

Neurobiologische Grundlagen der visuellen Wahrnehmung

Seminar Wahrnehmung

25. Oktober 2001

Neurobiologische Grundlagen der visuellen Wahrnehmung

- Neuronale Informationsverarbeitung
 - Neurone
 - Aufbau des Gehirns
- Auge
 - Struktur und Funktion
- Visueller Kortex
 - Eigenschaften von Neuronen
 - Struktur und Funktion

Golgi und y Cajal

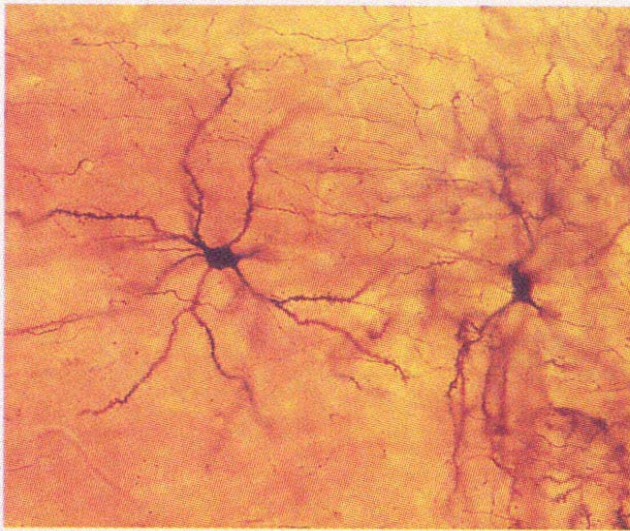


Golgi

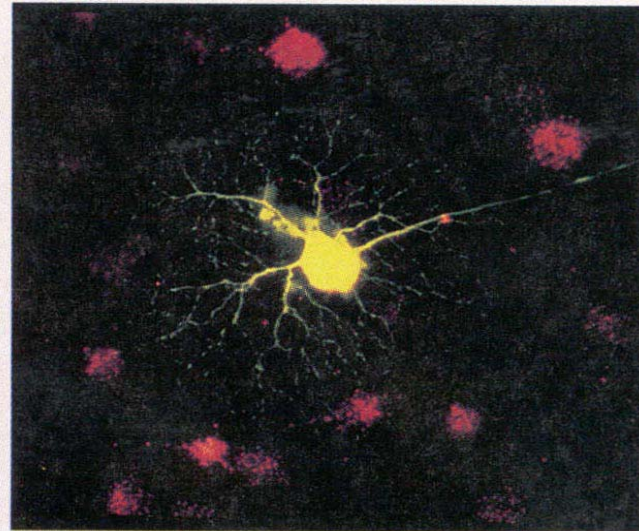


Ramón y Cajal

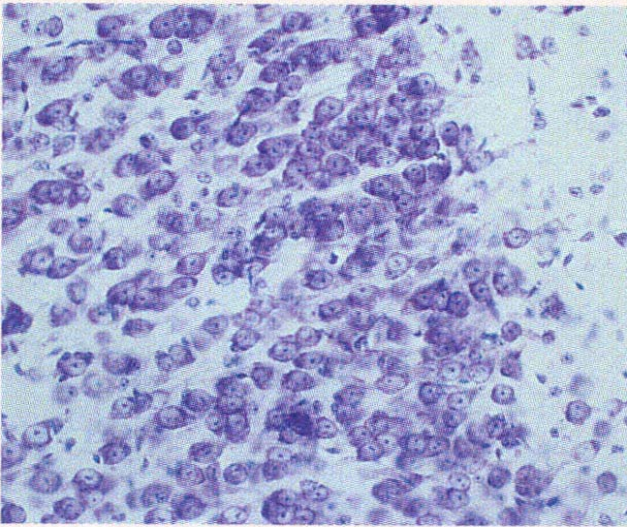
Anfärbung von Neuronen



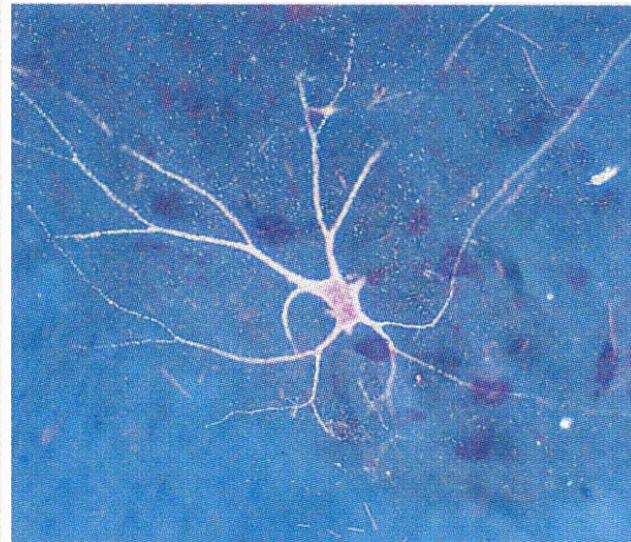
(A) Golgi stain



(C) Neuron injected with fluorescent dye

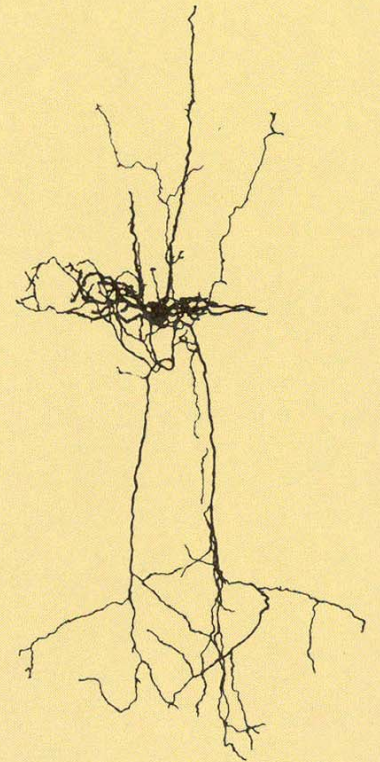
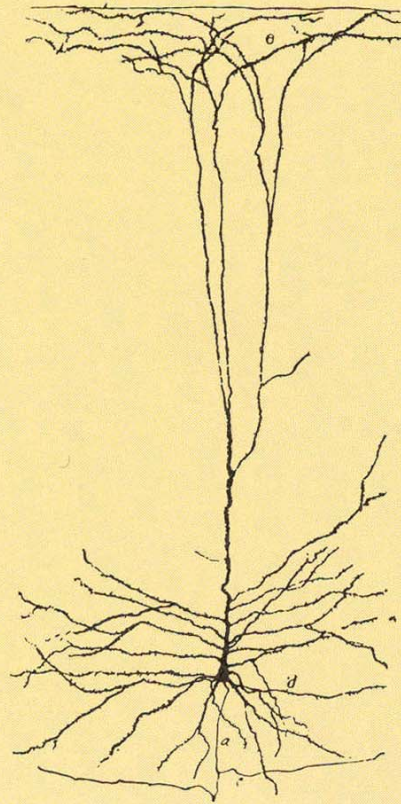
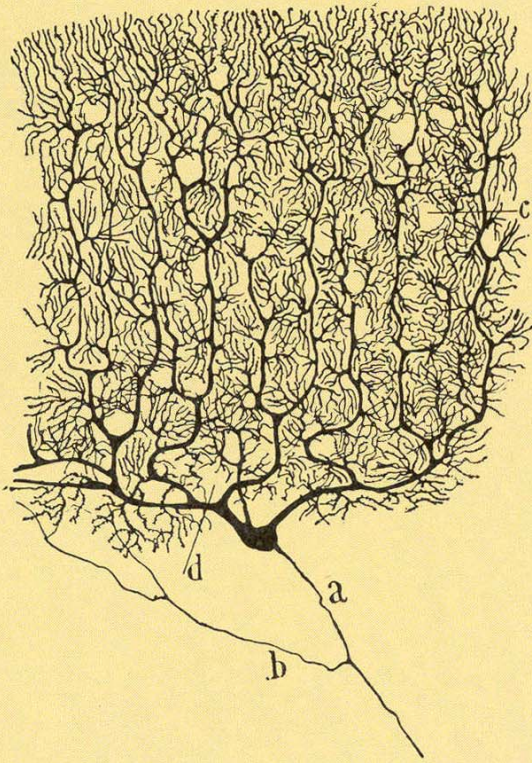


