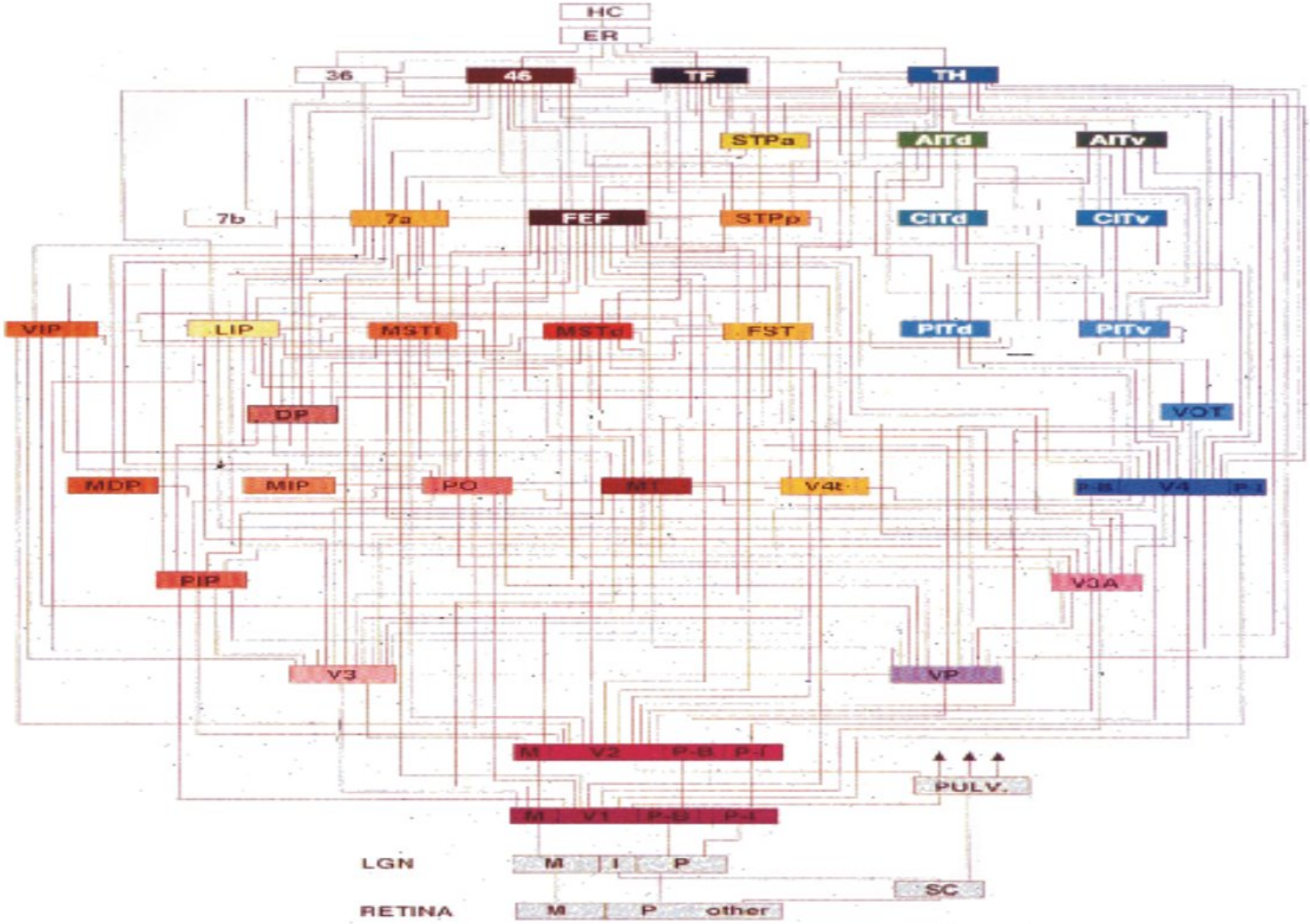
   3.1 „Adiskriminationen“

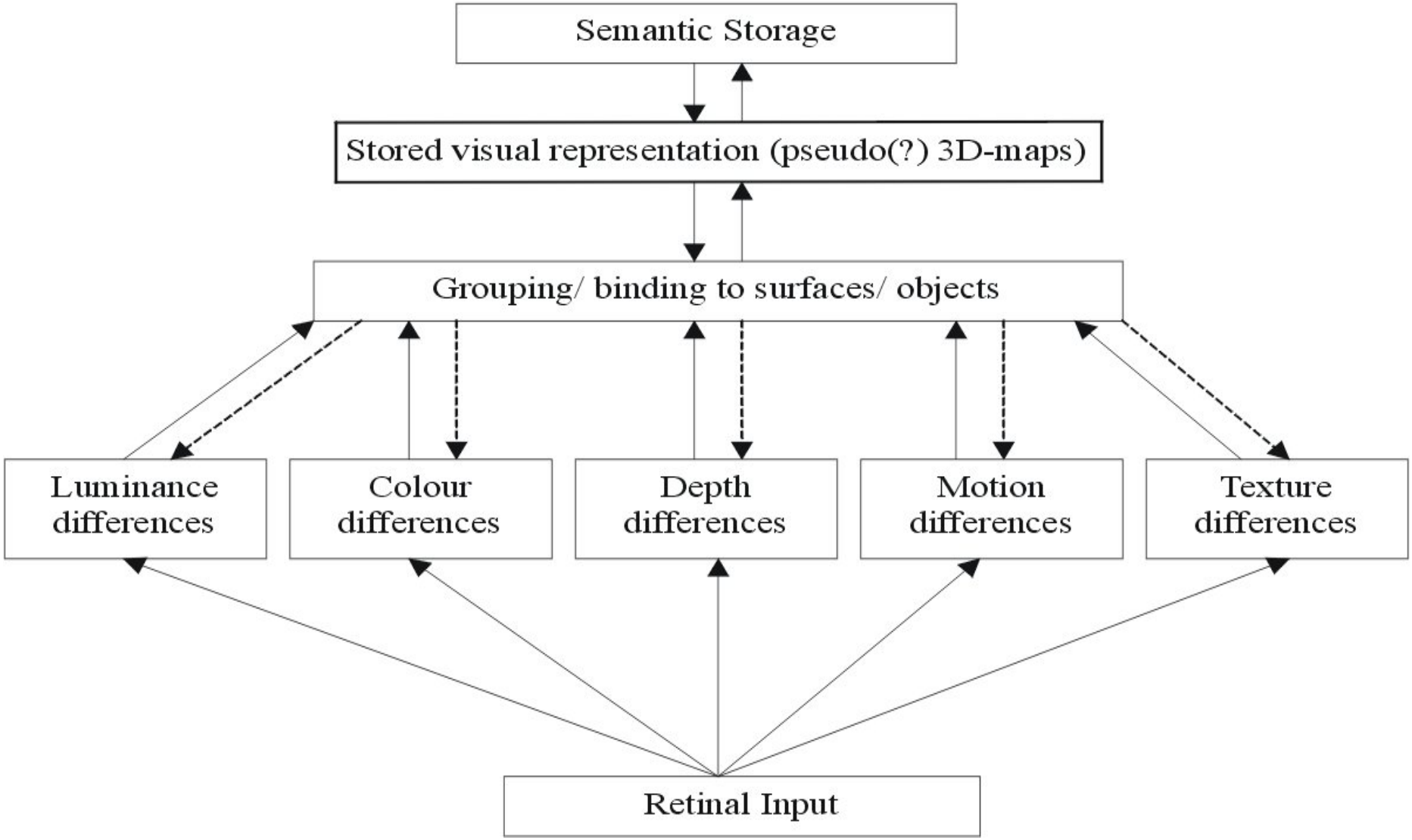
   3.2 Störungen der Objektkonstanz

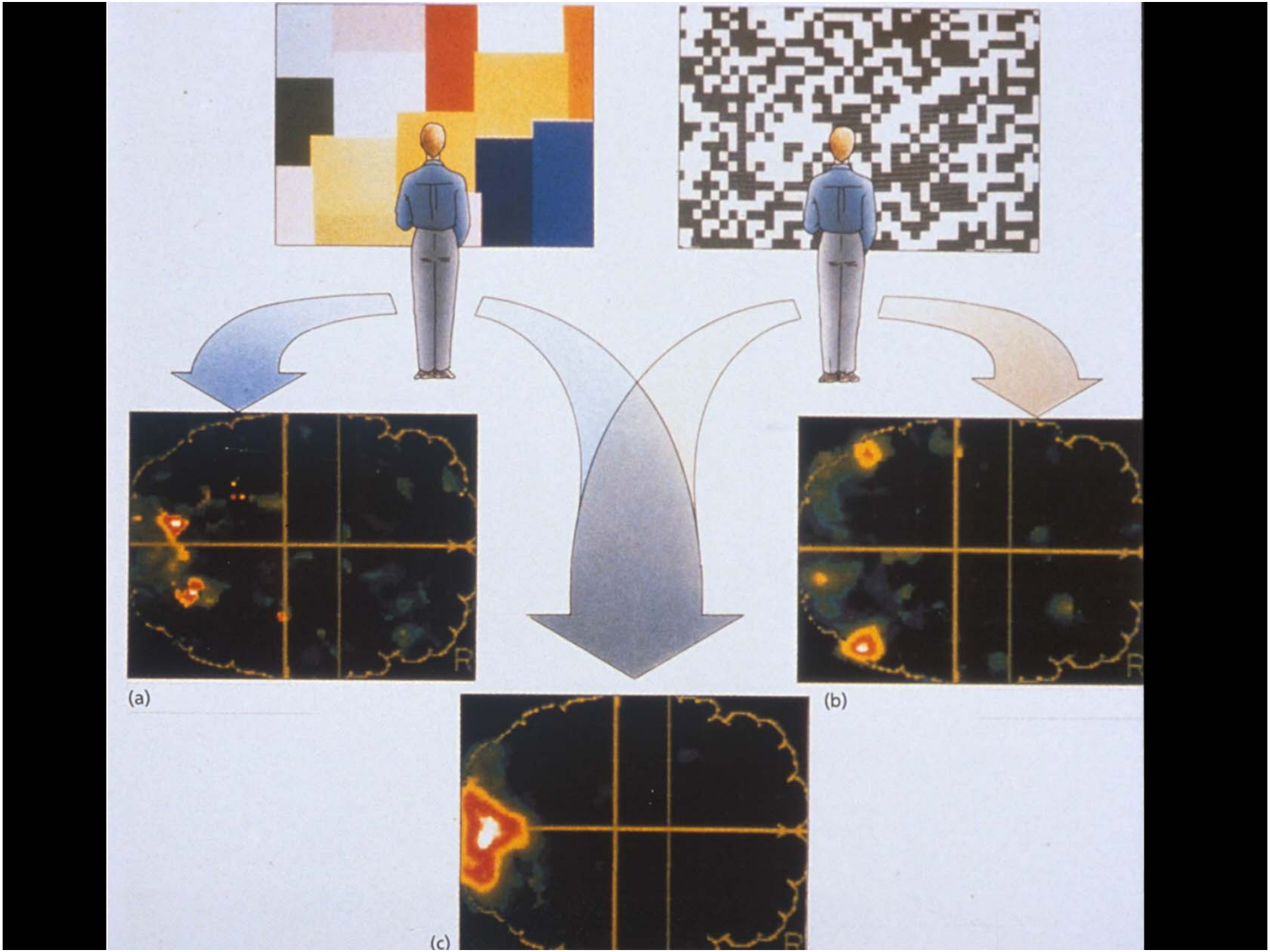
   3.3 Apperzeptive und assoziative Agnosien
4. „Blindsight“, Simultanagnosie und Neglekt