(B) Nissl stain

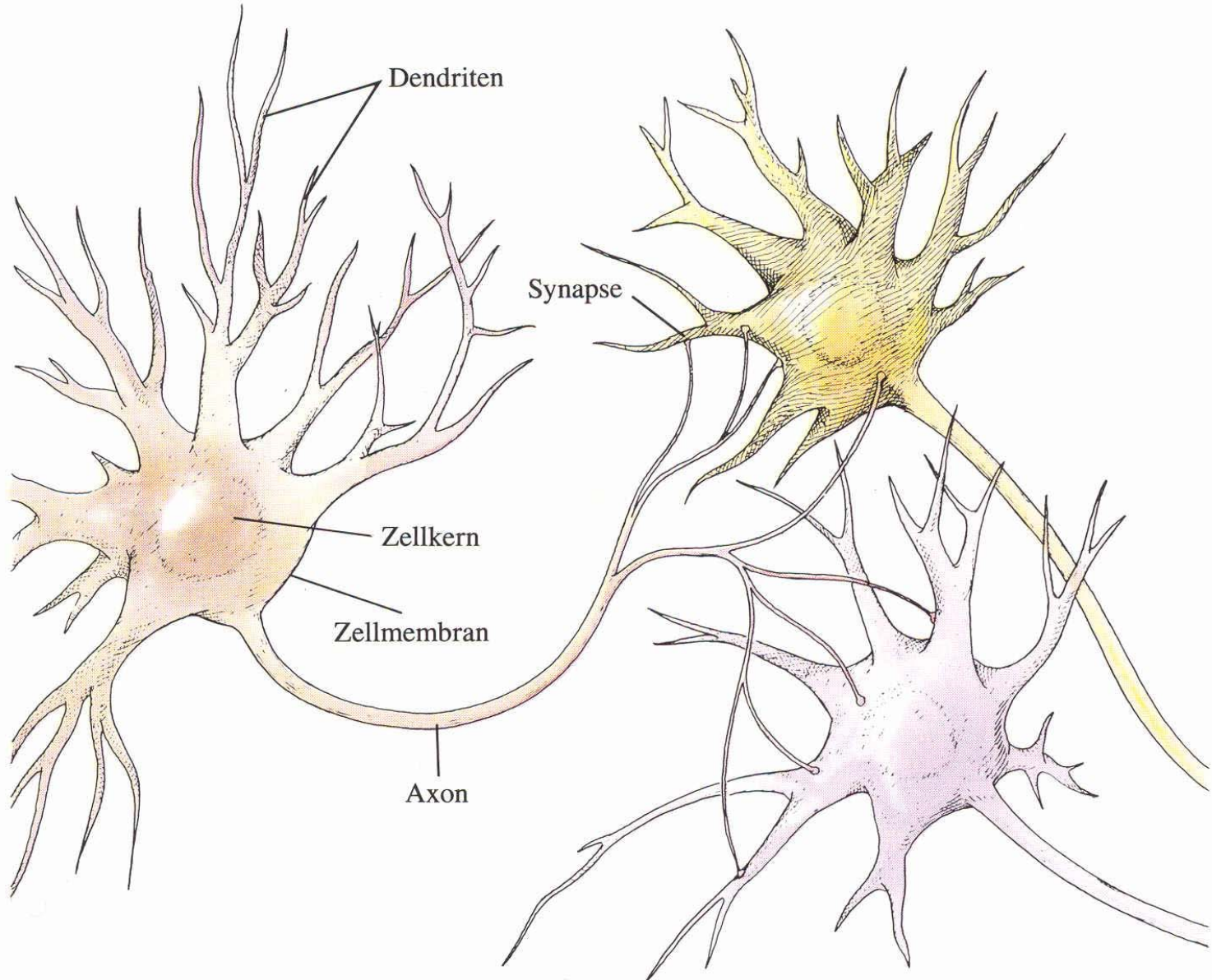


(D) HRP-filled motoneuron

Form von Neuronen



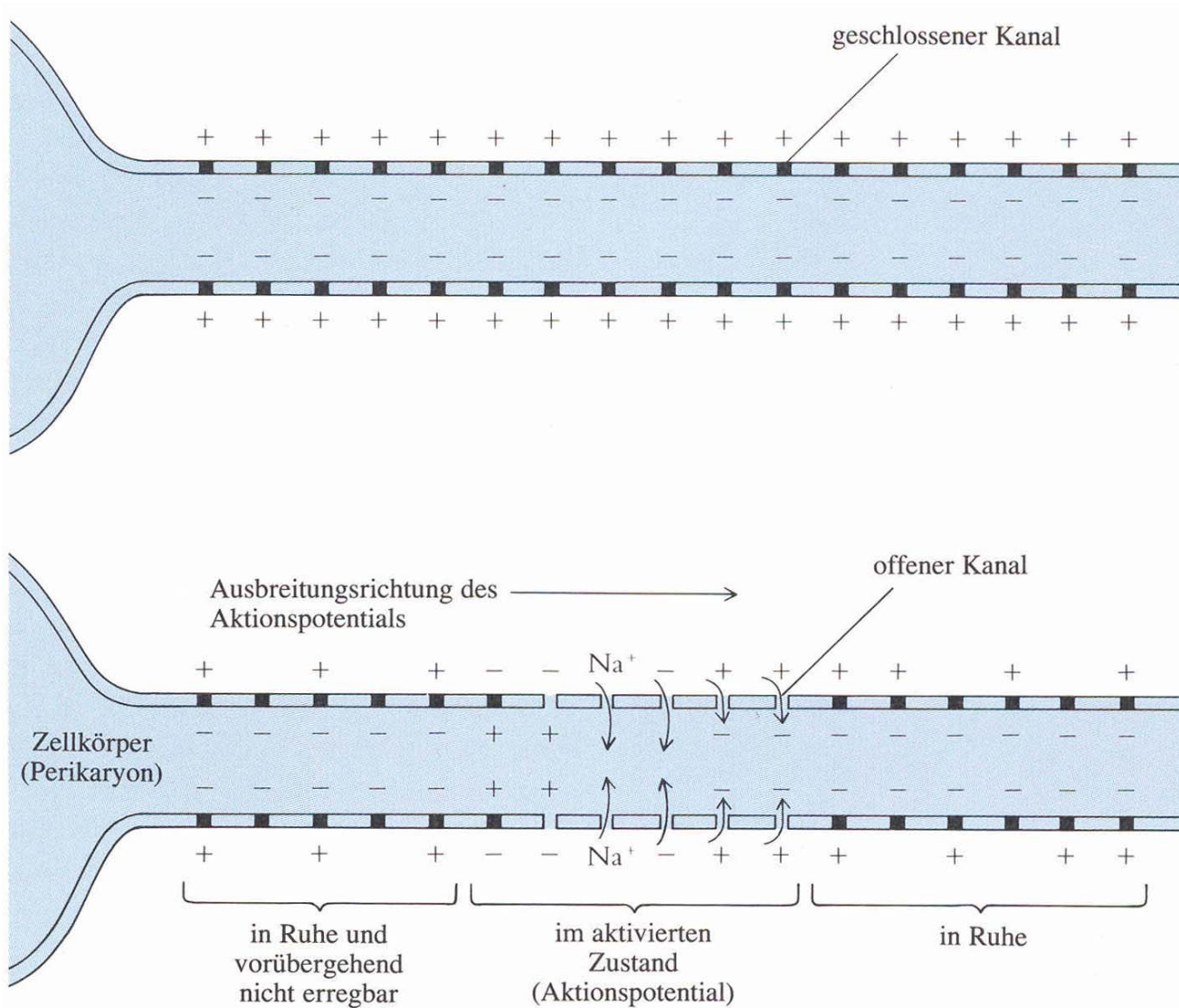
Nervenzellen



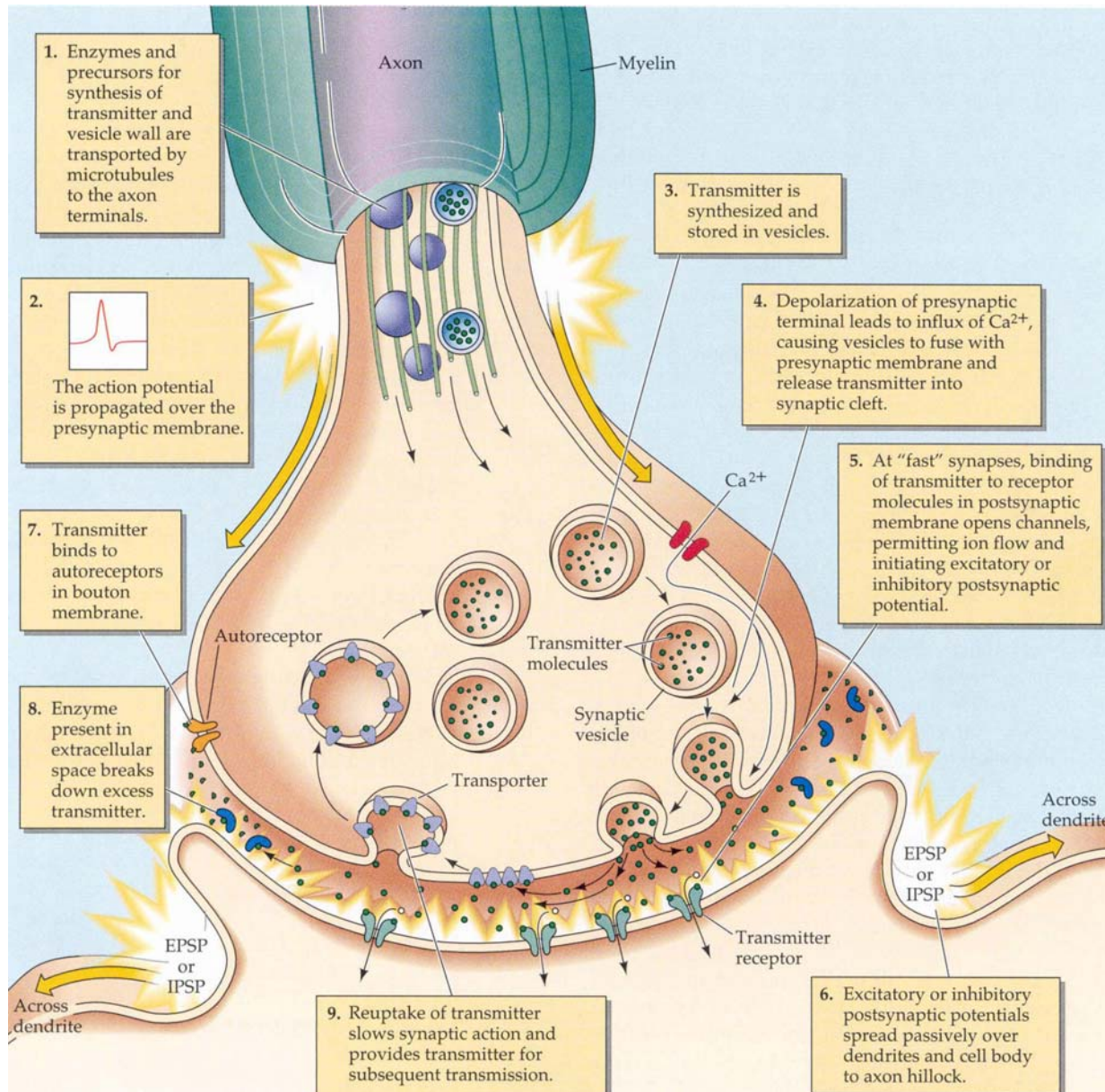
Aufbau von Nervenzellen

- **Neurone** bestehen aus Zellkörper, Dendriten, Axon und präsynaptischen Endigungen
- Jeder Bereich hat eine ganz bestimmte Aufgabe bei der Signalübertragung
- Der **Zellkörper** ist das Stoffwechselzentrum der Zelle
- **Dendriten** und **Axon** sind Fortsätze, die im Zellkörper entspringen
- **Synapsen** sind die Kontaktpunkte zu anderen Neuronen

Informationsweiterleitung

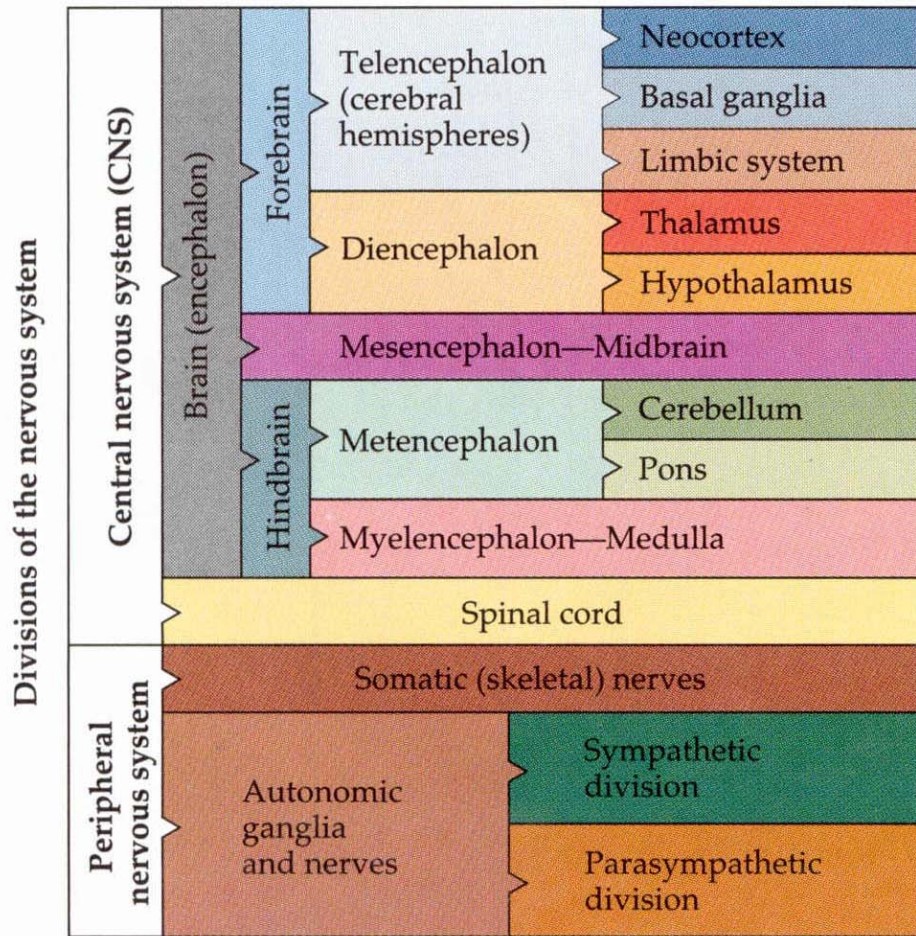


Synaptische Übertragung

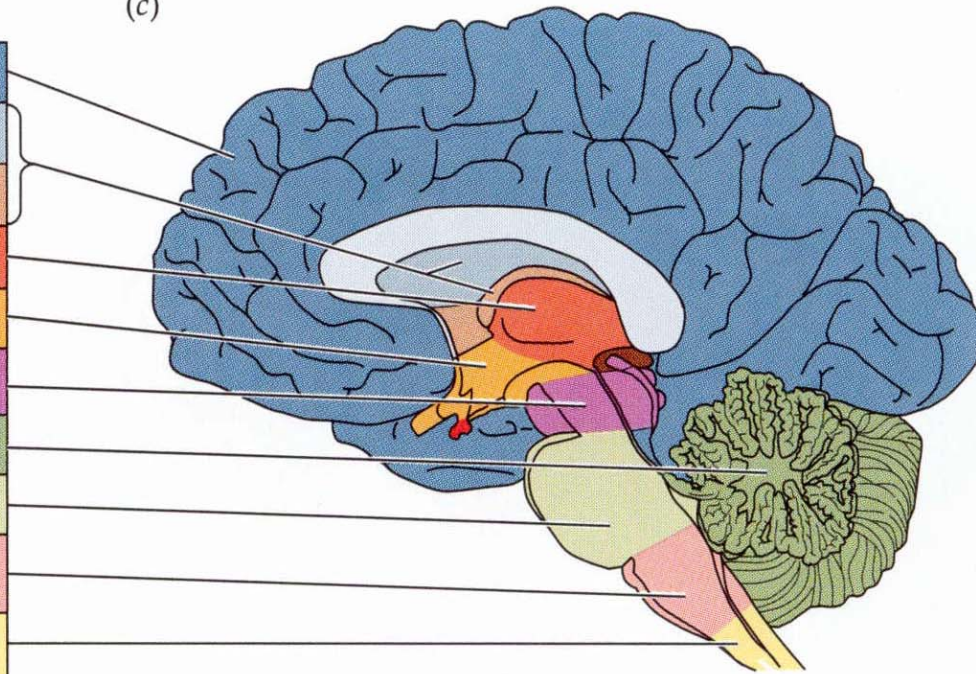


Struktur des Gehirns

b) Organization of the adult human brain

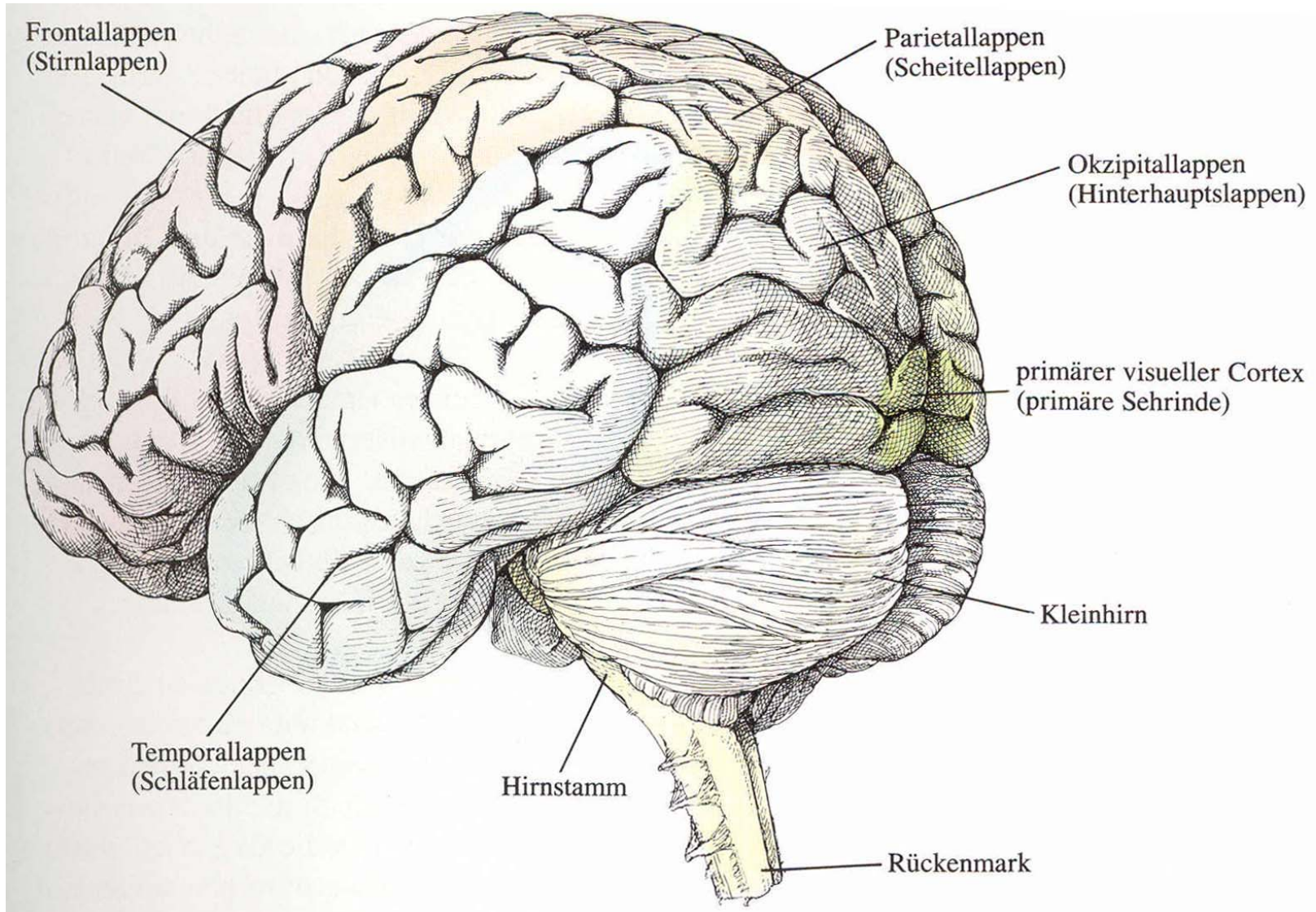


(c)