4
6
3
1
2
5
8
7
9
19
10
40
39
18
45
44
43
41
42
22
47
17
11
21
38
37
19
18
20
4
3
1
2
6
5
8
7
9
31
24
23
19
33
18
10
26
29
30
27
17
35
34
11
25
28
36
18
19
38
37
20


1 cm
MEDIAL PREFRONTAL
CINGULATE
DORSAL PREFRONTAL
46
MOTOR
FEF
MDP
PO
V2d
MIP
SOMATO
SENSORY
LATERAL
PREFRONTAL
PIP
V3
VIP
LIP
ORBITO-
FRONTAL
V3A
DP
7a
AUDITORY
MSTd
STPp
V4t
MST
FST
OLFACTORY
V4d
PITd
STPa
V1
CITd
AITd
PITv
V4v
CITv
AITv
ER
VP
VOT
M
L
I
LGN
TF
36
V2v
ER
TH
SC
RETINA
PULVINAR
HC
1 cm


HC
ER
36
46
TF
TH
STPa
AITd
AITv
7b
7a
FEF
STPp
CITd
CITv
VIP
LIP
MSTl
MSTd
FST
PITd
PITv
DP
VOT
MDP
MIP
PO
MT
V4t
V4
PIP
V3A
V3
VP
M
V2
P-B
P-I
PULV.
M
V1
P-B
P-I
LGN
M
I
P
SC
RETINA
M
P
other


Semantic Storage
Stored visual representation (pseudo(?) 3D-maps)
Grouping/ binding to surfaces/ objects
Luminance differences
Colour differences
Depth differences
Motion differences
Texture differences
Retinal Input


R
(a)
R
(b)
(c)

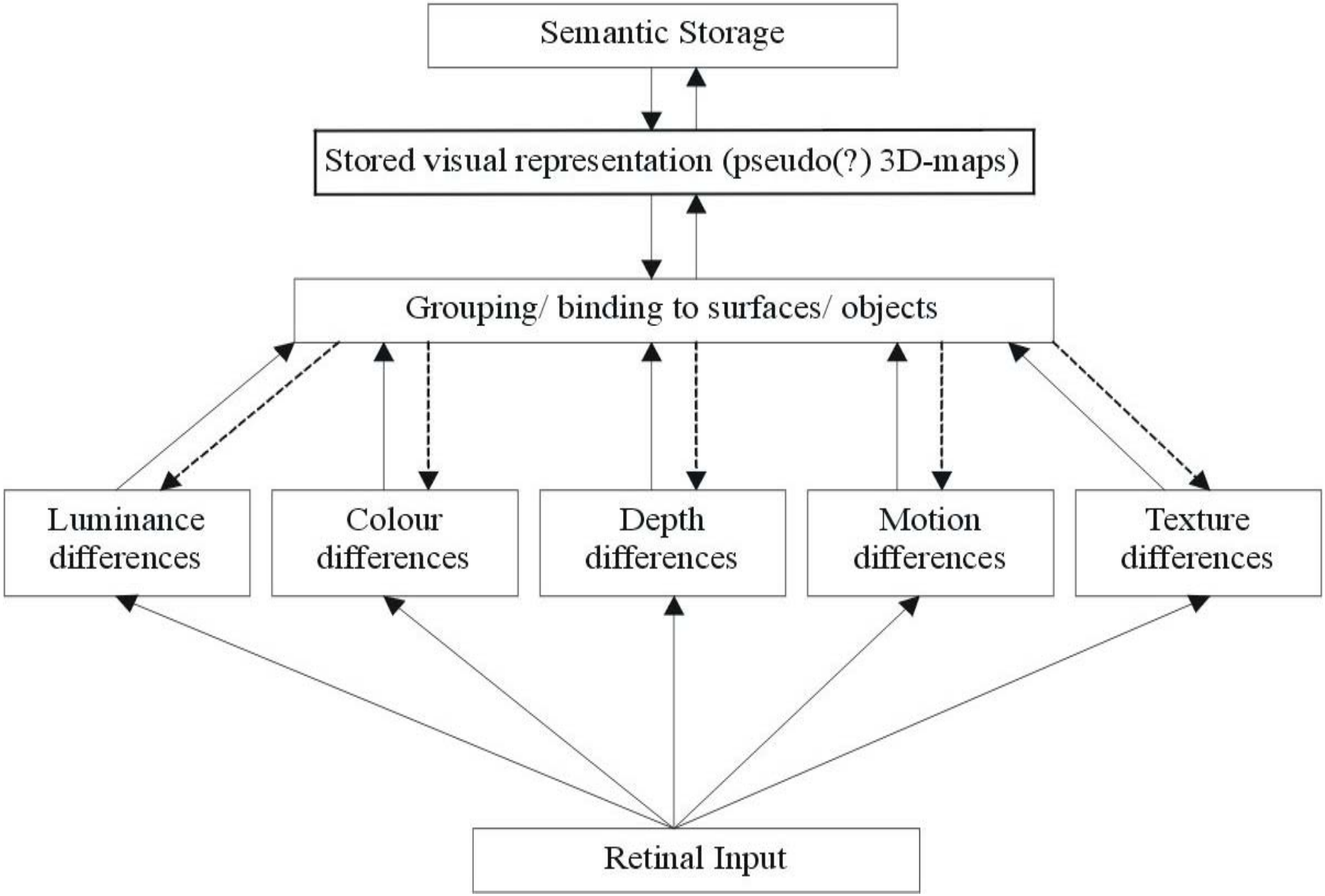
Zerebrale Sehstörungen

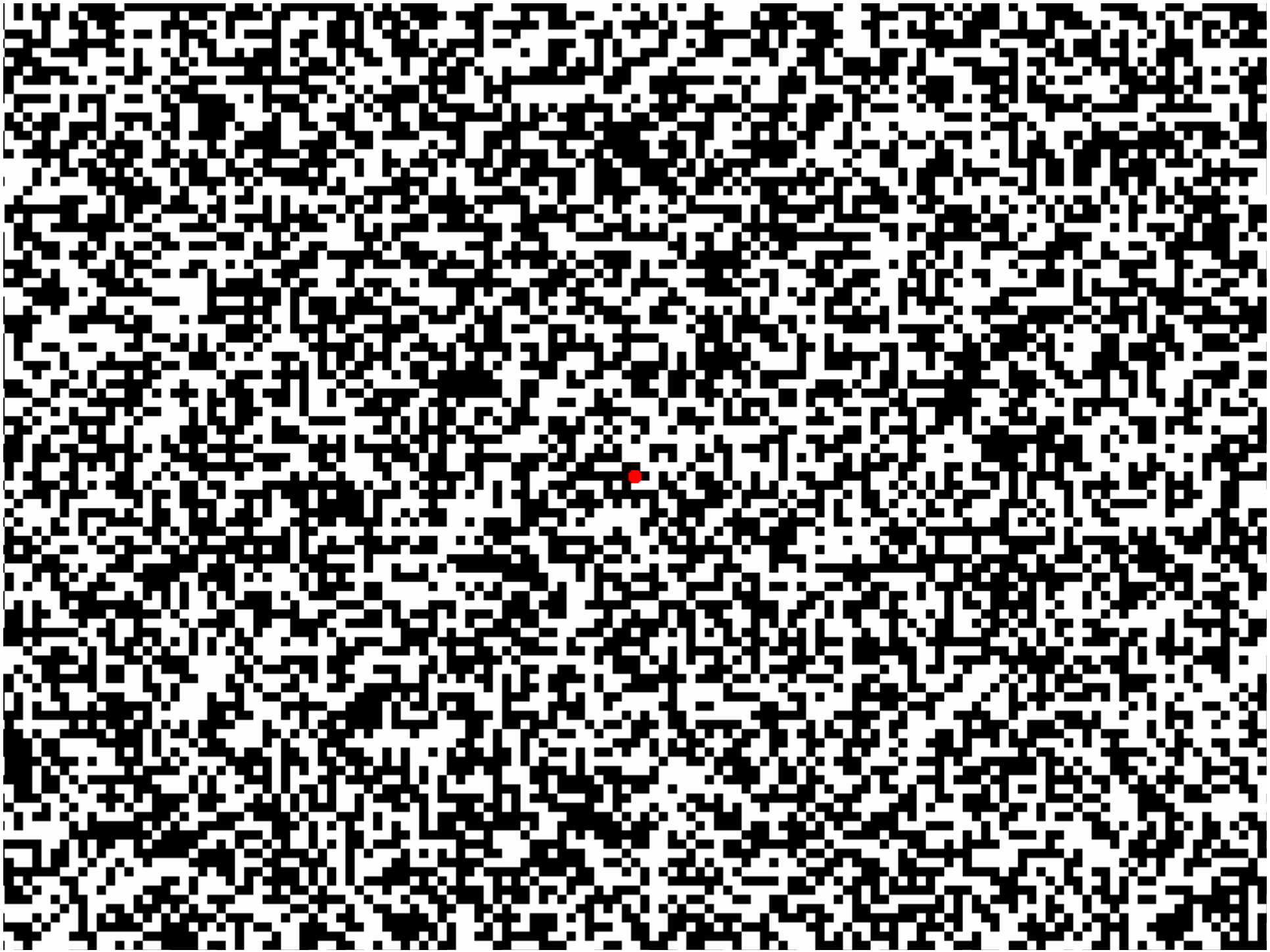
1. Sehbahn-spezifische Gesichtsfeldausfälle
2. Segmentierung der Sehfunktion: Physiologie
3. **Segmentierung der Sehfunktion: Pathophysiologie**

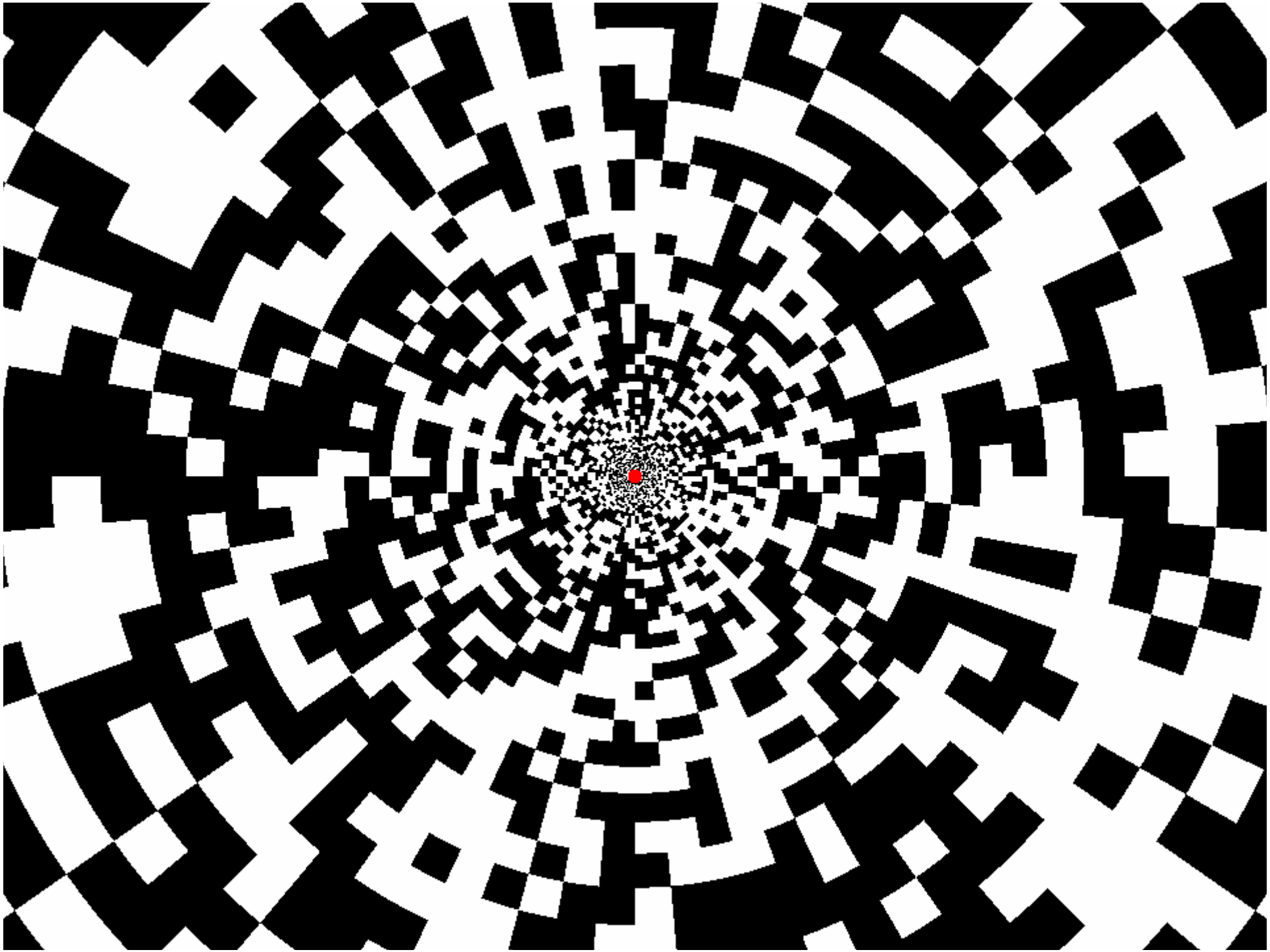
   3.1 „Adiskriminationen“

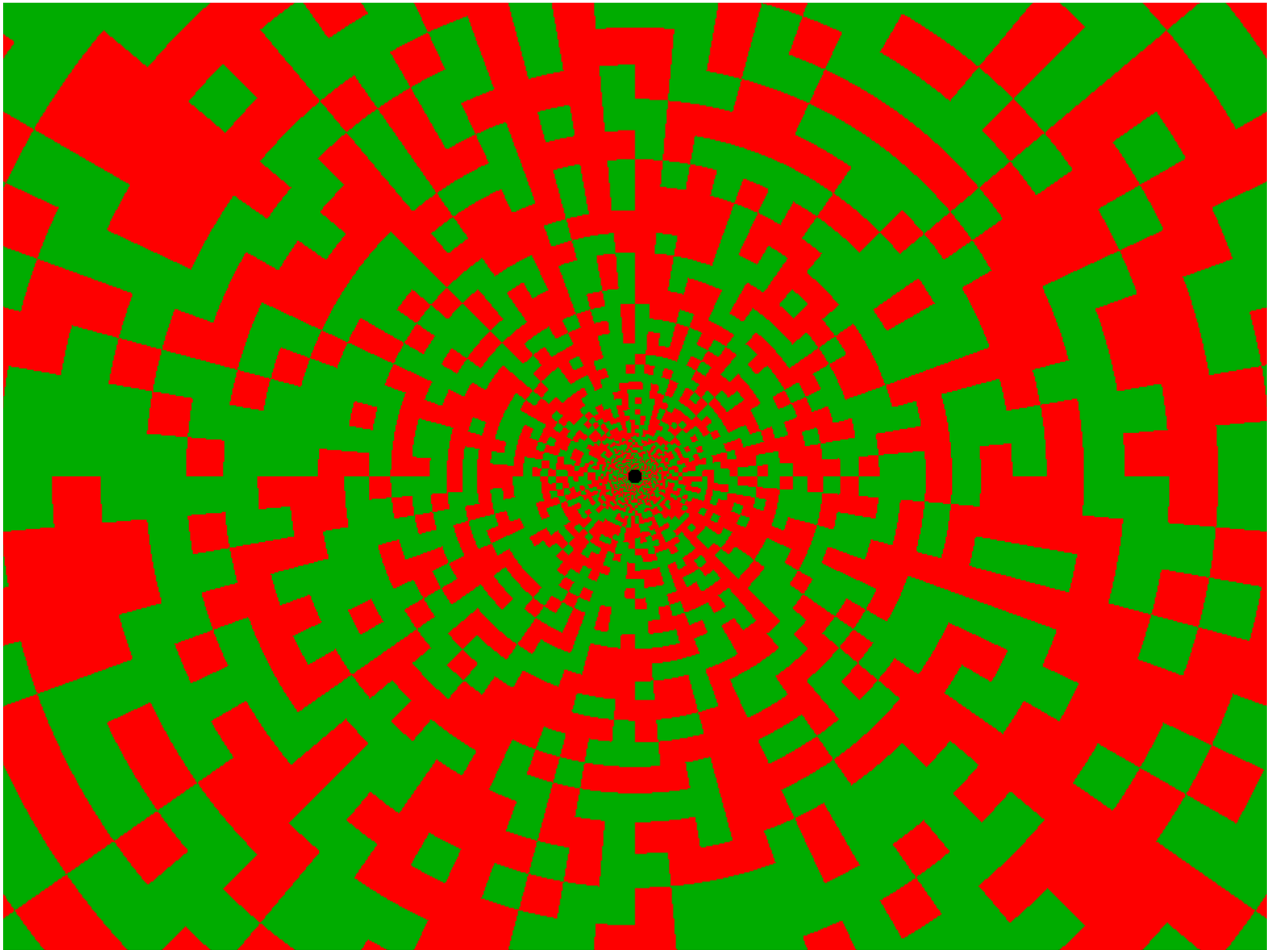
   3.2 Störungen der Objektkonstanz

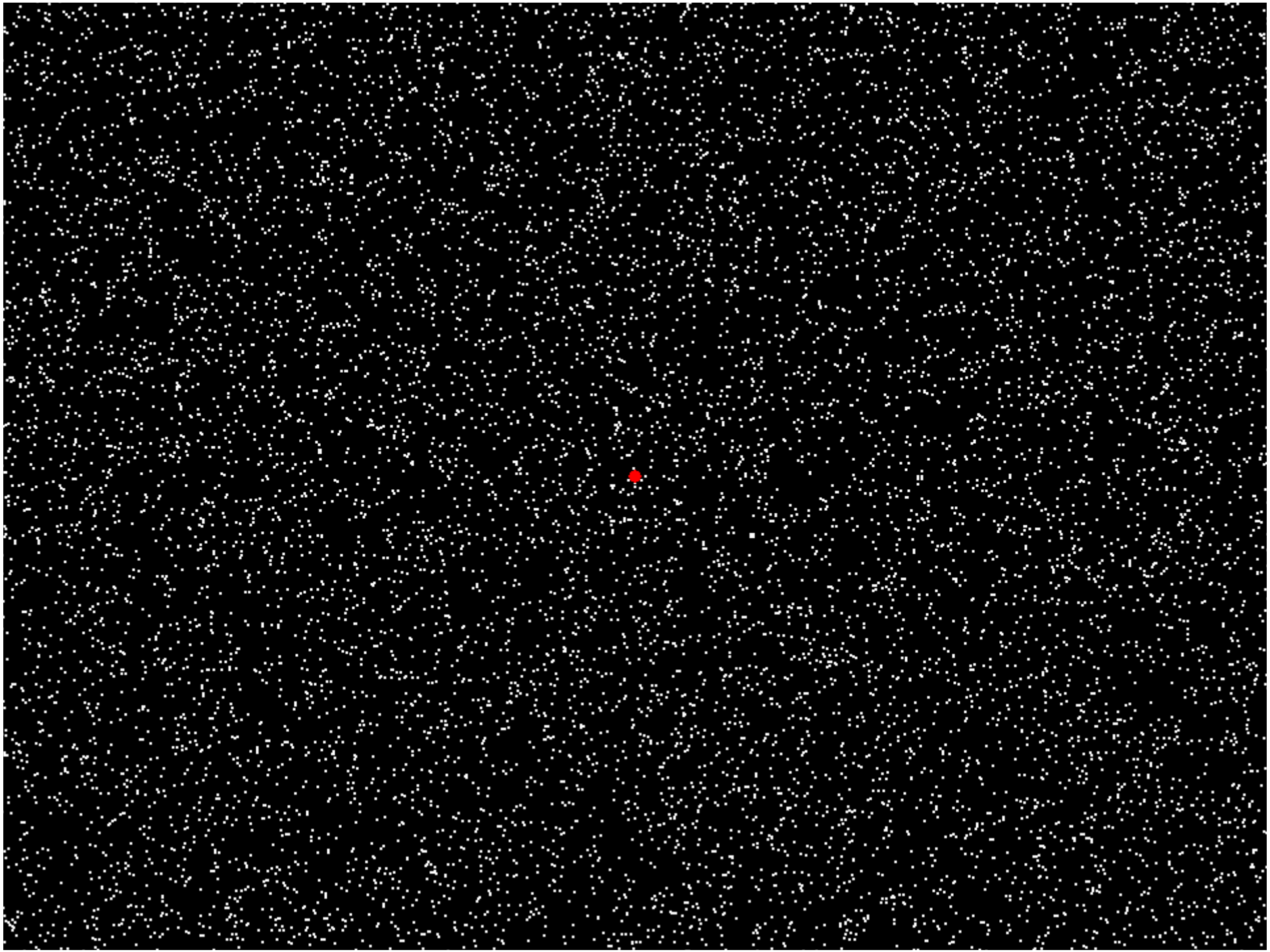
   3.3 Apperzeptive und assoziative Agnosien
4. „Blindsight“, Simultanagnosie und Neglekt