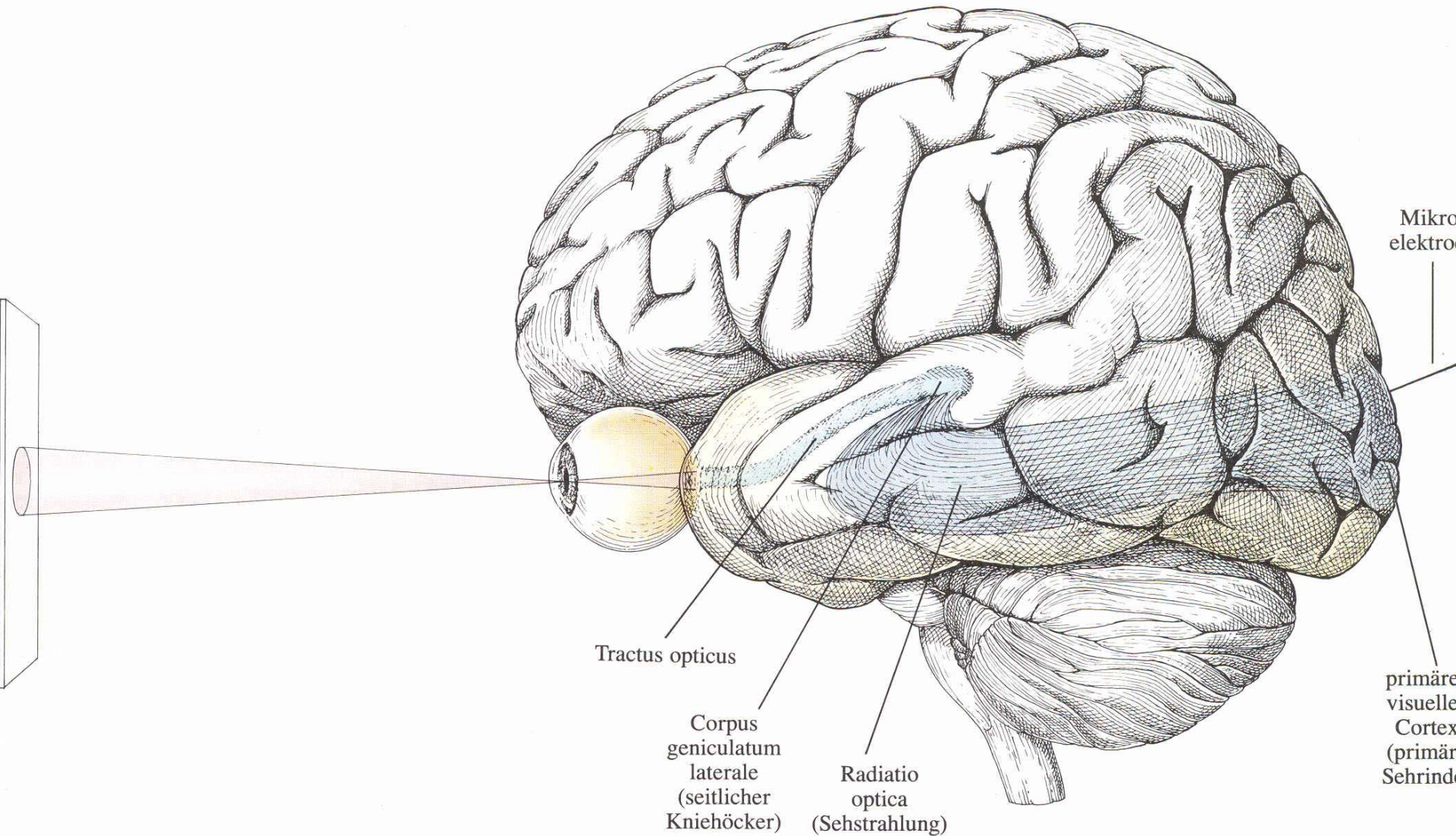


Adult brain

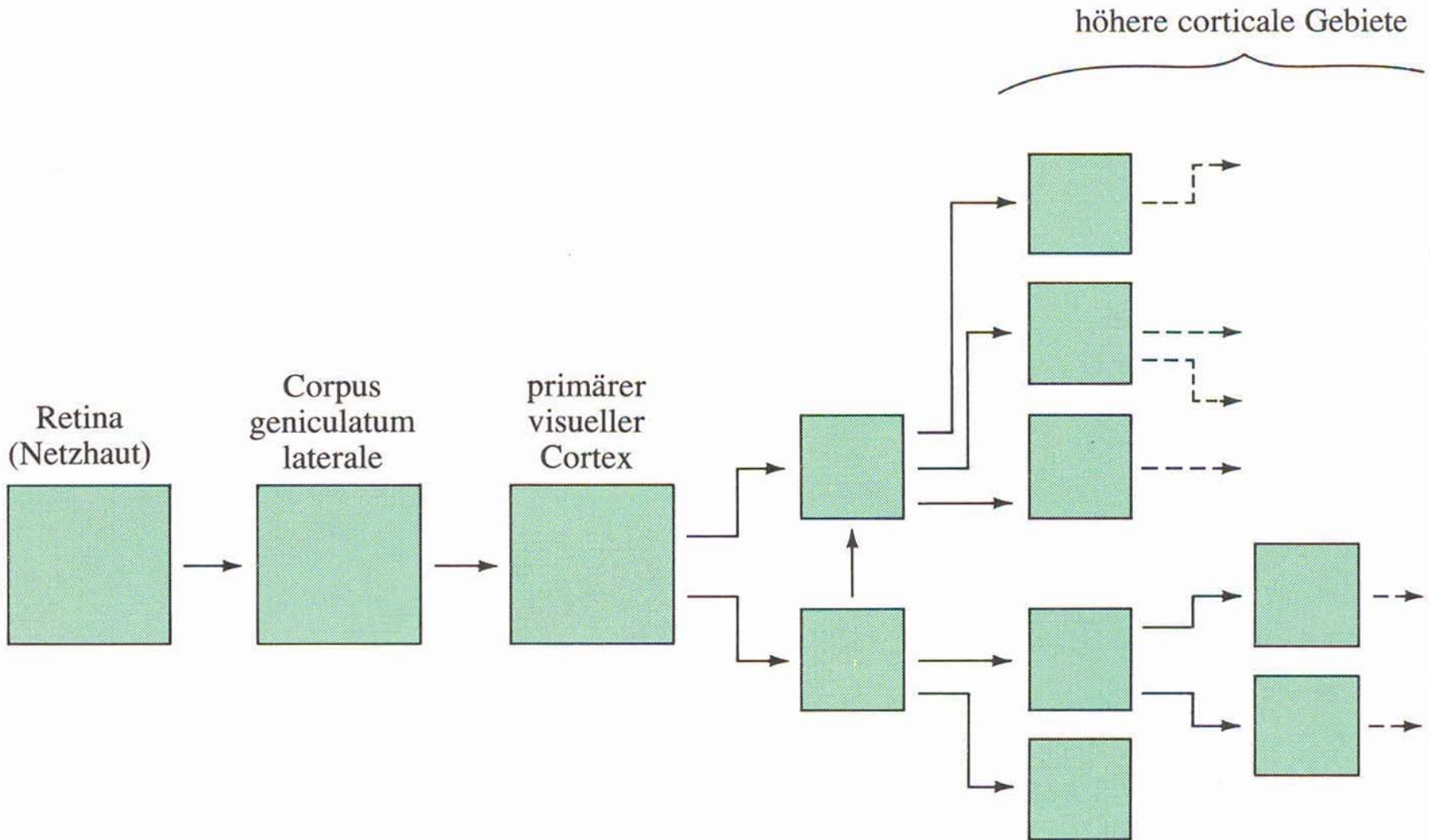
Die Großhirnrinde



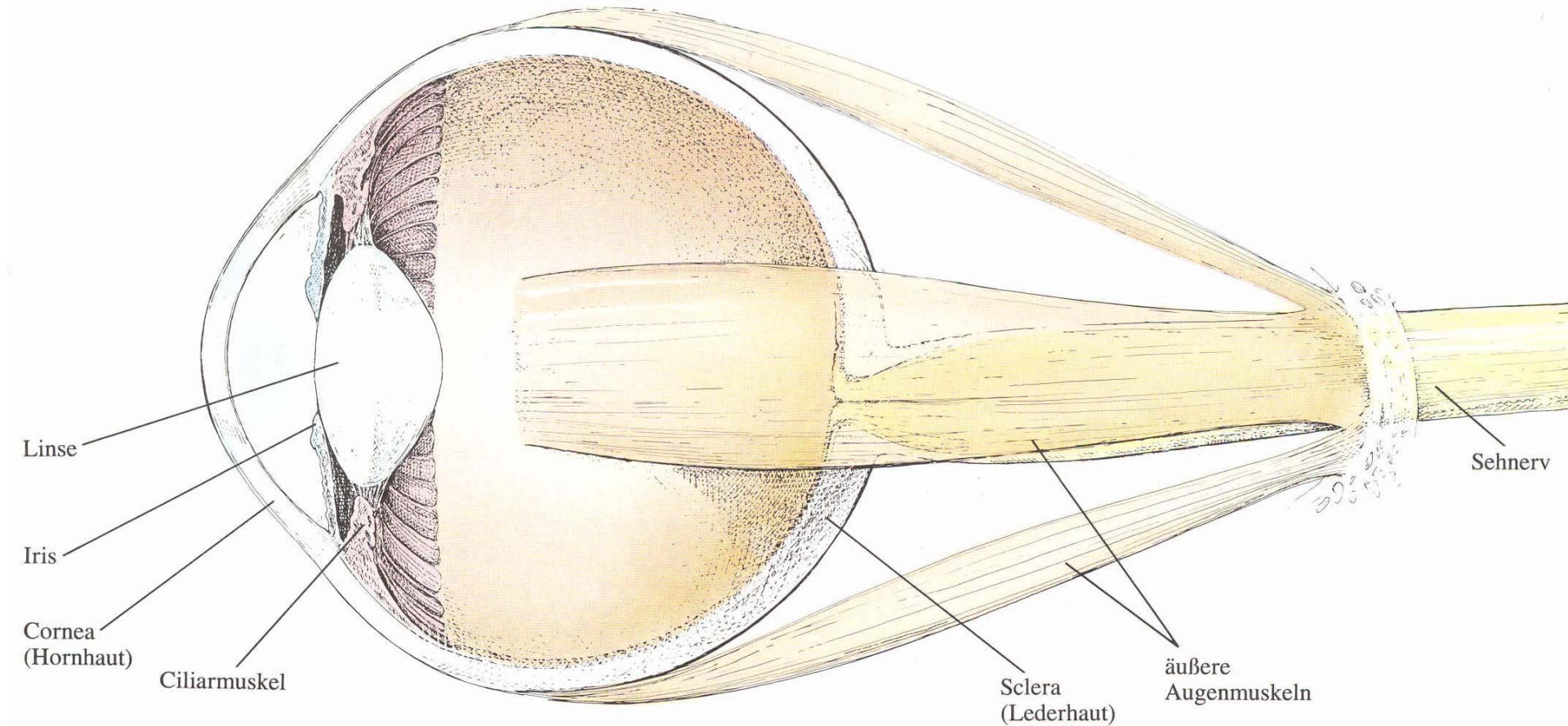
Visuelle Bahnen



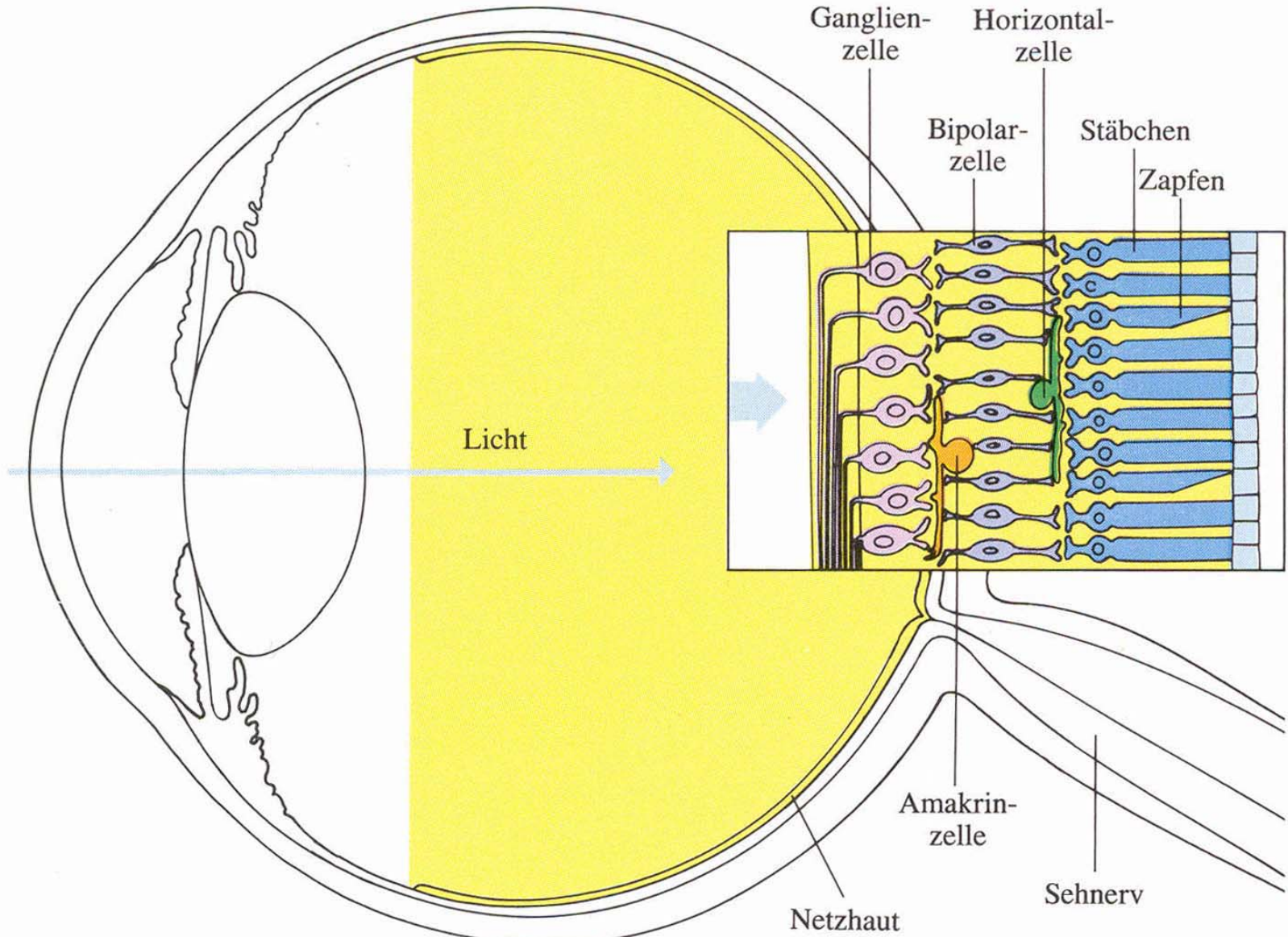
Aufbau des visuellen Systems



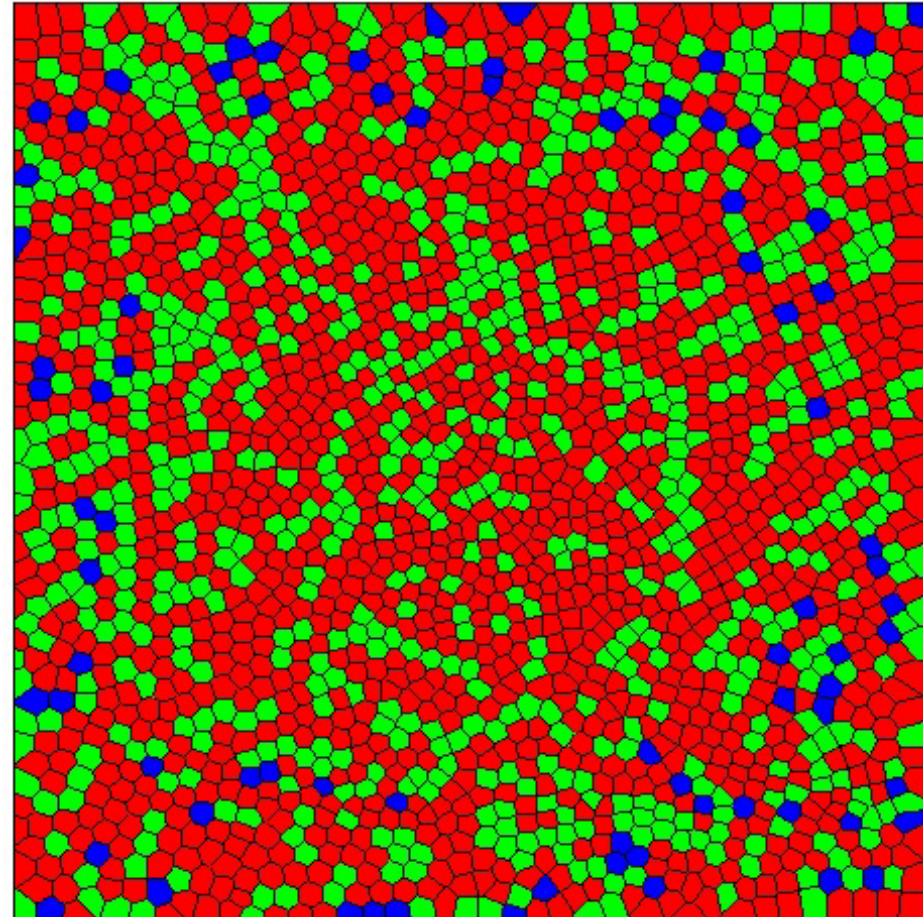
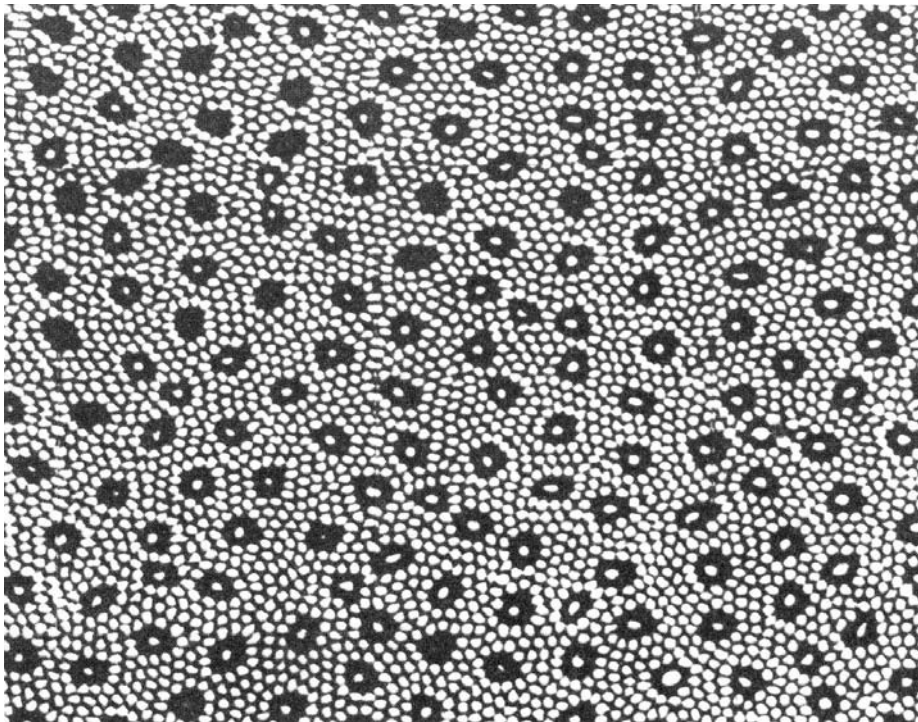
Das Auge