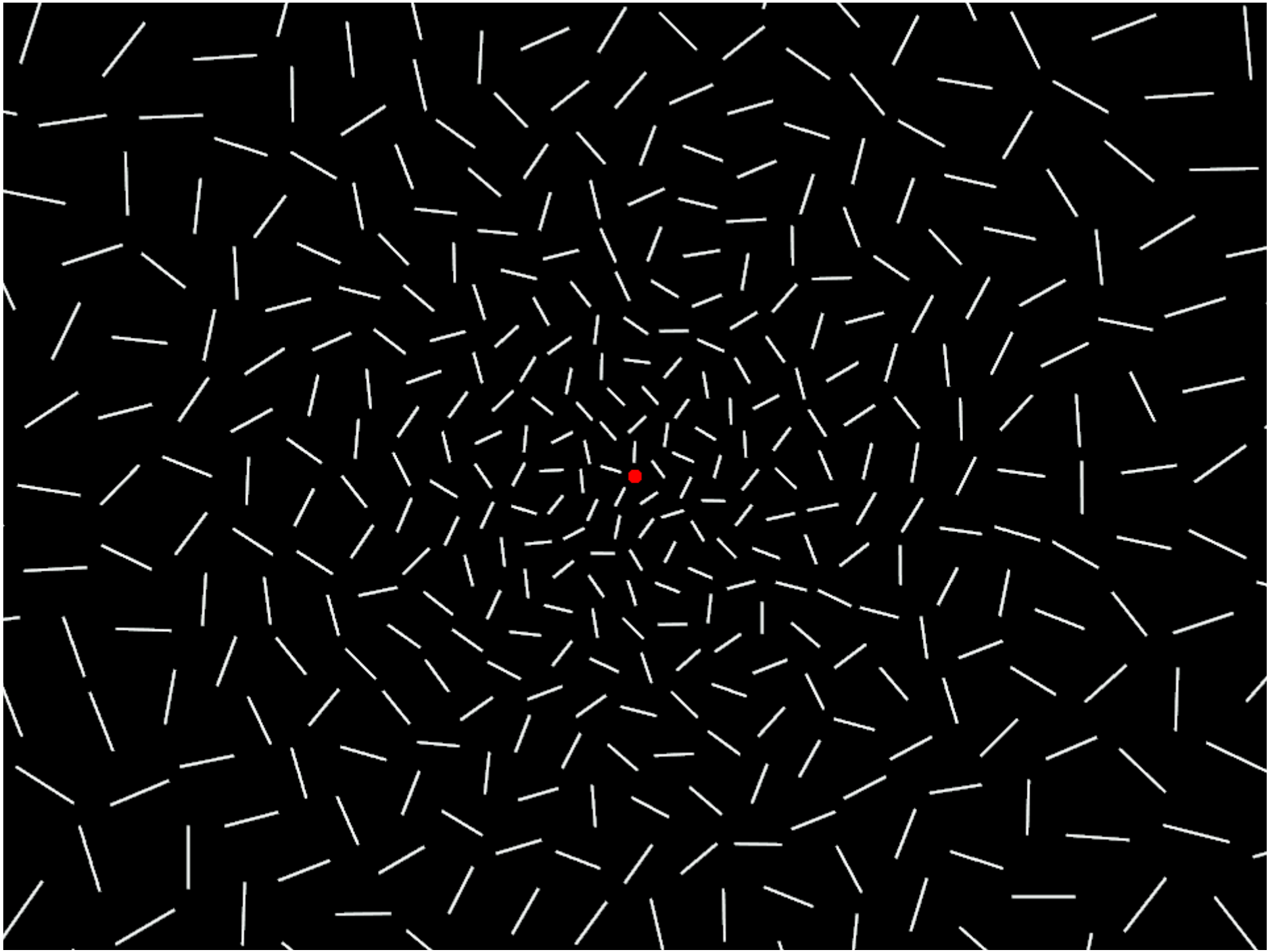

Semantic Storage
Stored visual representation (pseudo(?) 3D-maps)
Grouping/ binding to surfaces/ objects
Luminance differences
Colour differences
Depth differences
Motion differences
Texture differences
Retinal Input

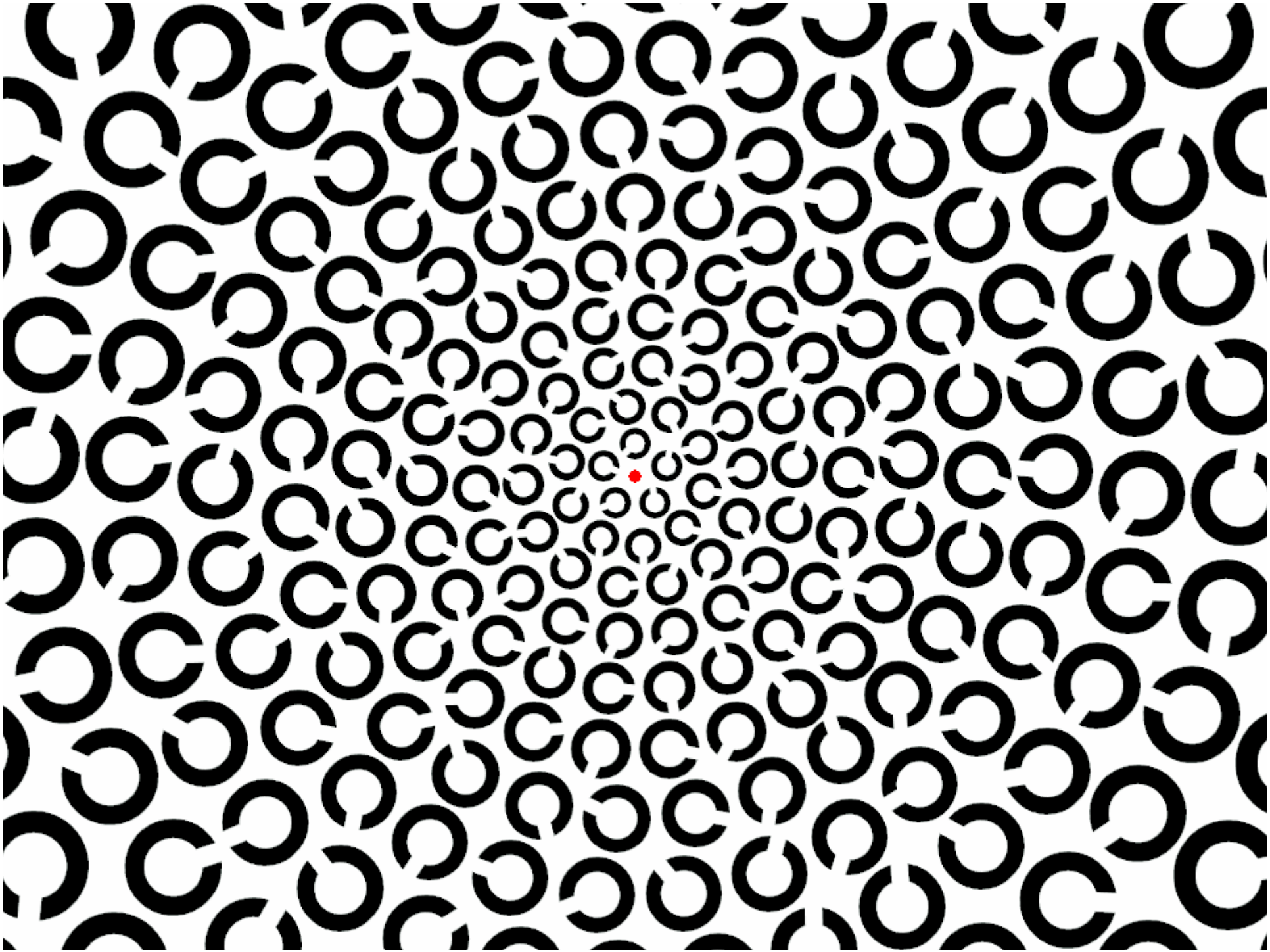


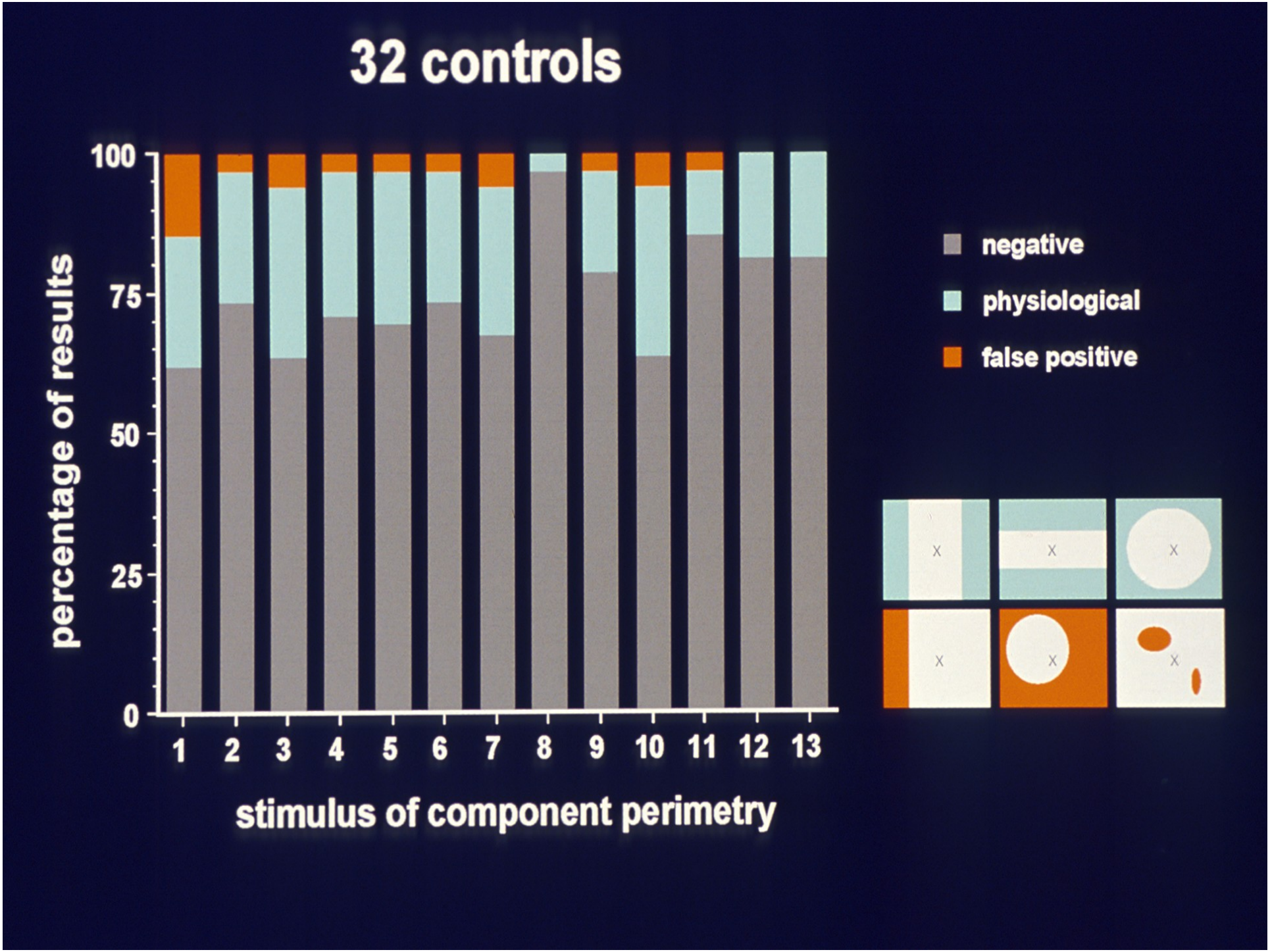











32 controls
100
75
50
25
0
percentage of results
1
2
3
4
5
6
7
8
9
10
11
12
13
stimulus of component perimetry
negative
physiological
false positive
X
X
X
X
X
X