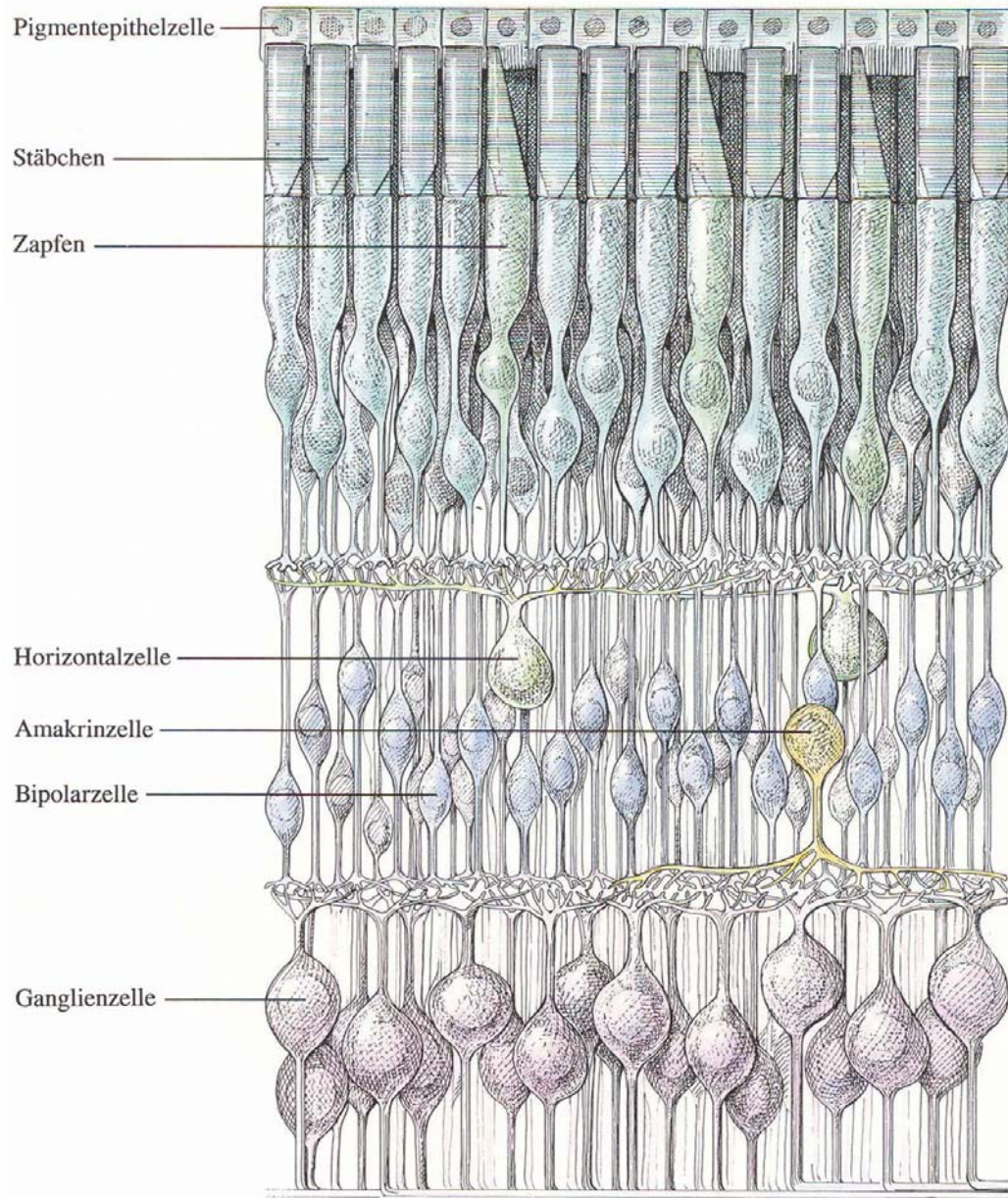
Die Netzhaut



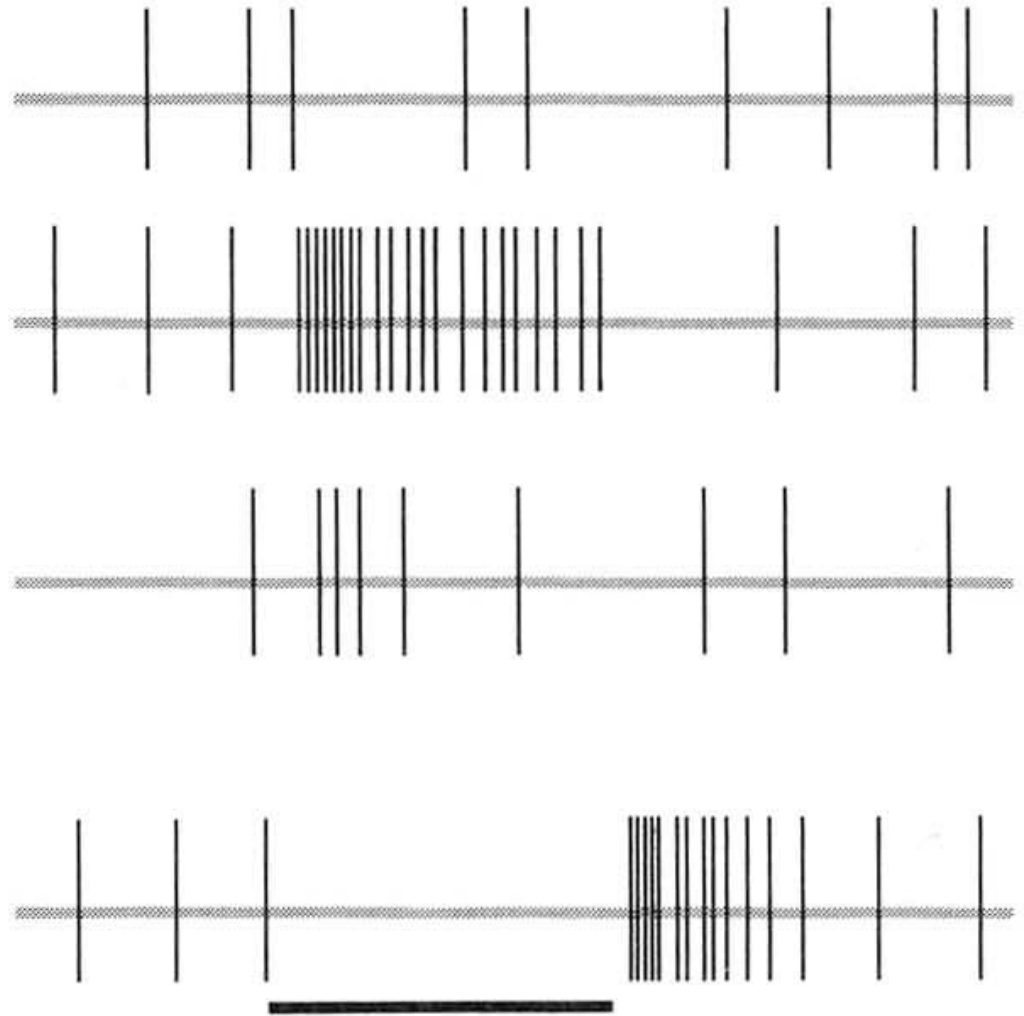
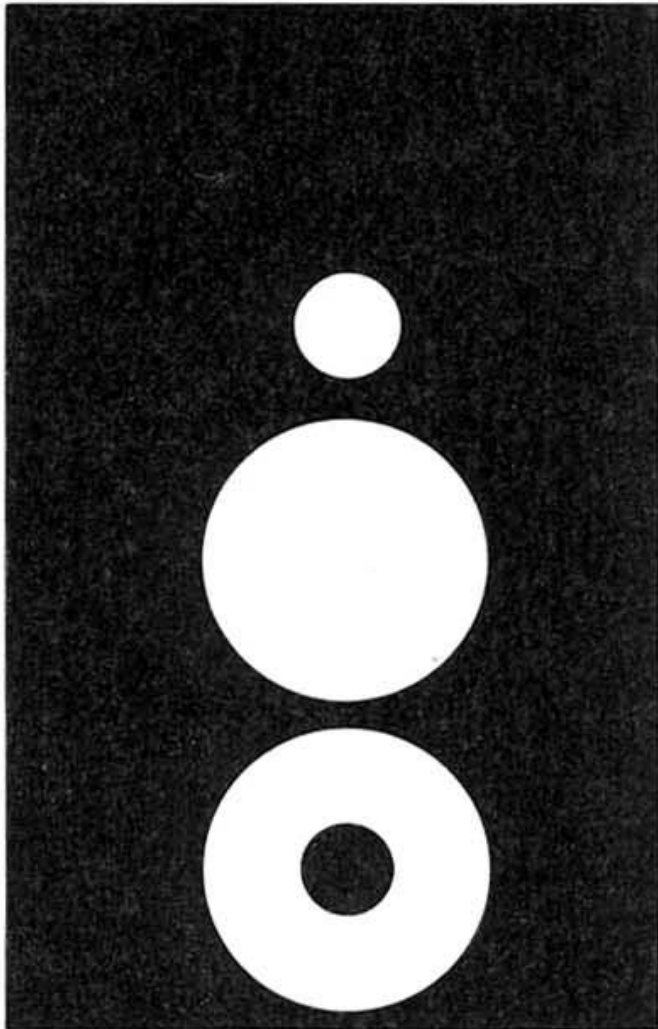
Photorezeptormosaik