Visual field of patient PG

conventional perimetry

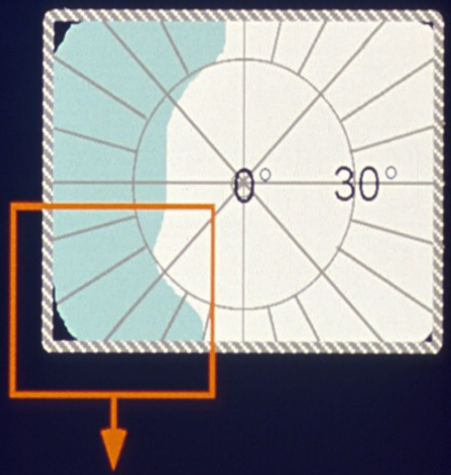
absolute defect in
- both eyes
- one eye

homonymous hemianopia
upper left quadrant

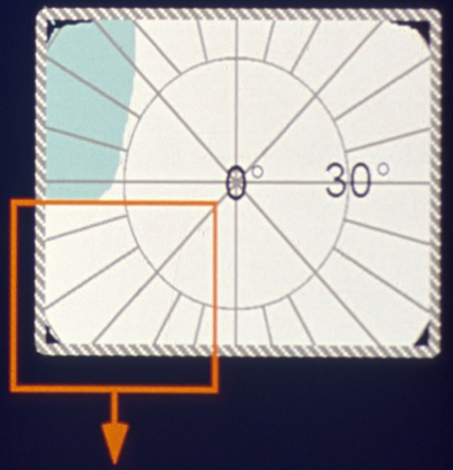
lesion:
medial occipto-temporal cortex
and parts of the optic radiation

component perimetry

deviating visual perception



degraded or not perceived:
- color
- depth
- checkerboard

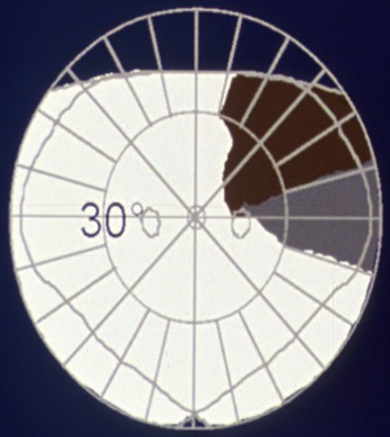


unchanged:
- motion
- flicker
- acuity
- black / white noise field

Visual field of patient SF

conventional perimetry

absolute defect in
- both eyes
- one eye

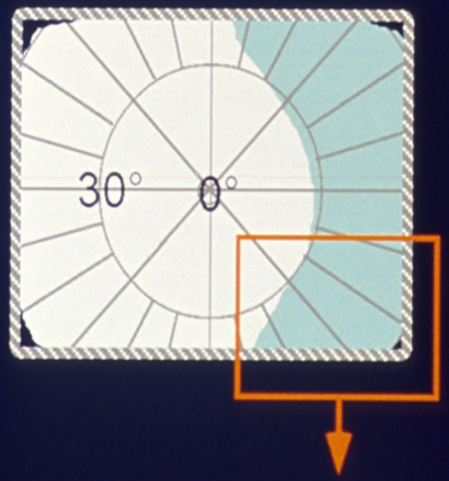


homonymous hemianopia
upper right quadrant

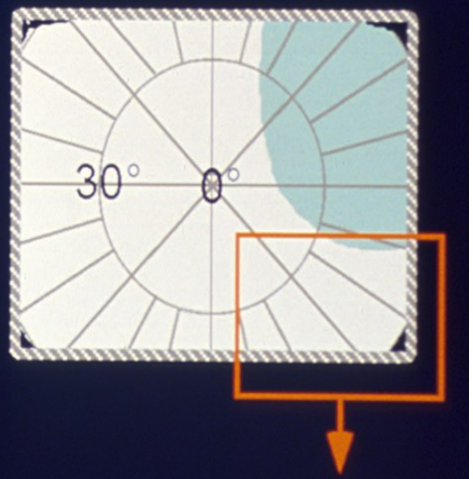
lesion:
medial occipto-temporal cortex
and parts of the optic radiation

component perimetry

deviating visual perception



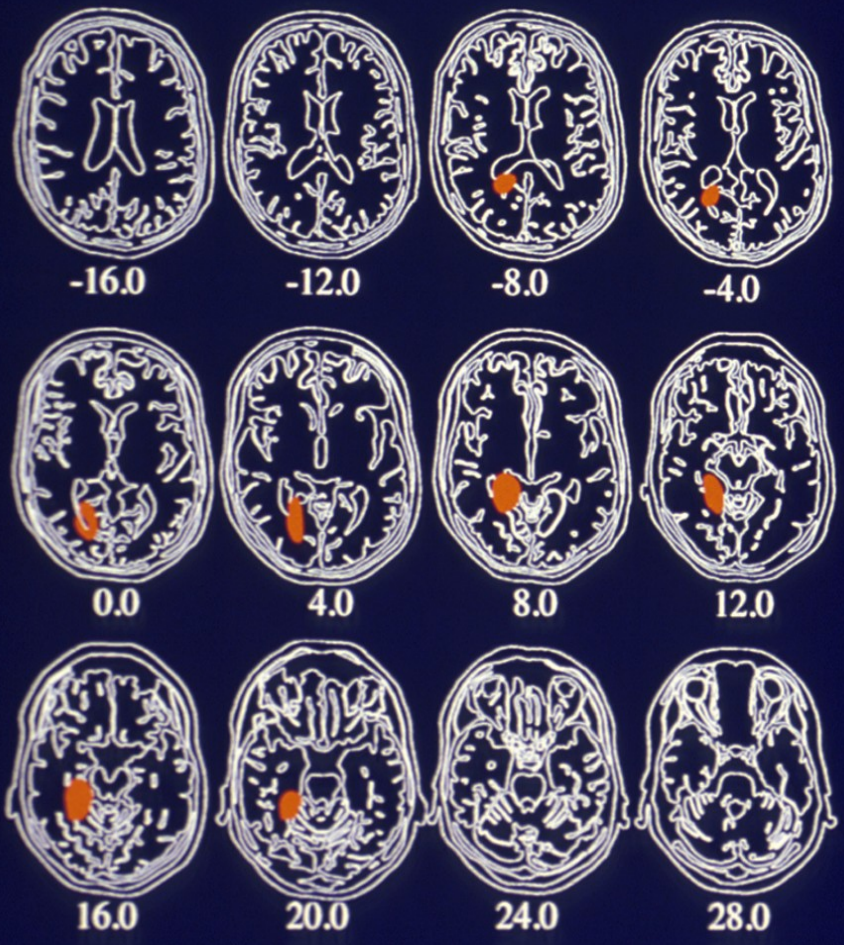
degraded or not perceived:
- color •
- depth •
- checkerboard •



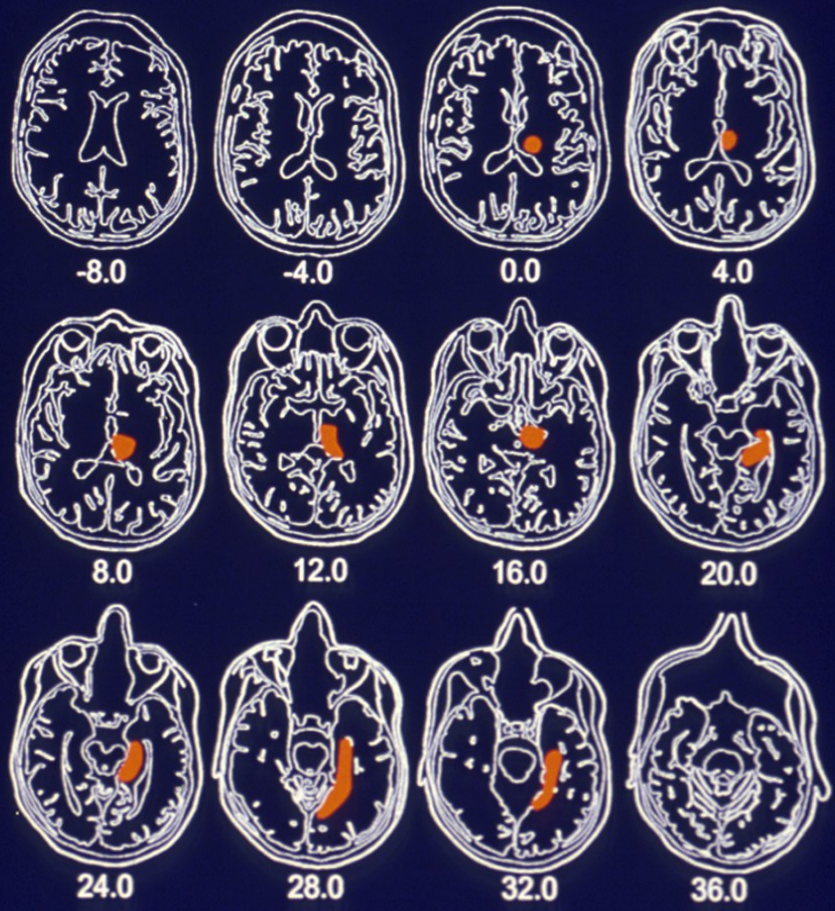
unchanged:
- motion •
- flicker •
- acuity •
- black / white noise field •

Location of lesions

Patient PG



Patient SF



Visual field of patient DF

conventional perimetry

relative defect in
- both eyes
- one eye

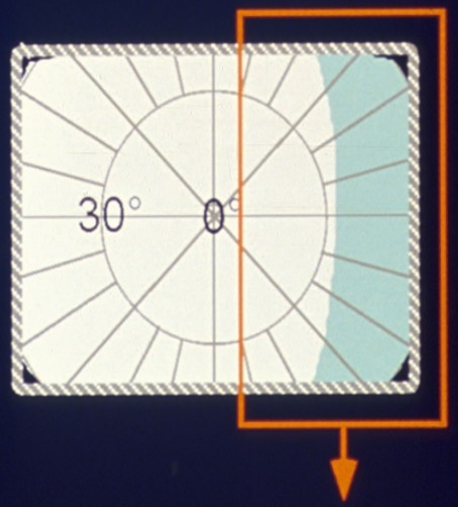
relative defects particular
in the right hemifield

lesion:

lateral fronto-temporal cortex

component perimetry

deviating visual perception



degraded or not perceived:
- motion •
- flicker •
- depth •
- checkerboard •

unchanged:
- • colors
- • acuity
- • all noise field pattern

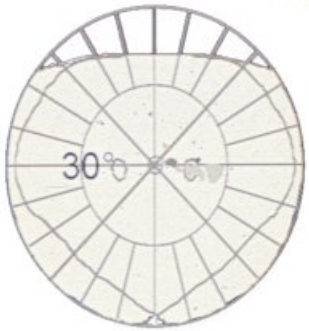
Visual field of patient KJ

Conventional perimetry

Relative defect in

Both eyes

One eye

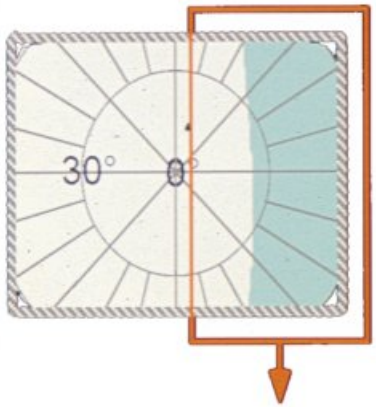


Relative scotomata

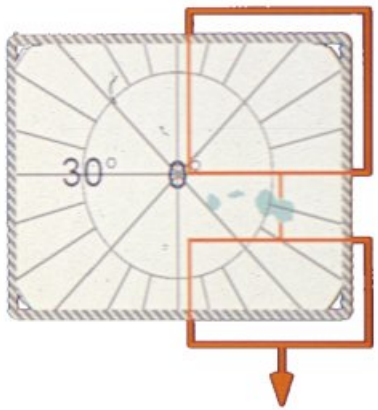
Lesion:
parieto-occipital cortex

Component perimetry

Deviating visual perception



Degraded or not perceived:
depth, colors, flicker, motion,
checkerboard, pattern elements