Retinale Schaltkreise



Retinale Ganglienzellen

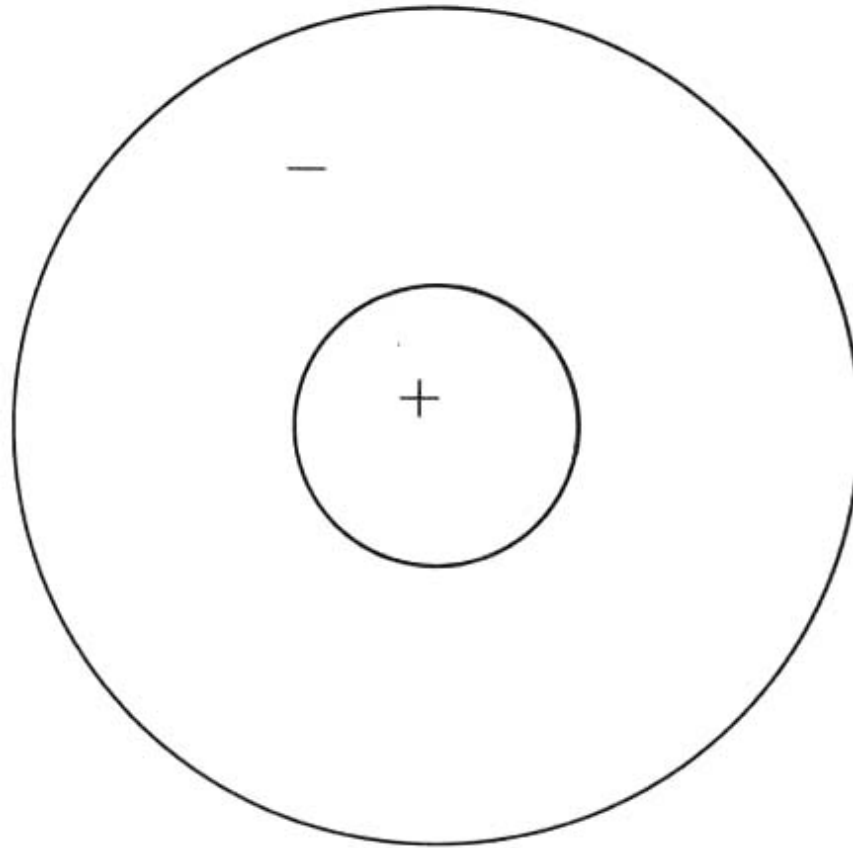


Stimulus: ein

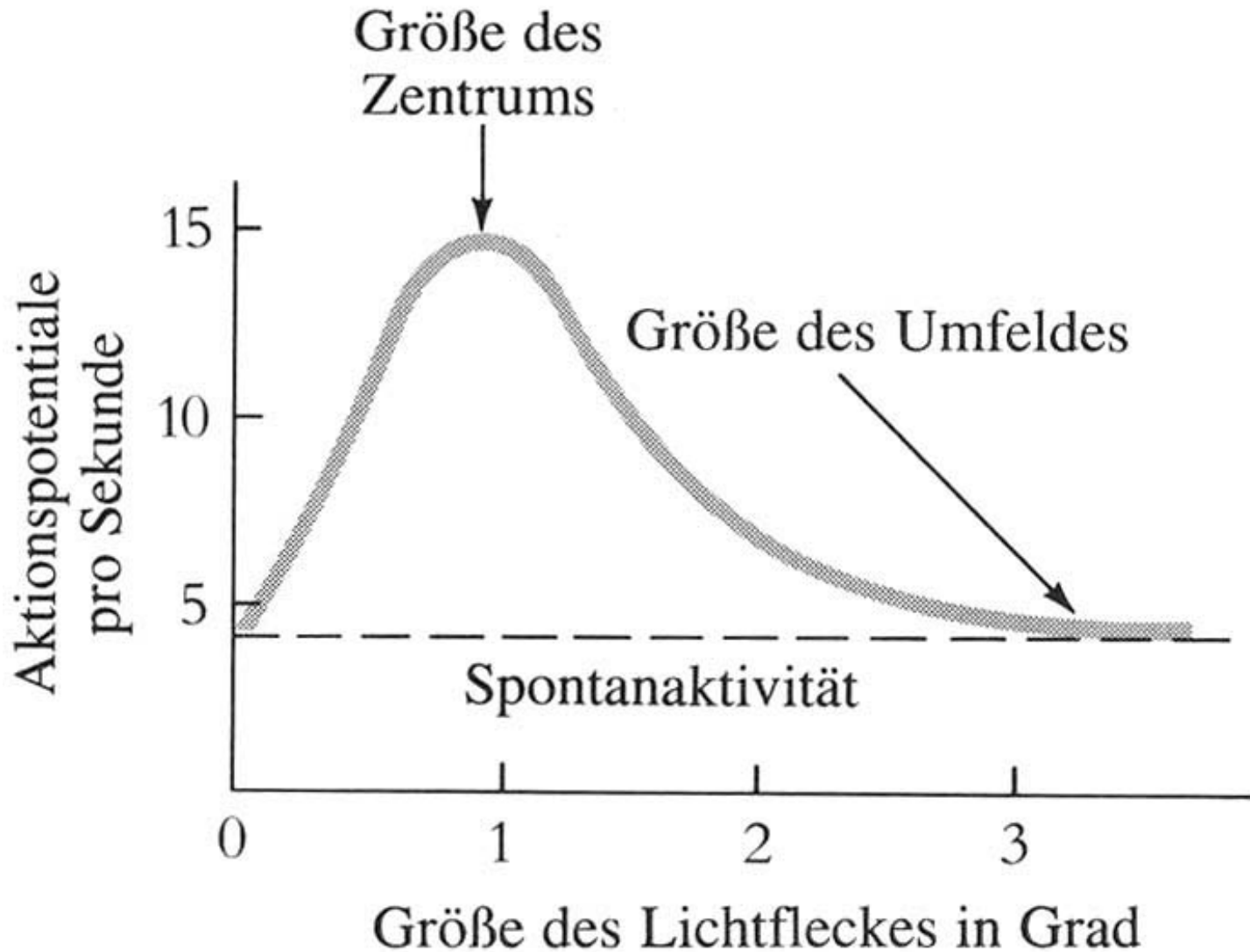
aus

Rezeptive Felder

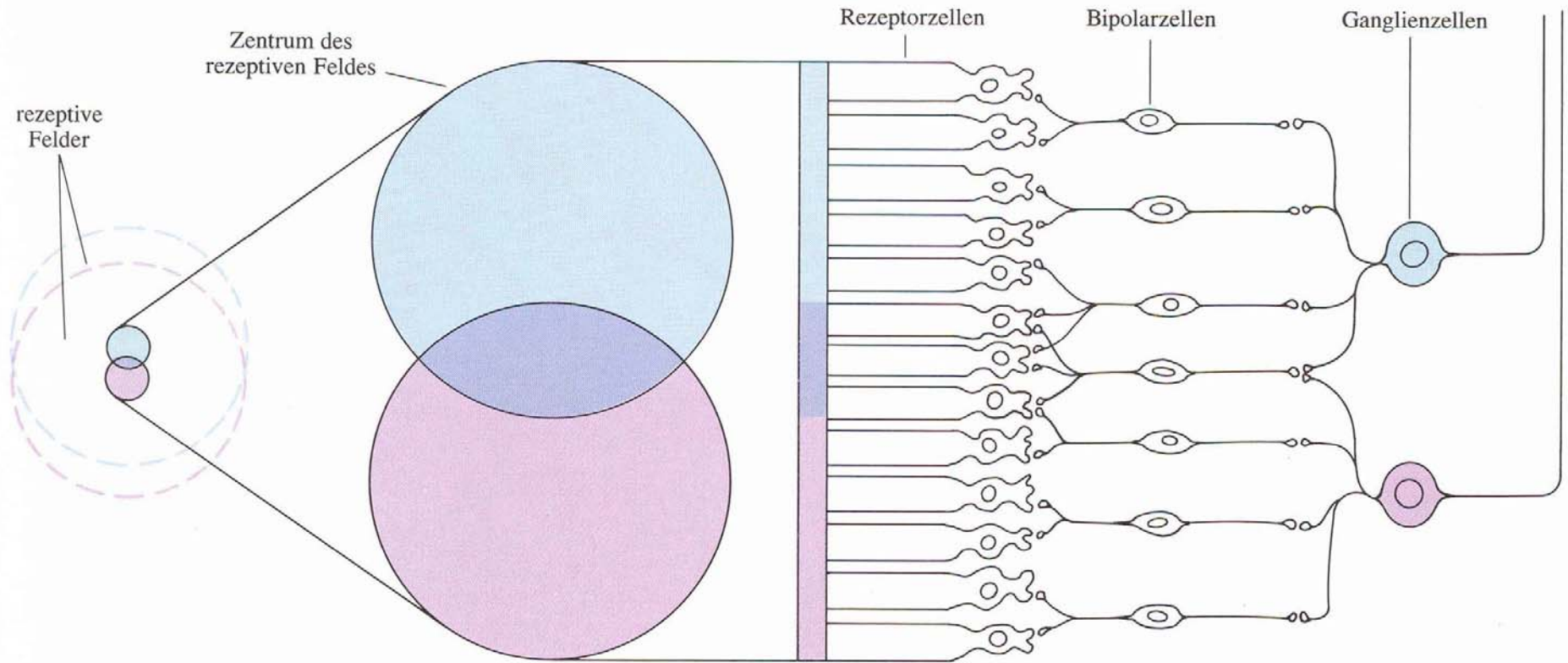
On-Zentrum



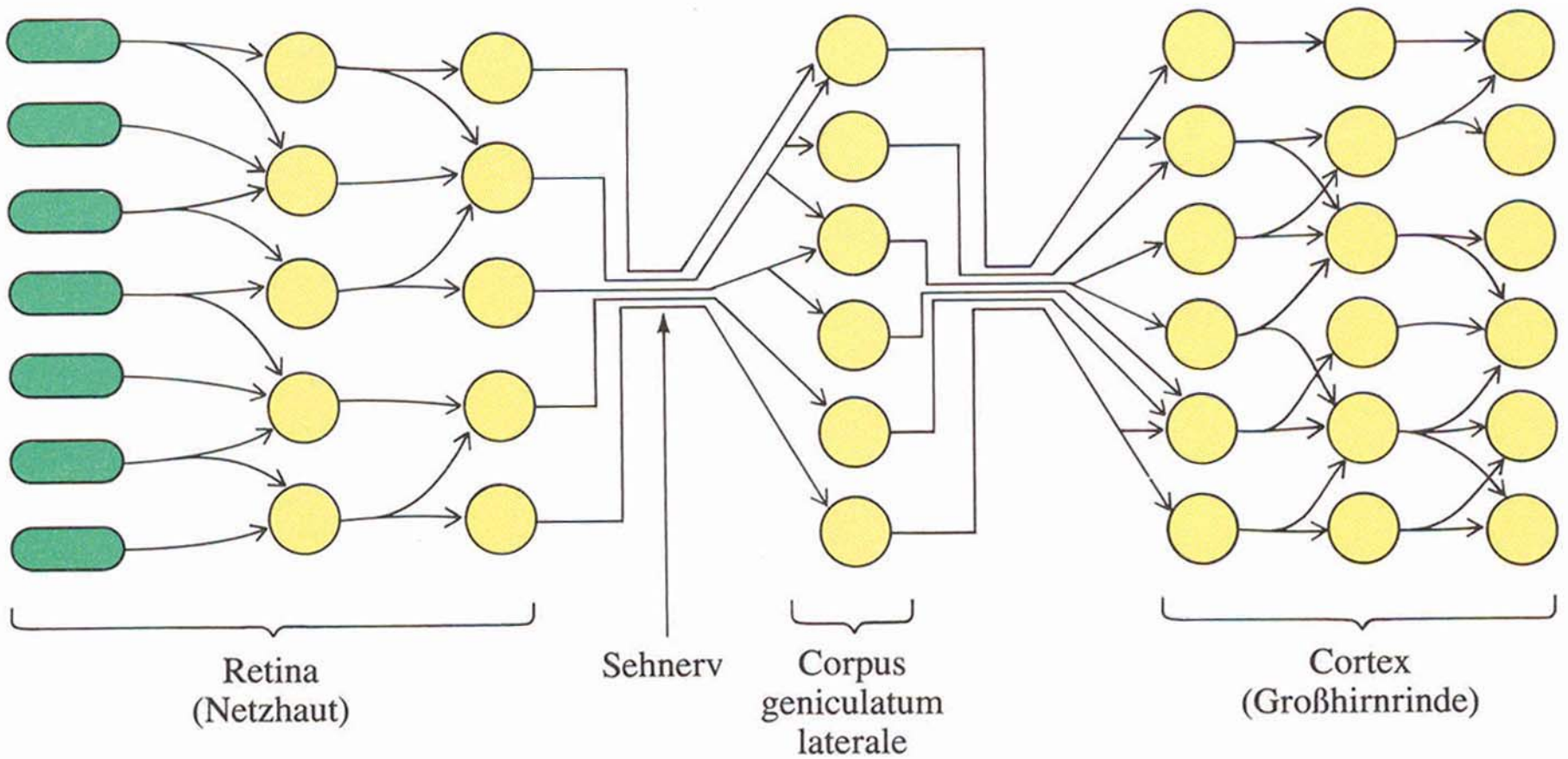
Größe der rezeptiven Felder



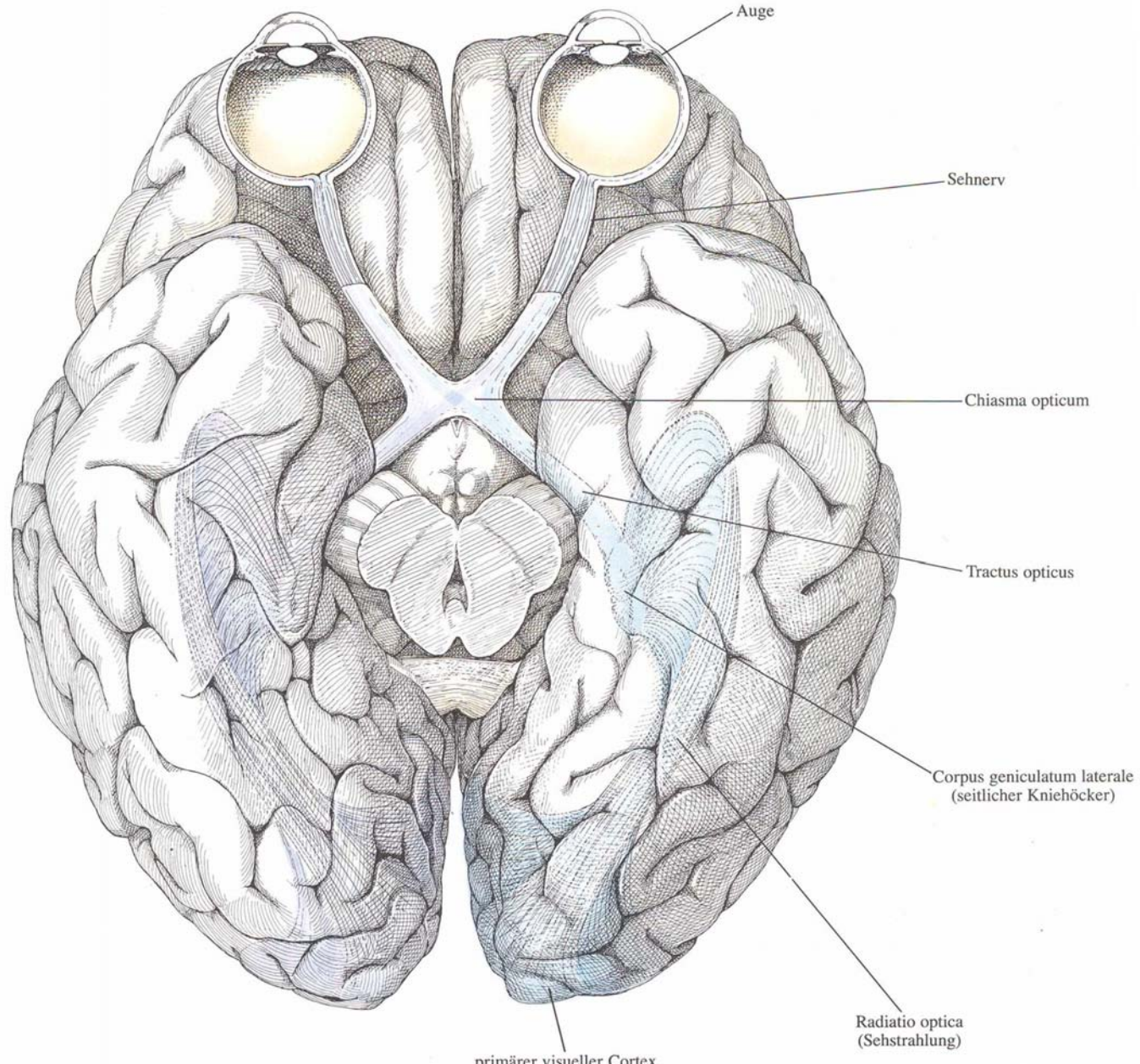