Unchanged:
acuity,
black/white noise field

Location of lesion

Patient KJ

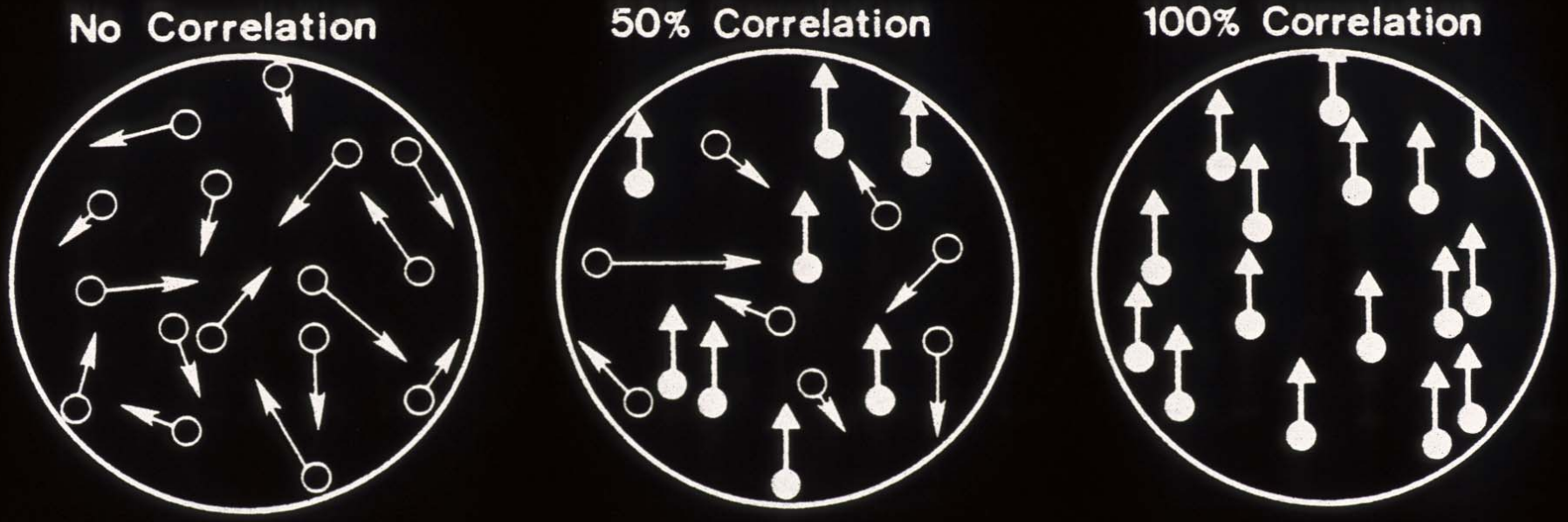
Patients with selective visual field defects

DF
SN
selective motion perception deficit

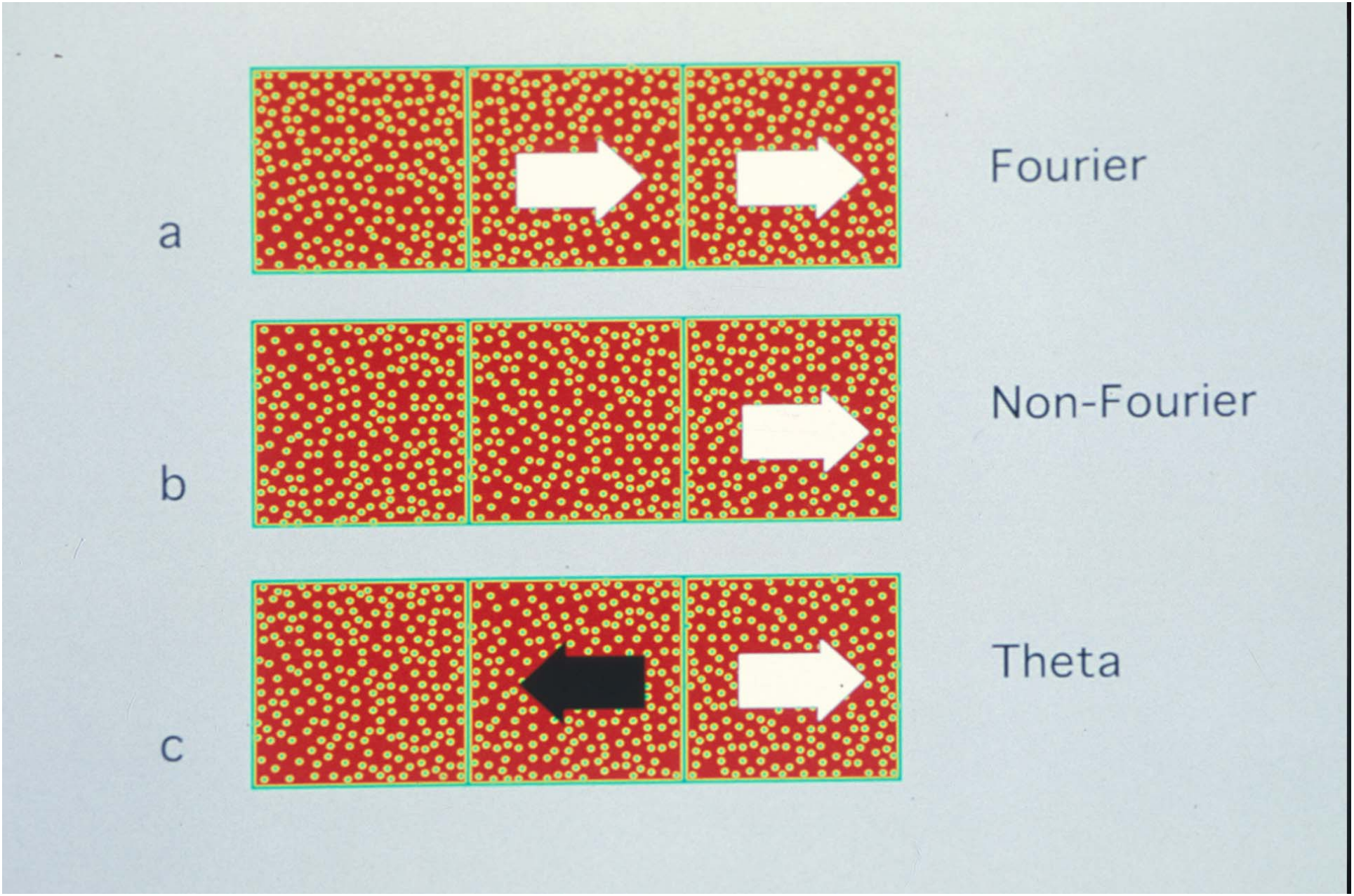
KJ

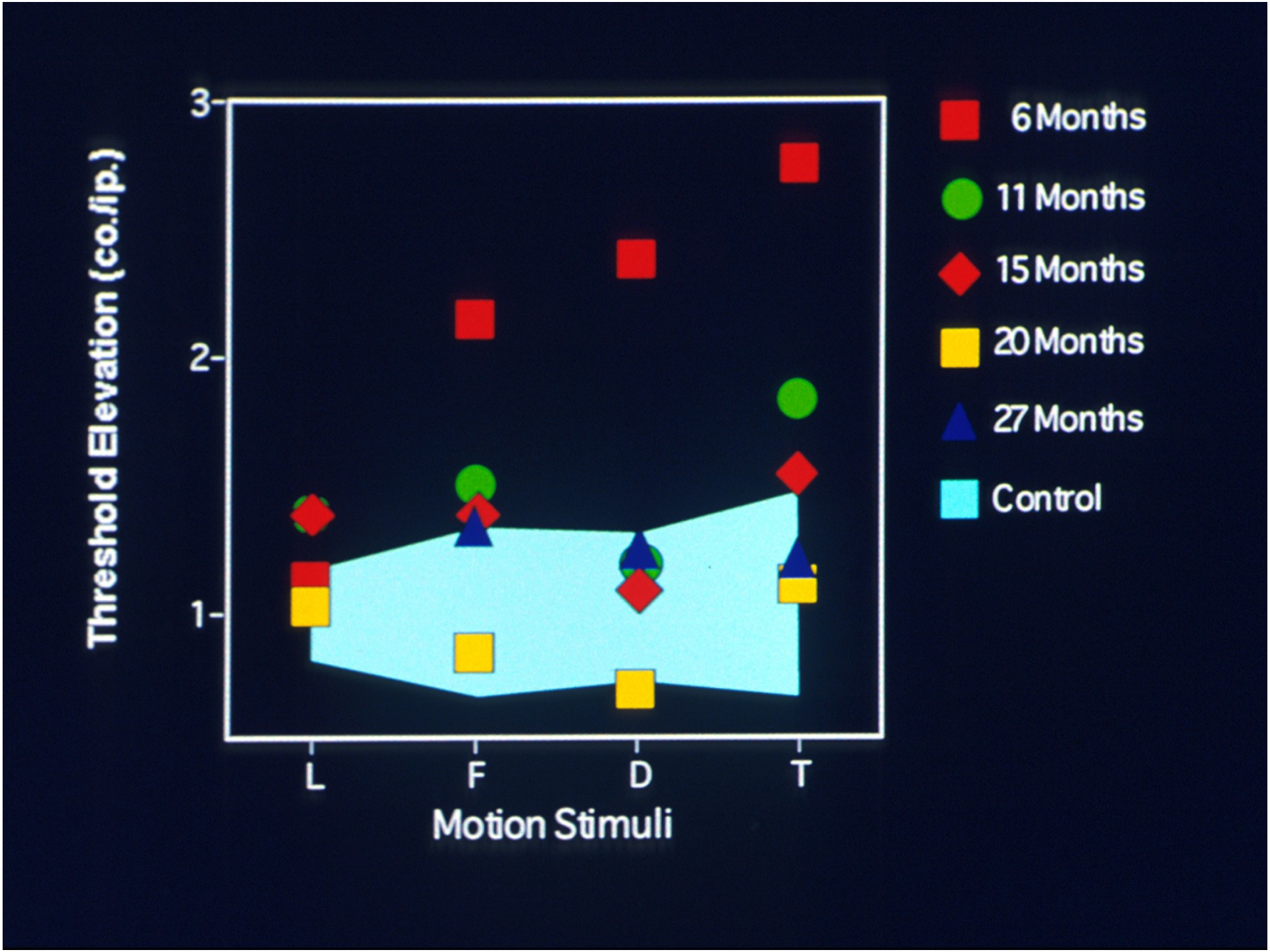
SF
PG
selective color perception deficit