Überlappung



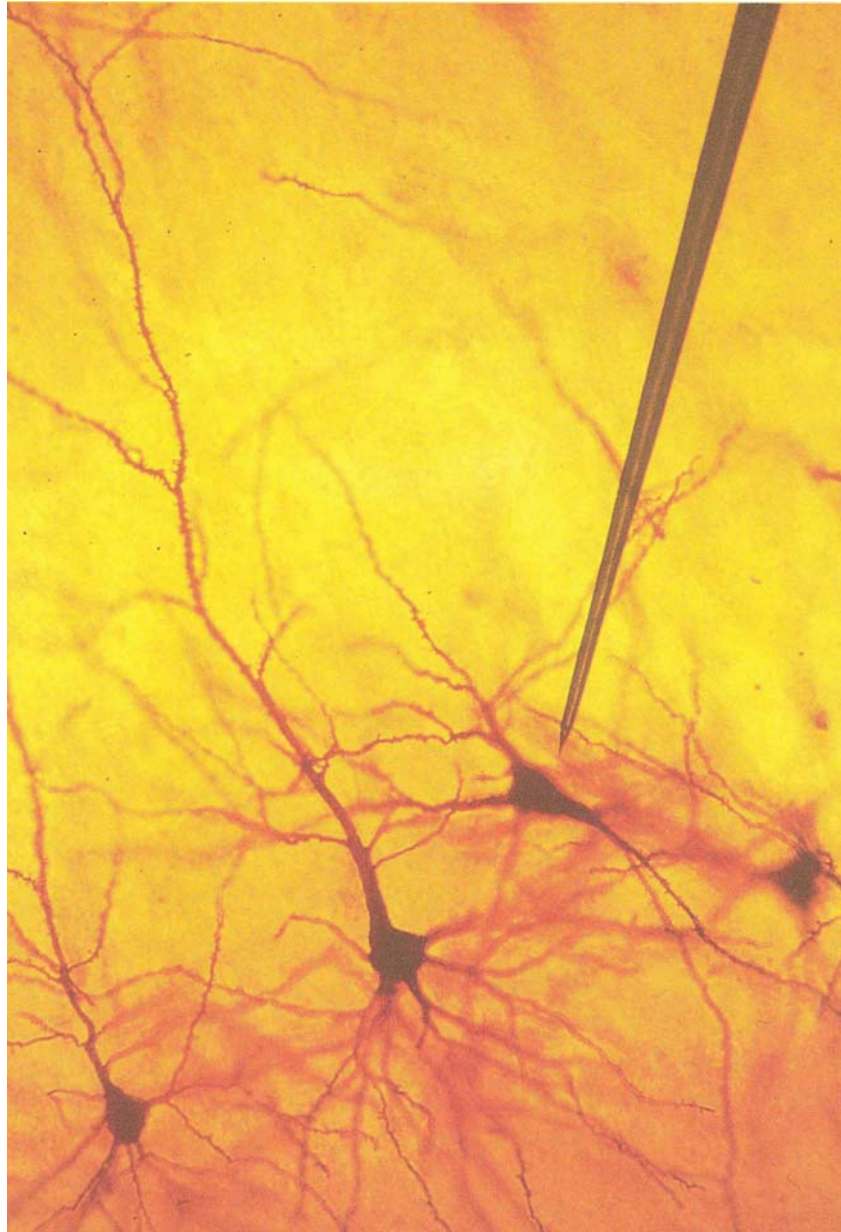
Divergenz und Konvergenz



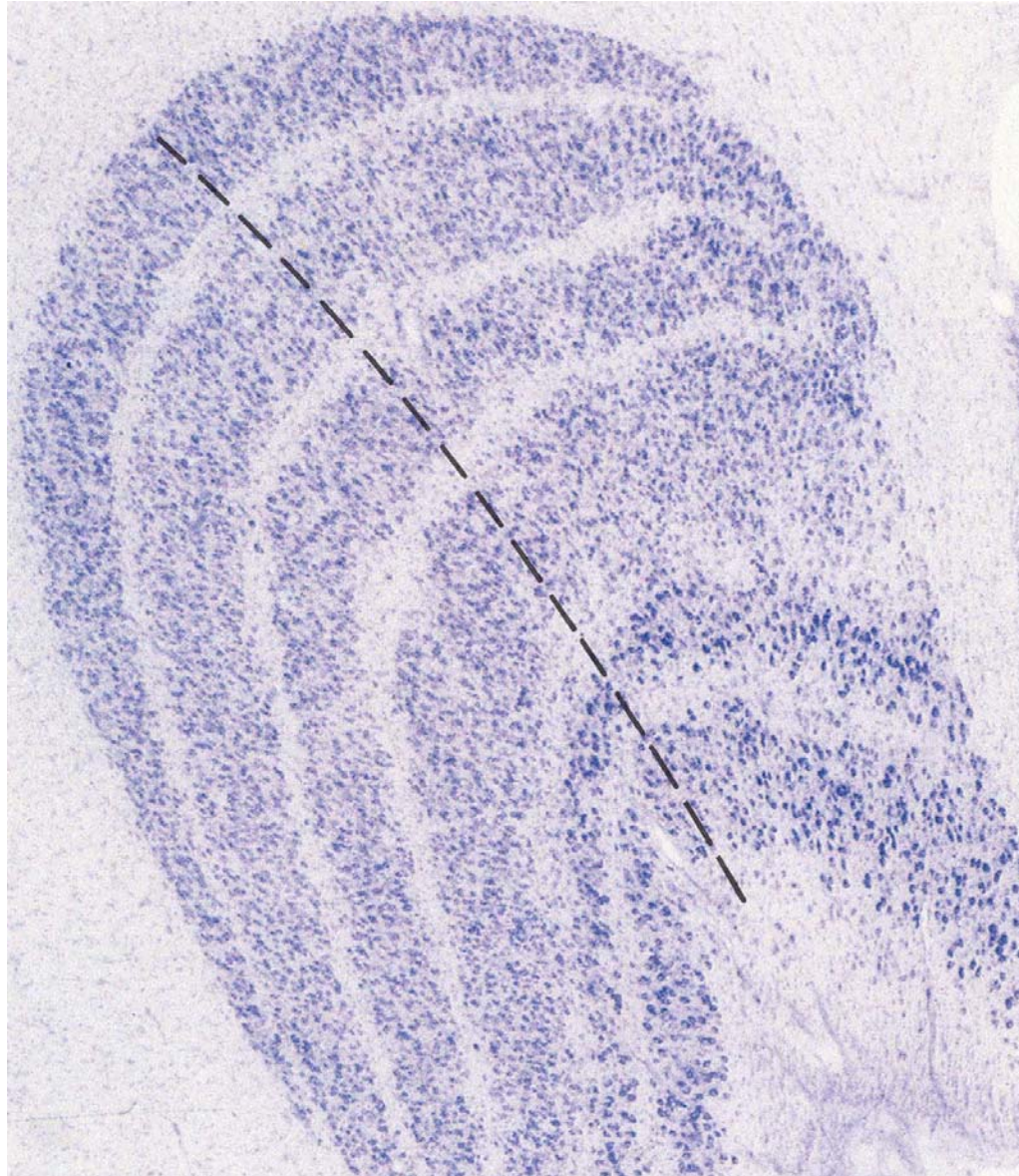
Der visuelle Kortex



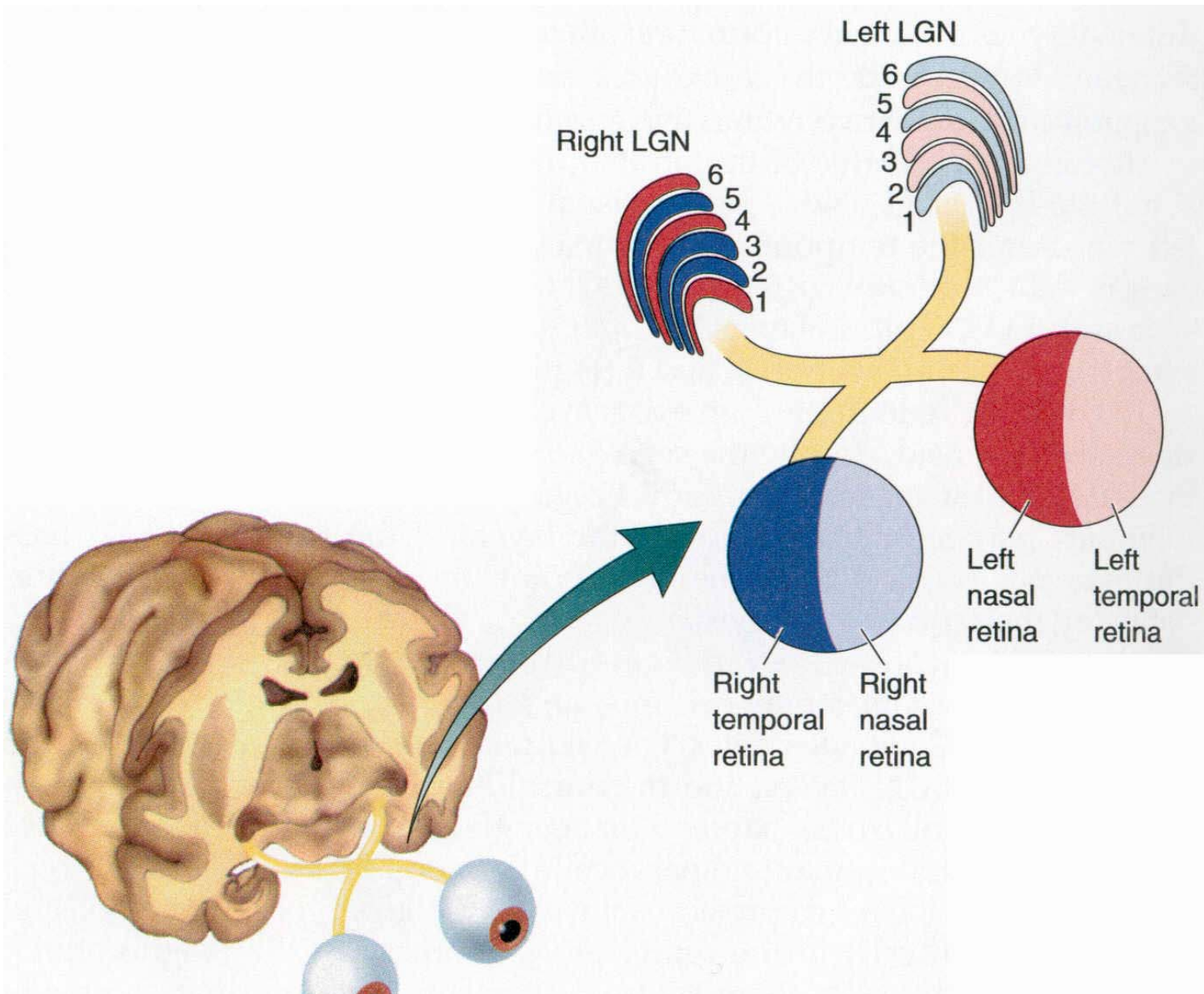
Einzelzelleleitungen



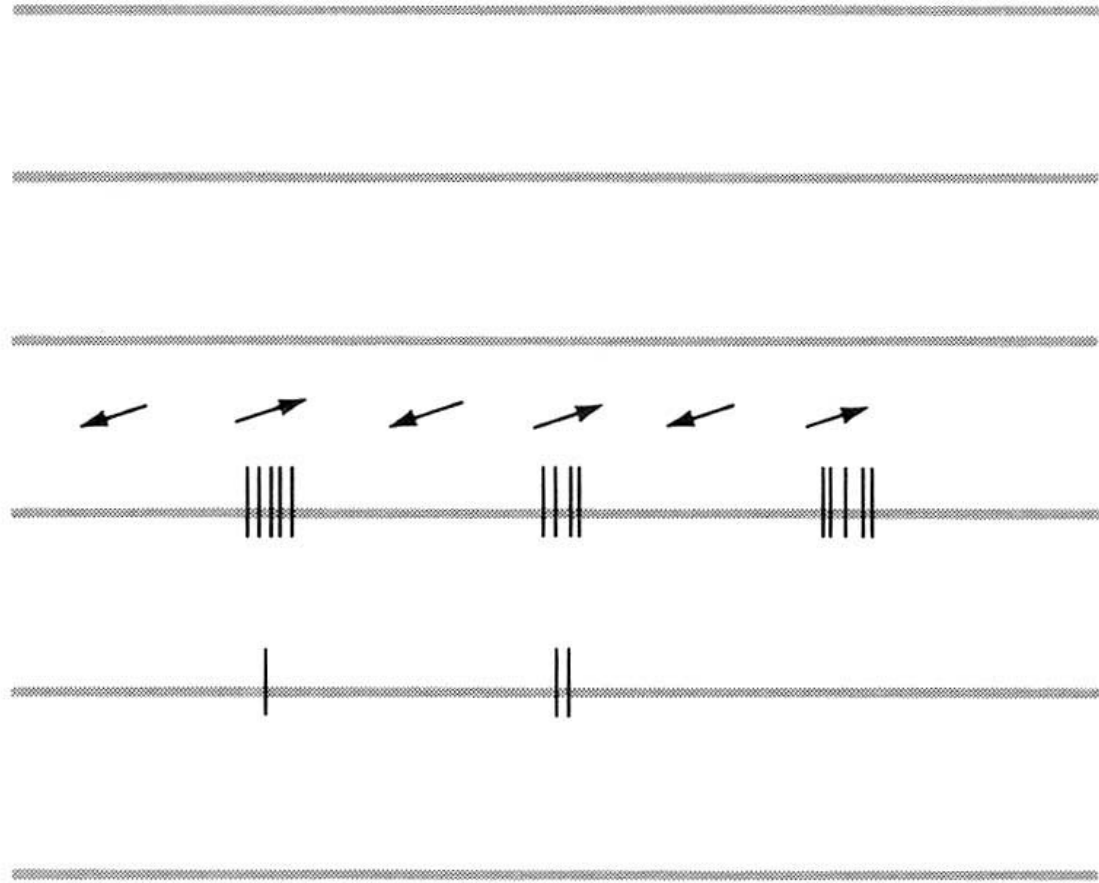
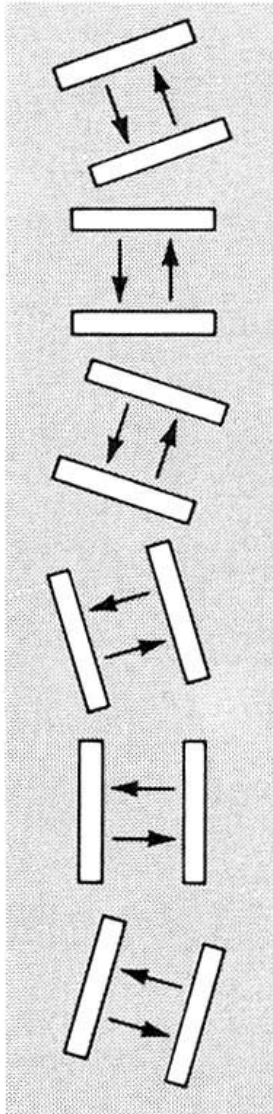
Das Corpus Geniculatum Laterale