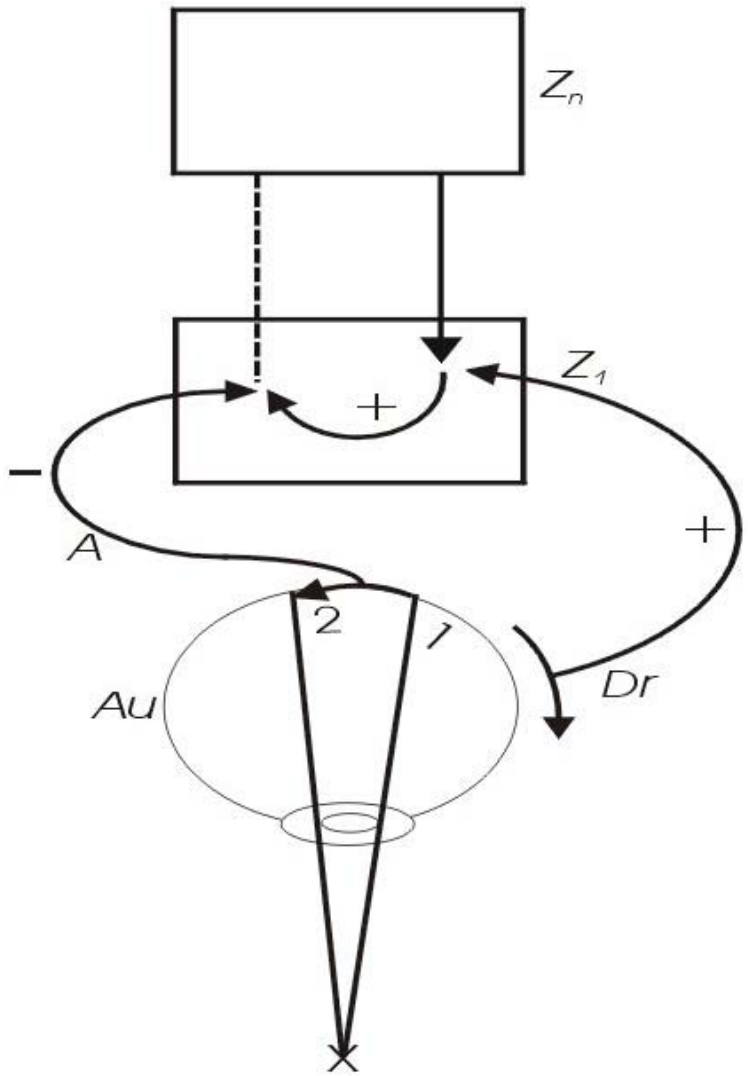
Lesions are projected into the same hemisphere



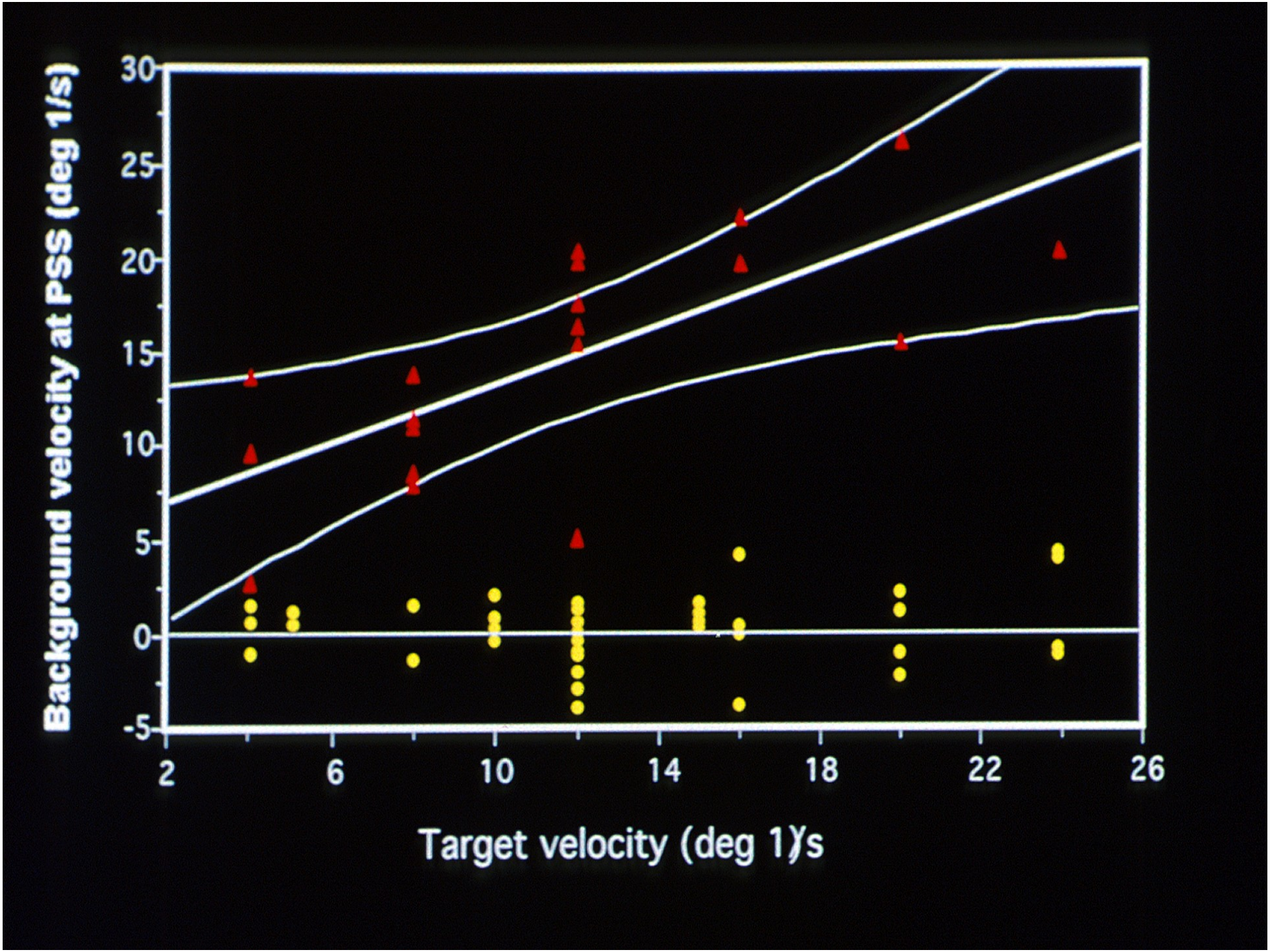
aus: Newsome, W.T. & Paré, D.B.
The Journal of Neuroscience, 2201-221 (1988)


a
Fourier
b
Non-Fourier
c
Theta


Threshold Elevation (co./ip.)
3
2
1
L
F
D
T
Motion Stimuli
6 Months
11 Months
15 Months
20 Months
27 Months
Control



A

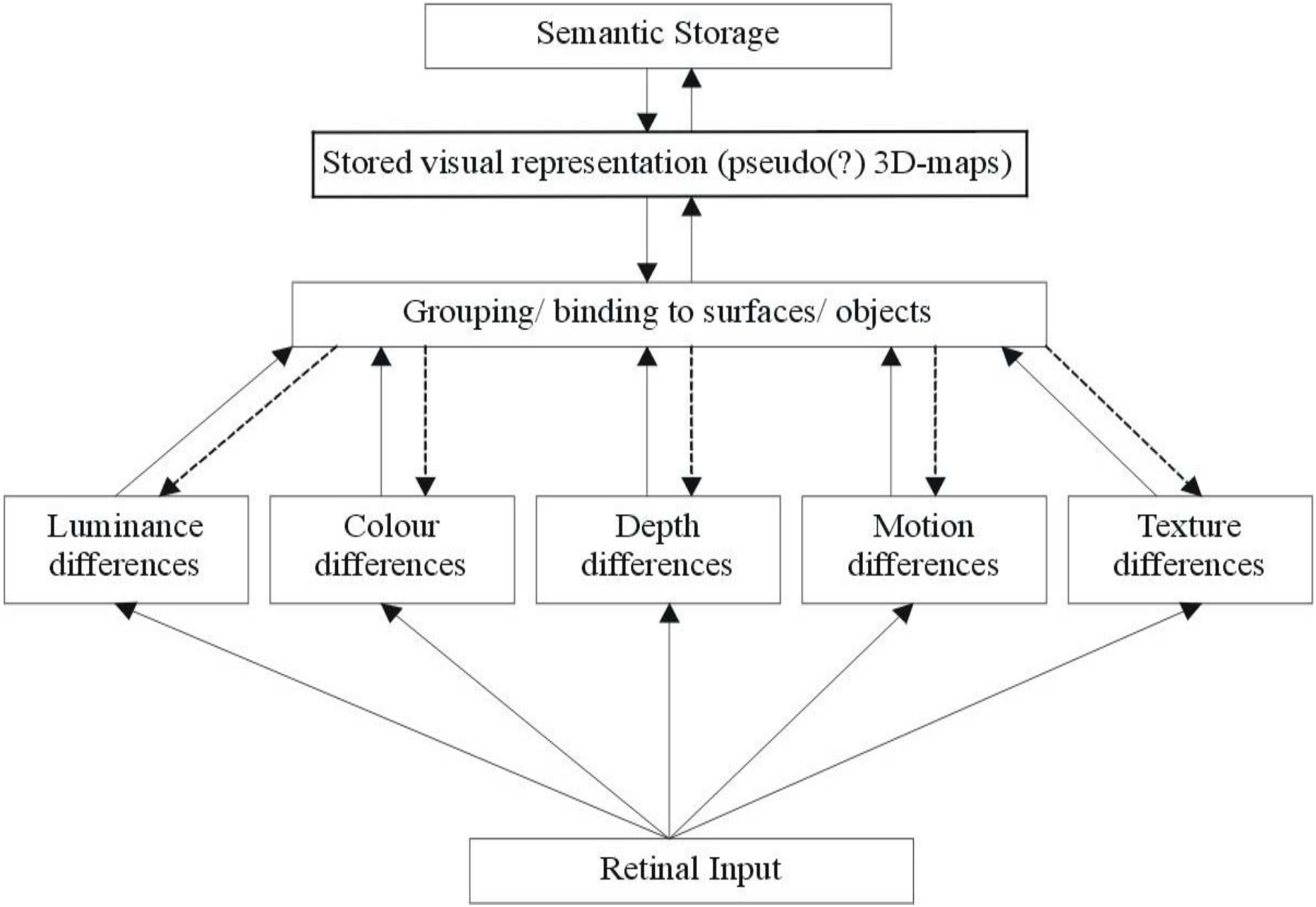

Background velocity at PSS (deg 1/s)
30
25
20
15
10
5
0
-5
2
6
10
14
18
22
26
Target velocity (deg 1/s)