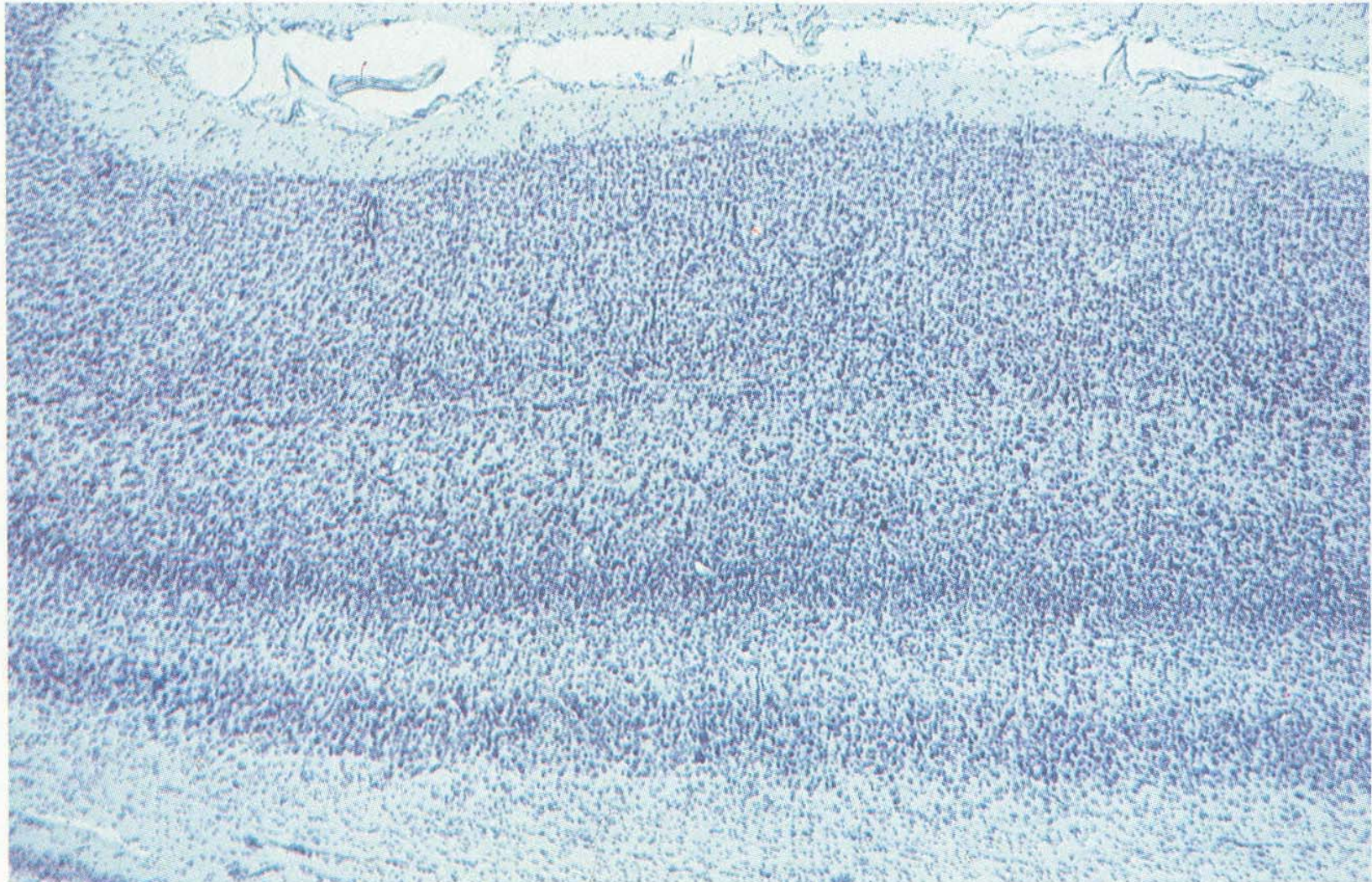
Retino-thalamische Projektion



Der primäre visuelle Kortex



Schichtung des visuellen Kortex



1

2

3

4A

4B

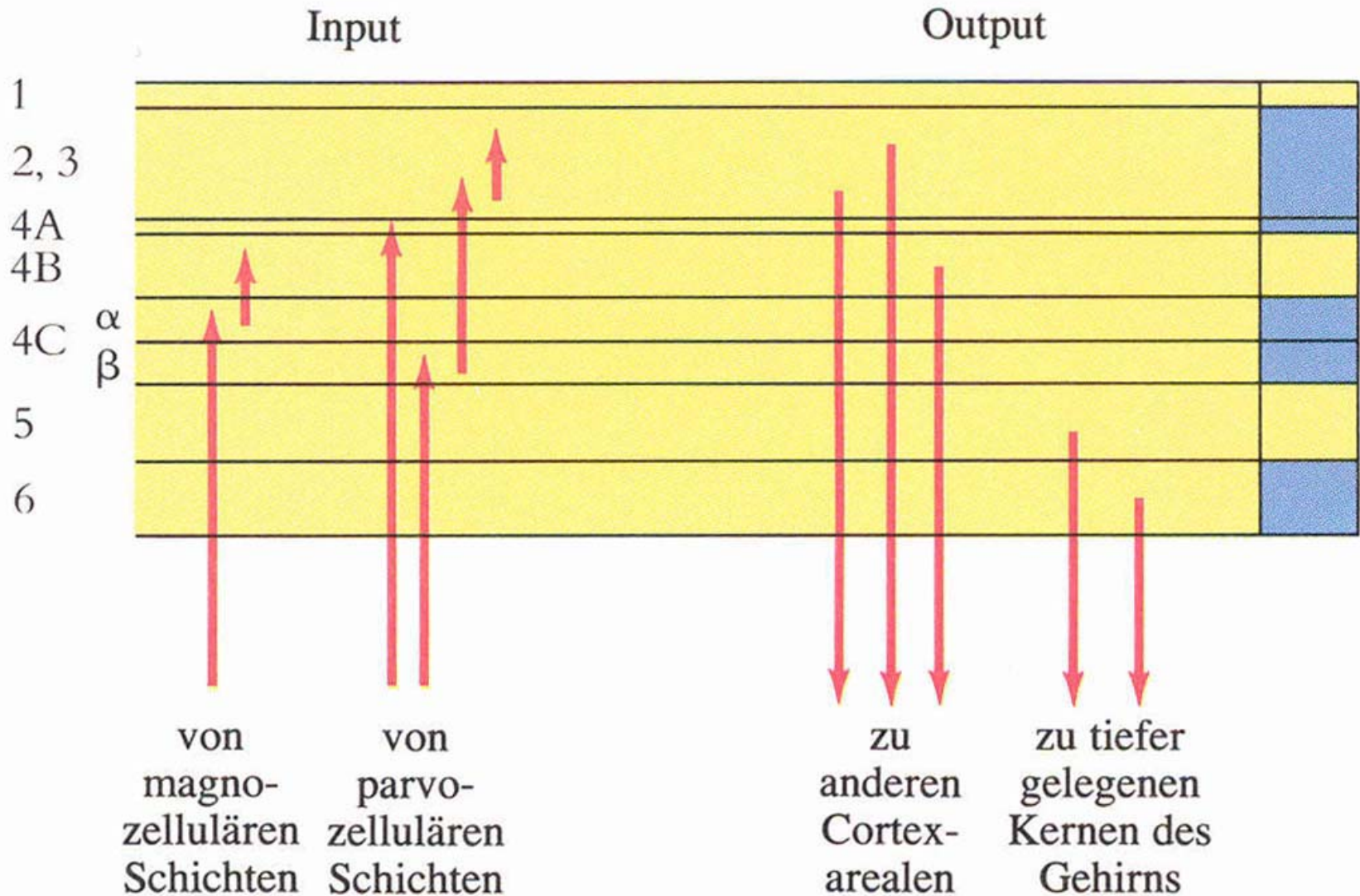
4C

5

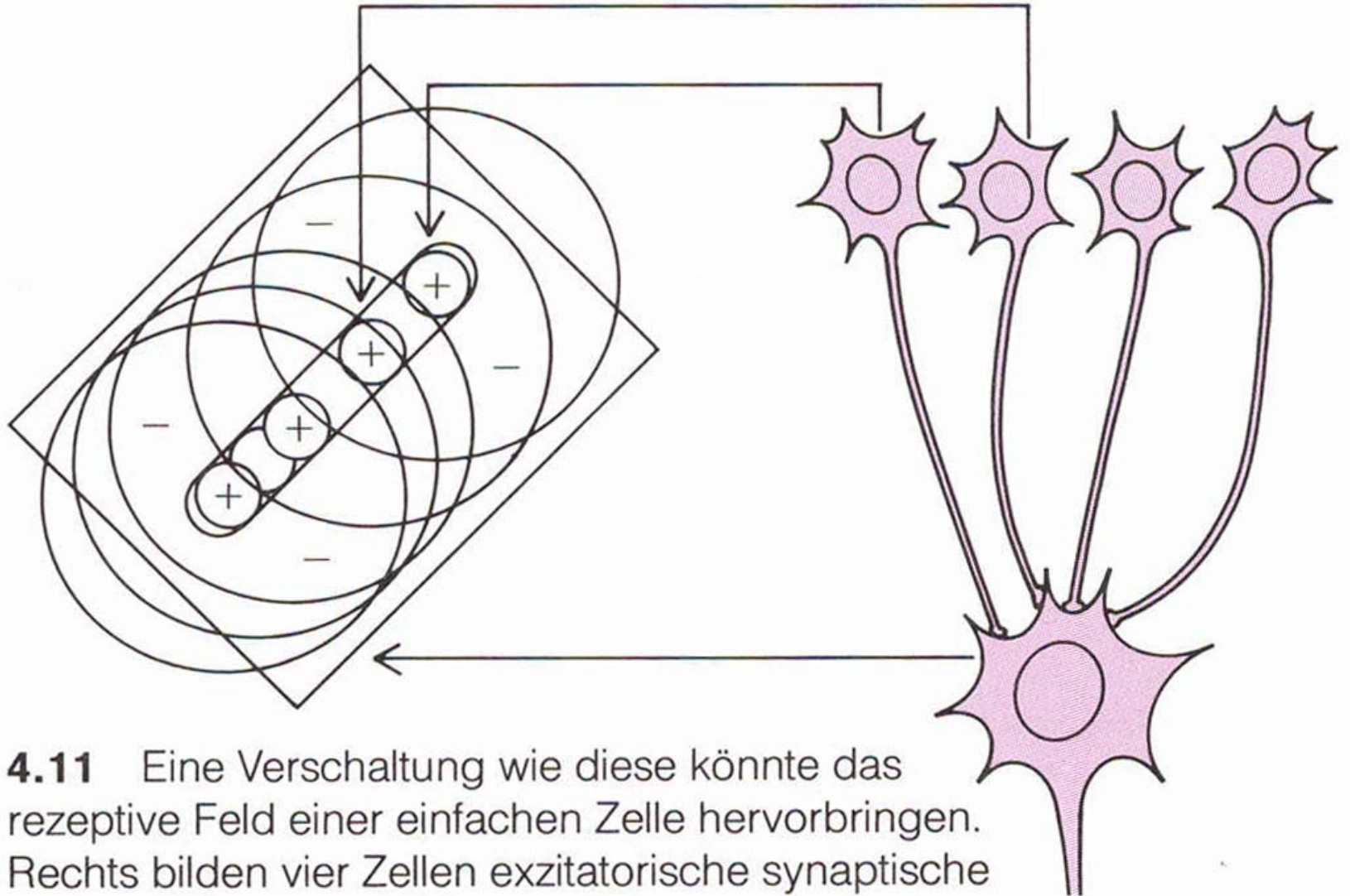
6

—| 1 Millimeter

Funktionelle Schichtung

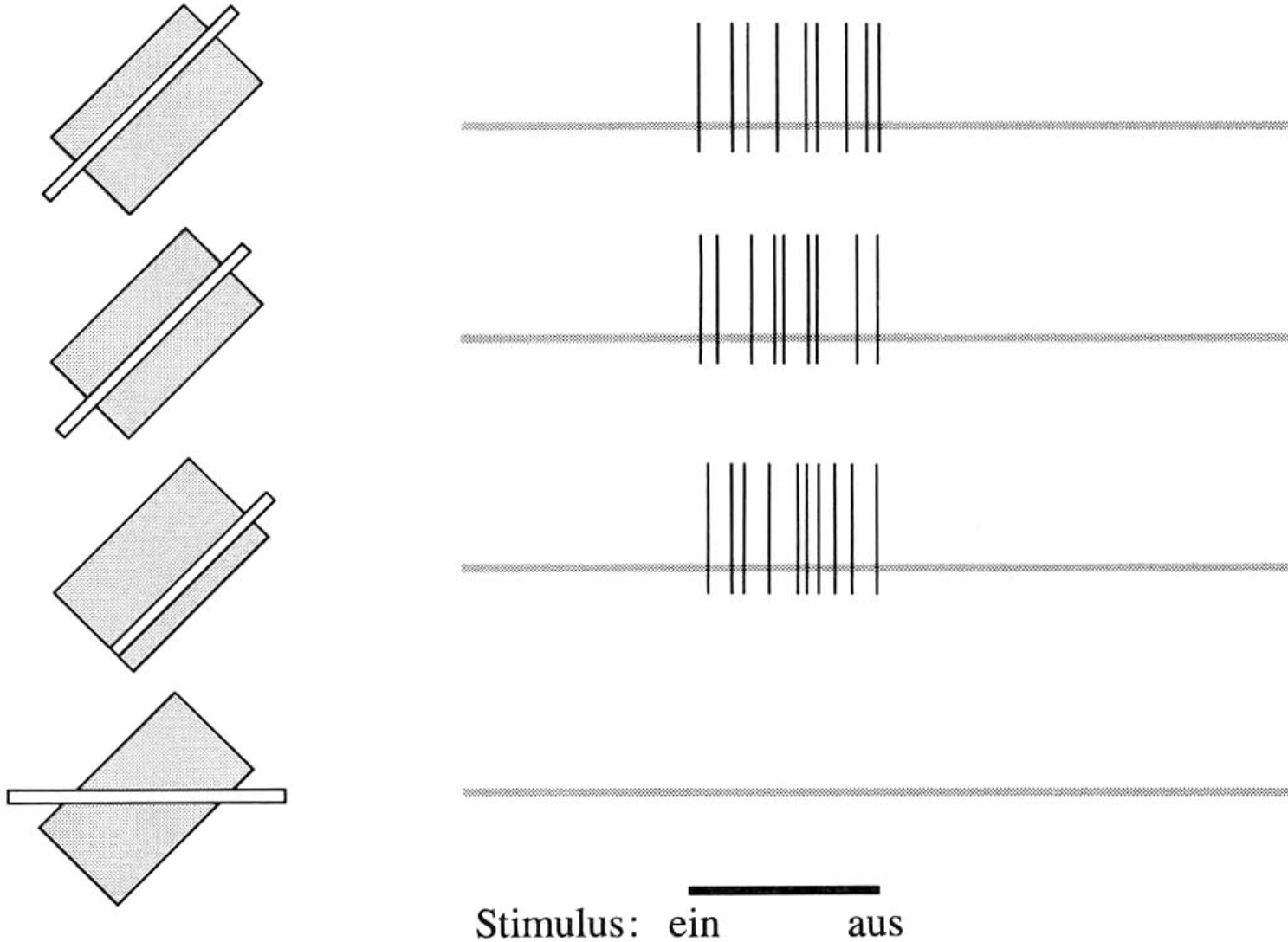


Einfache Zellen

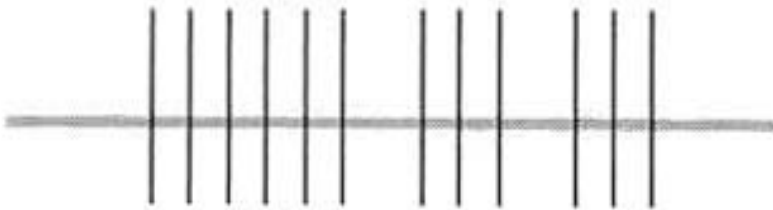
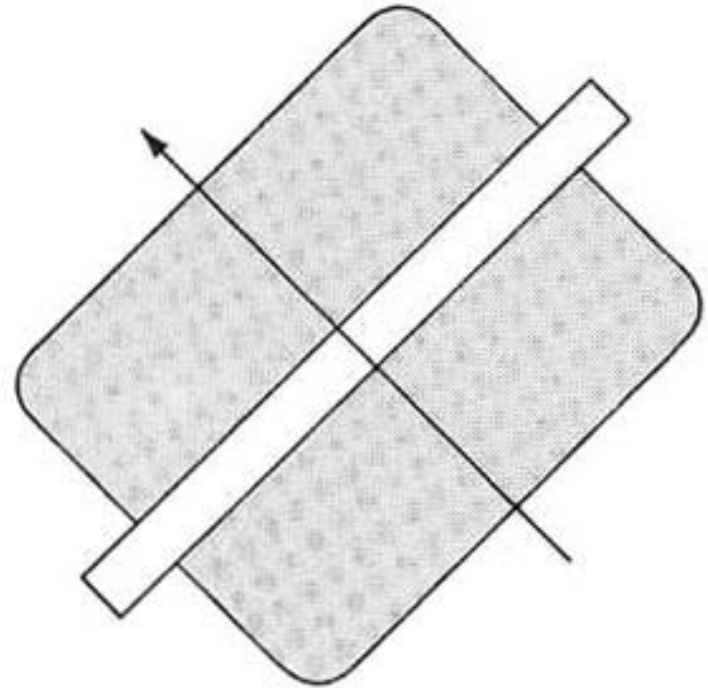
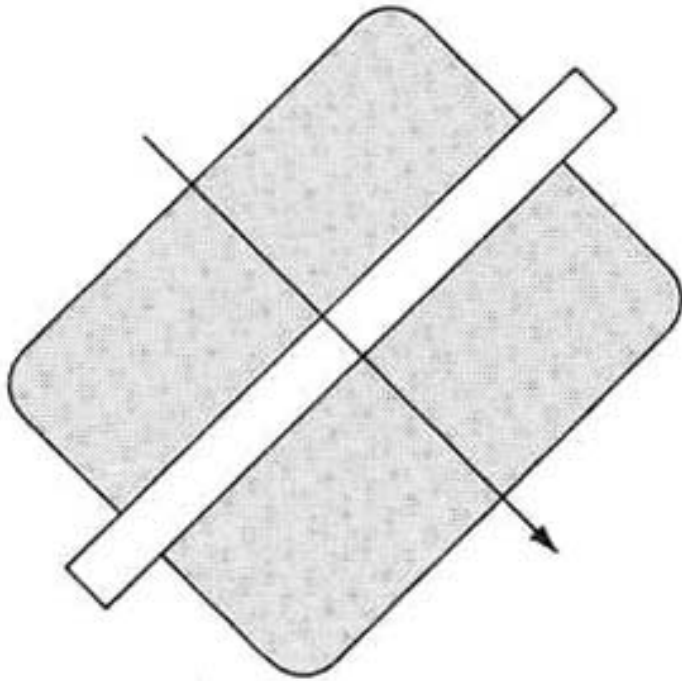


4.11 Eine Verschaltung wie diese könnte das rezeptive Feld einer einfachen Zelle hervorbringen. Rechts bilden vier Zellen exzitatorische synaptische