Spezifische zerebral bedingte Sehstörungen

- Skotom der LUE („Erblindung“; Perimetrie)
- Verlust des Tiefensehens
- Bewegungsblindheit
- Achromatopsie
- Fehlen der Farbkonstanz
- Verlust der senso-motorischen Koppelung
  (z. B. Efferenzkopie)
- Objektagnosie
  - assoziativ
  - apperzeptiv
- Prosopagnosie
- Simultanagnosie
- Neglekt/Balint-Syndrom

Näheres siehe:

M. Fahle & M. Greenlee (Hrsg.)
Visual Neuropsychology
Oxford University Press, 2003


Semantic Storage
Stored visual representation (pseudo(?) 3D-maps)
Grouping/ binding to surfaces/ objects
Luminance differences
Colour differences
Depth differences
Motion differences
Texture differences
Retinal Input

Zerebrale Sehstörungen

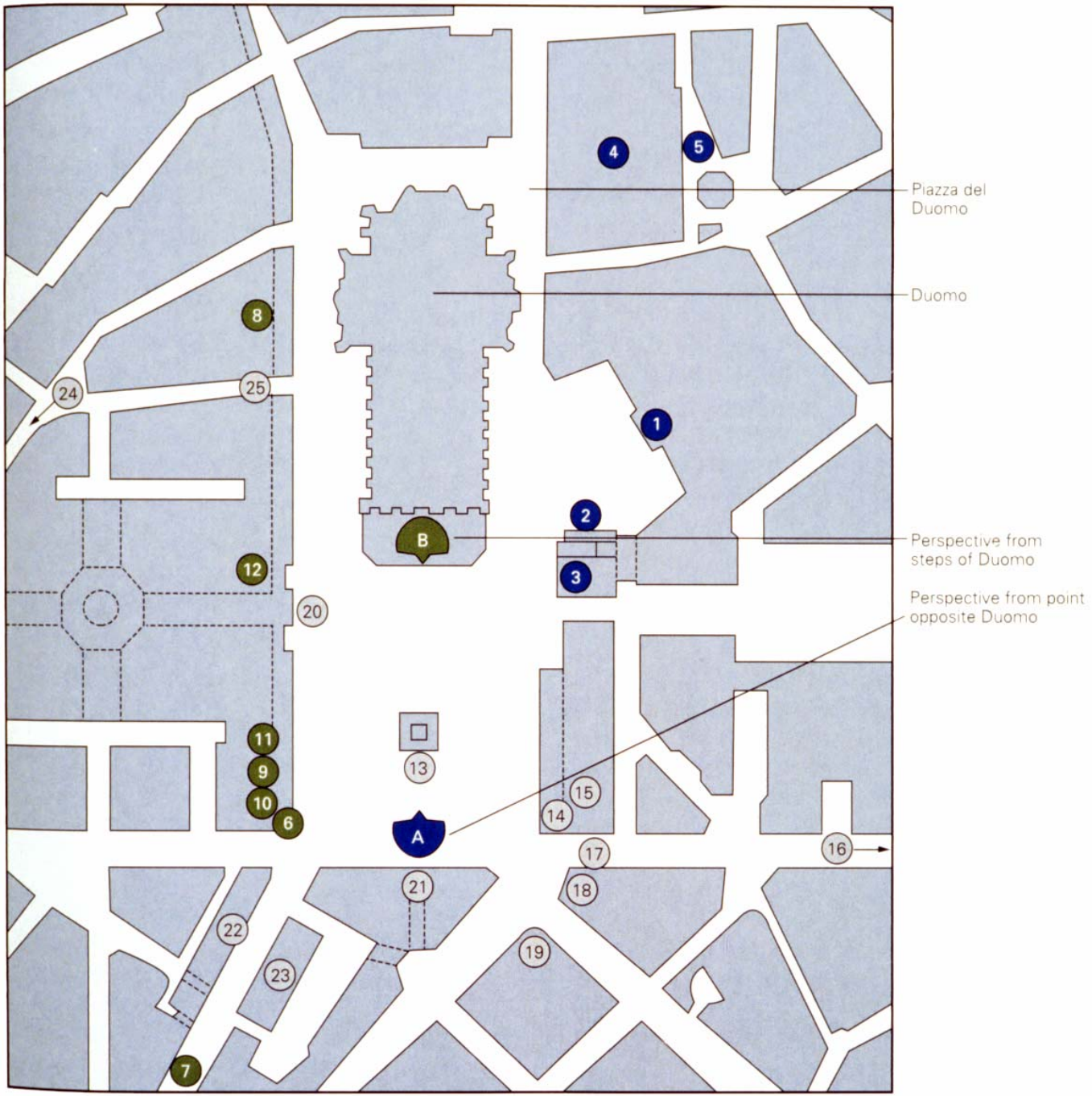
1. Sehbahn-spezifische Gesichtsfeldausfälle
2. Segmentierung der Sehfunktion: Physiologie
3. Segmentierung der Sehfunktion: Pathophysiologie

   3.1 „Adiskriminationen“

   3.2 Störungen der Objektkonstanz

   3.3 Apperzeptive und assoziative Agnosien

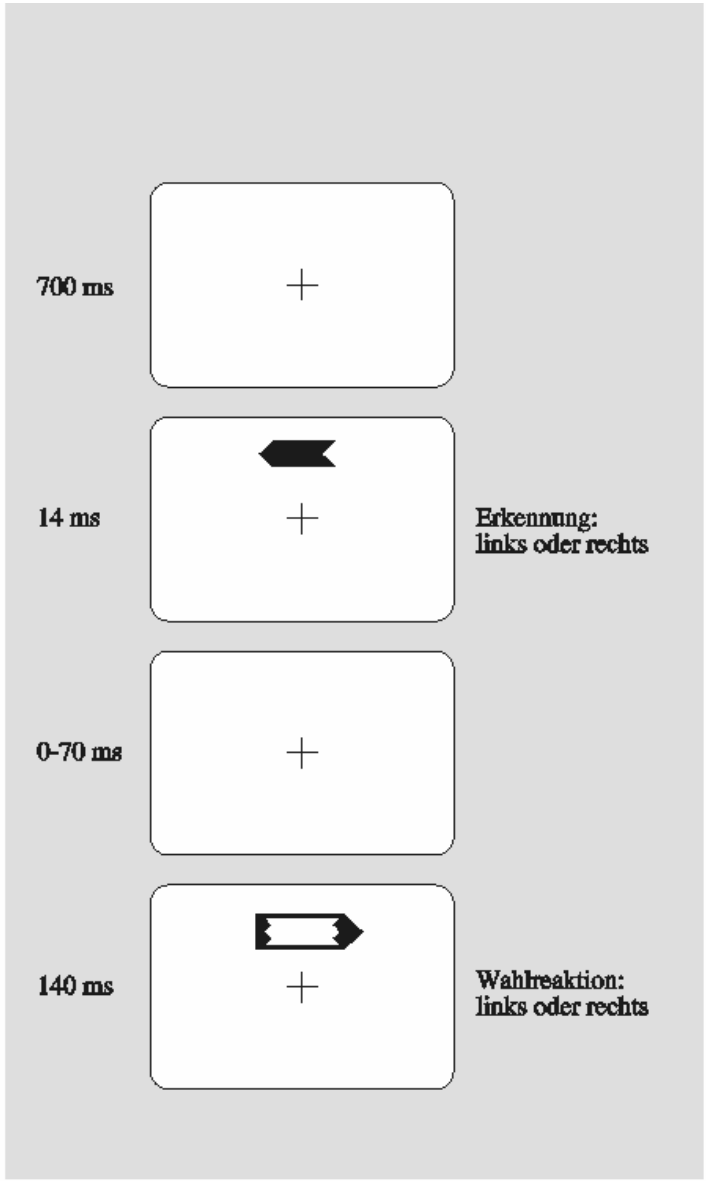
4. **„Blindsight“, Simultanagnosie und Neglekt**

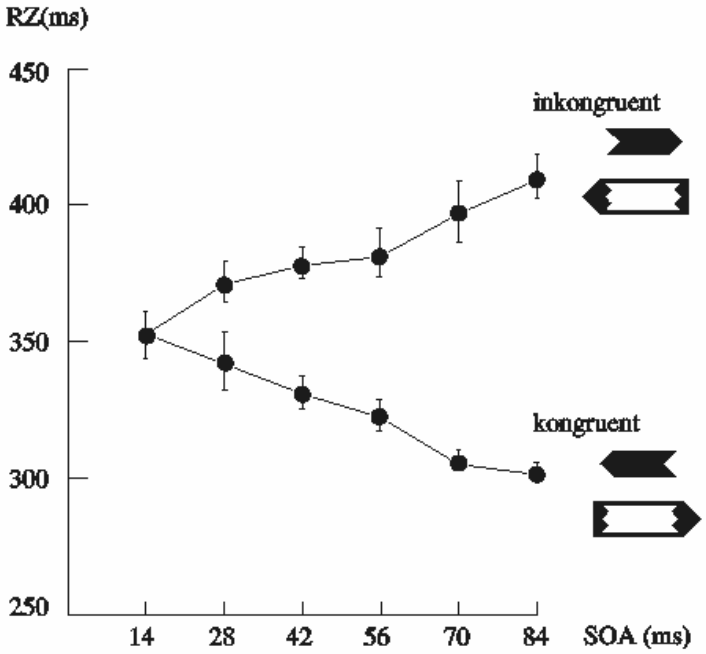

Piazza del Duomo
Duomo
Perspective from steps of Duomo
Perspective from point opposite Duomo
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
A
B

Unbewußte Wahrnehmung

Wir nehmen nicht alles wahr, was wir sehen

(und unser Handeln beeinflusst)


700 ms
14 ms
Erkennung:
links oder rechts
0-70 ms
140 ms
Wahlreaktion:
links oder rechts


RZ(ms)
450
400
350
300
250
inkongruent
kongruent
14
28
42
56
70
84
SOA (ms)

Zusammenfassung

- Sehen ist eine komplexe, durch einen großen Teil des Cortex vermittelte Funktion
- Die Sehfunktion unterteilt sich in eine Reihe voneinander teilweise unabhängiger Teilfunktionen (Farben-, Bewegungs-, Tiefensehen)
- Teilfunktionen können isoliert ausfallen
- Ausfälle müssen wegen der Größe der beteiligten Cortexbereiche relativ häufig sein, werden aber selten diagnostiziert, vermutlich wegen bilateraler Repräsentation
- Neue diagnostische Methoden:
  - Verhaltensebene: Komponenten- & Blickperimetrie
  - EEG: Vielkanal-Ableitungen mit Dipol-Analyse
  - Kernspintomografie: Anatomie
  - funktionelle Kernspintomografie: Funktion
- Prognose: Spontanheilung und Reha