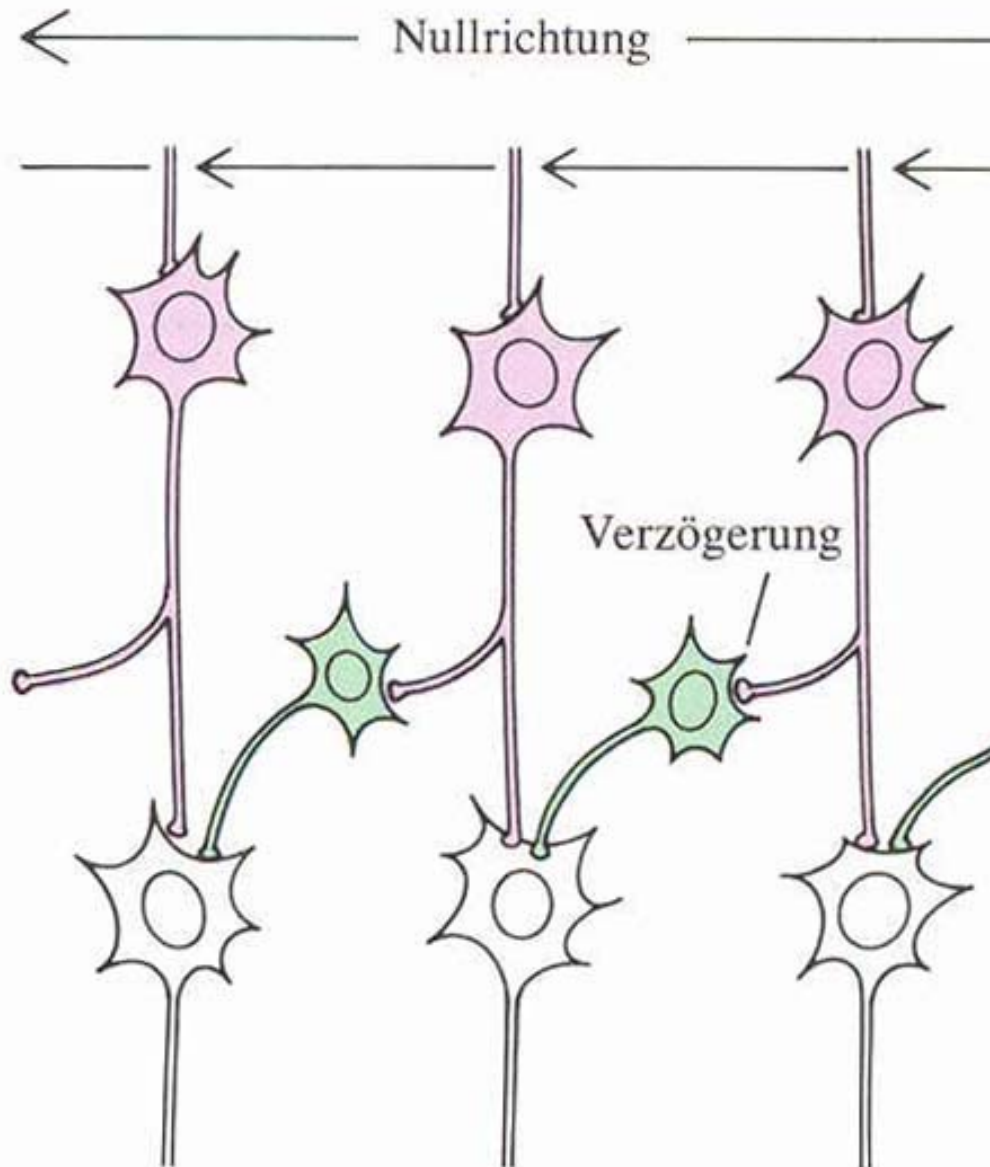
Komplexe Zellen



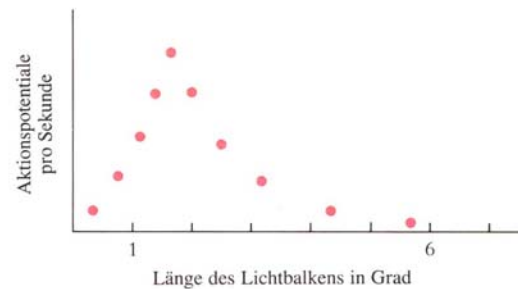
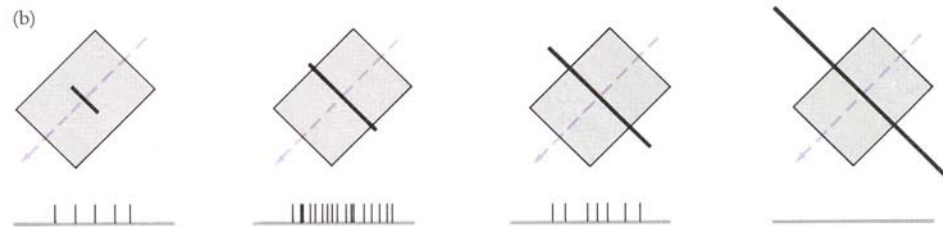
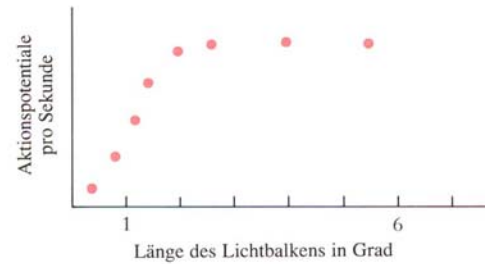
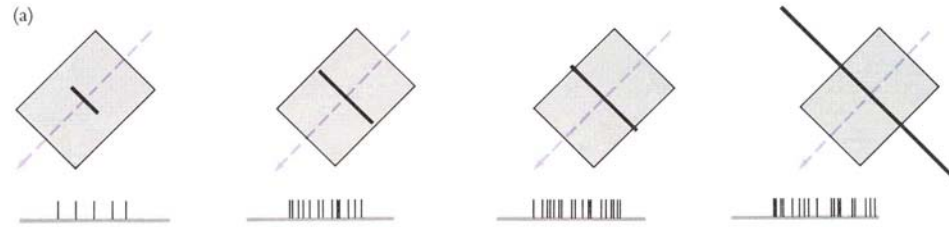
Richtungsempfindlichkeit



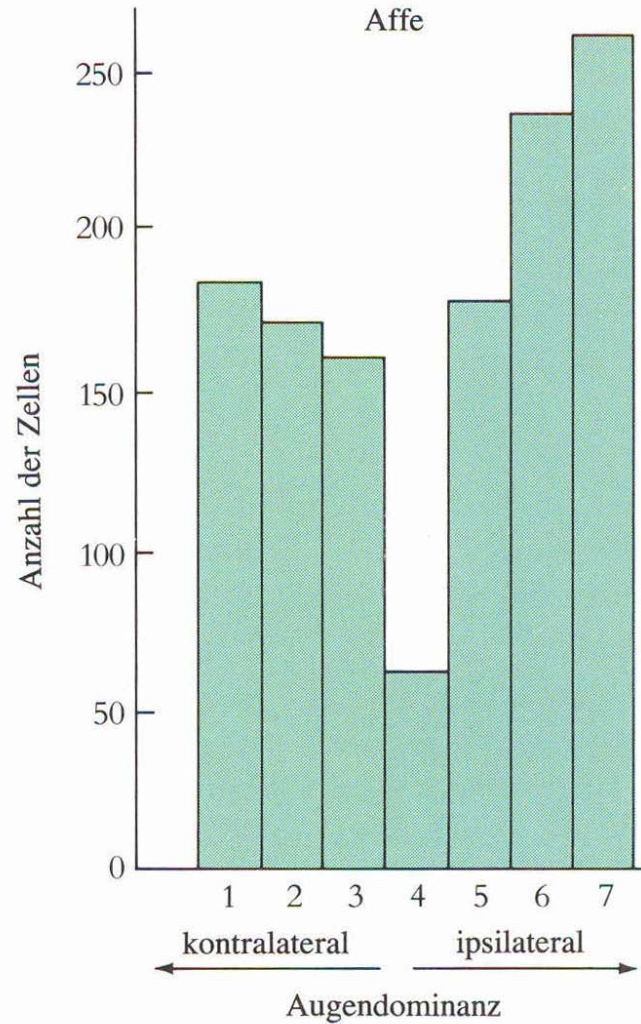
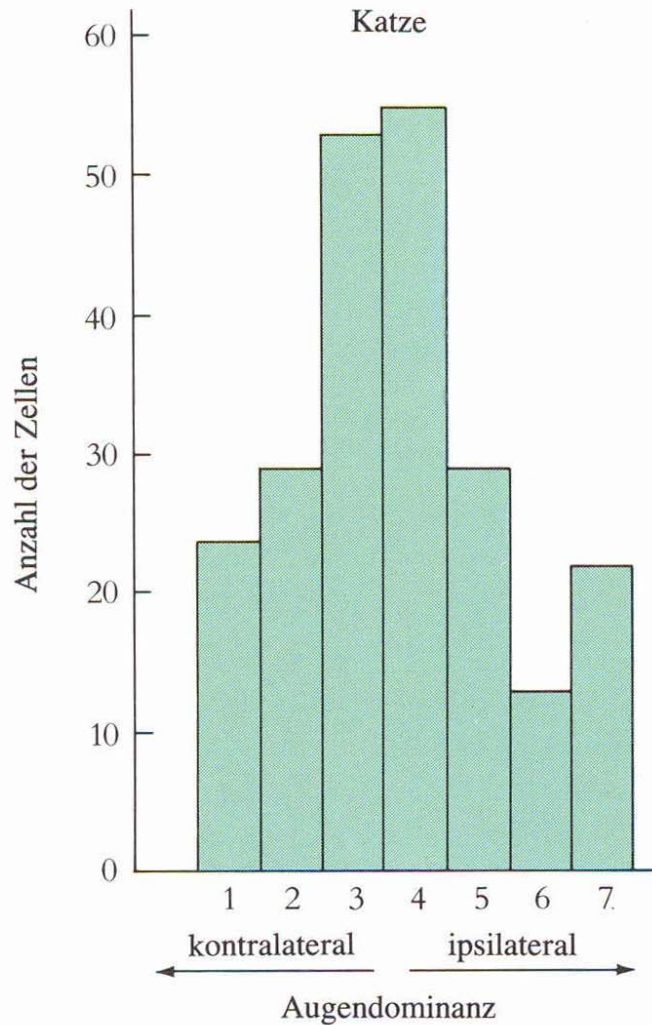
Bewegungsdetektor



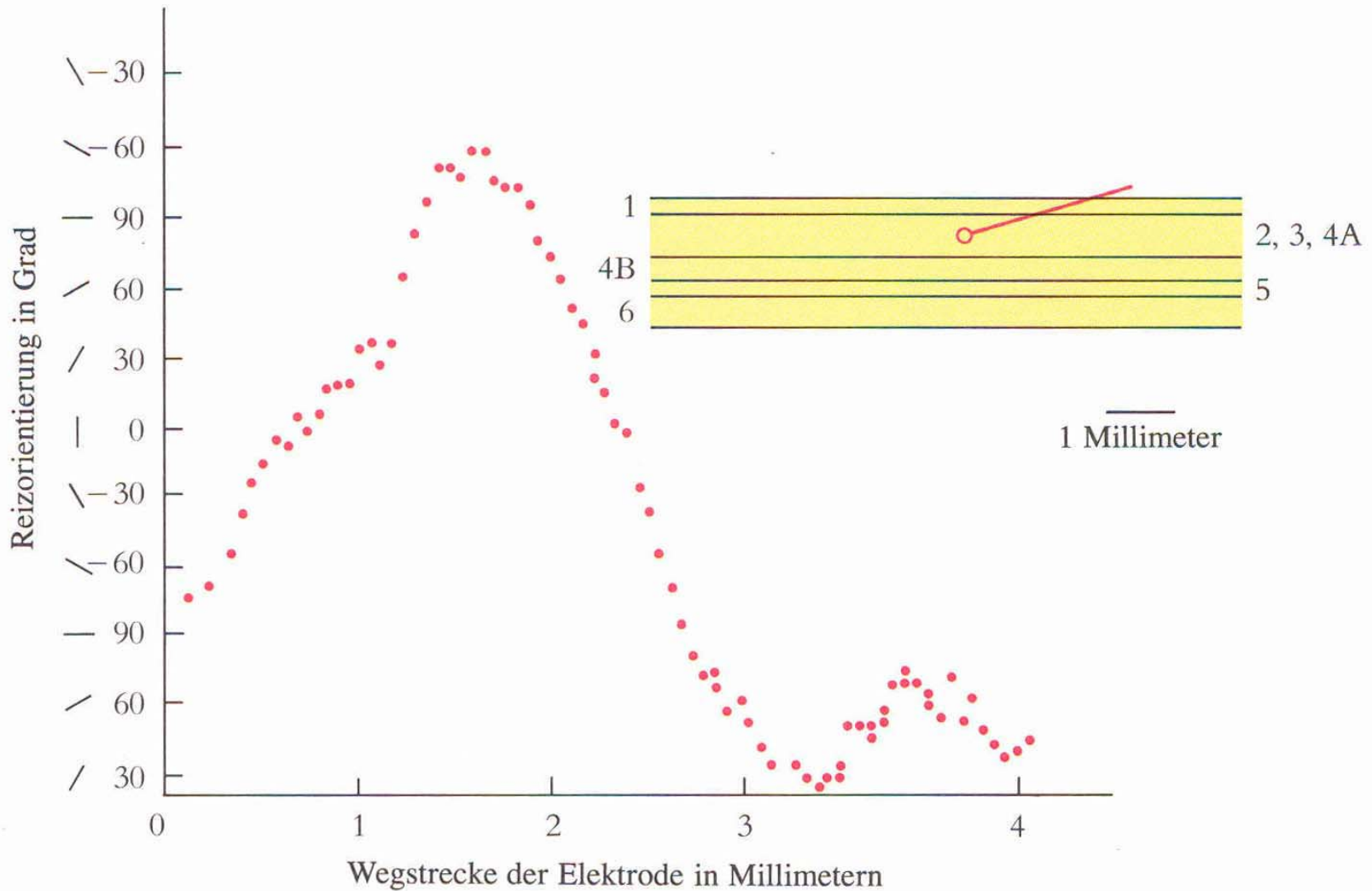
Hyperkomplexe Zellen



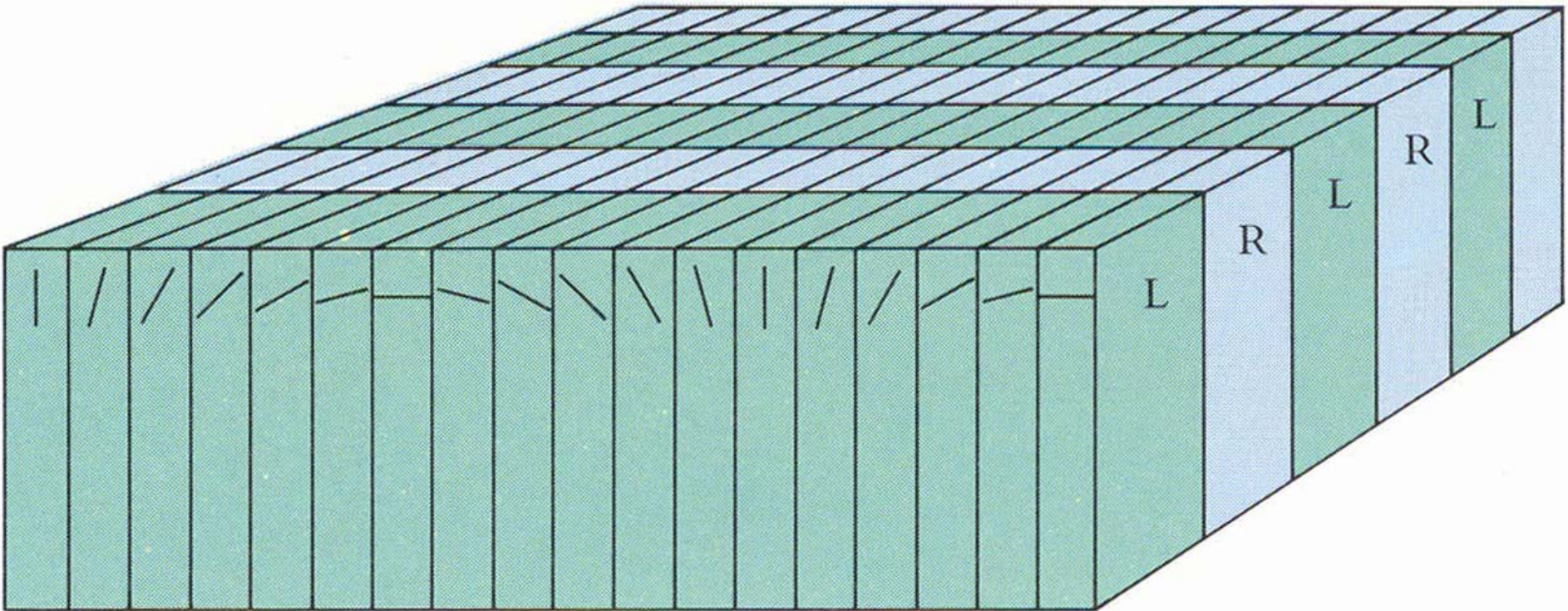
Okulare Dominanz



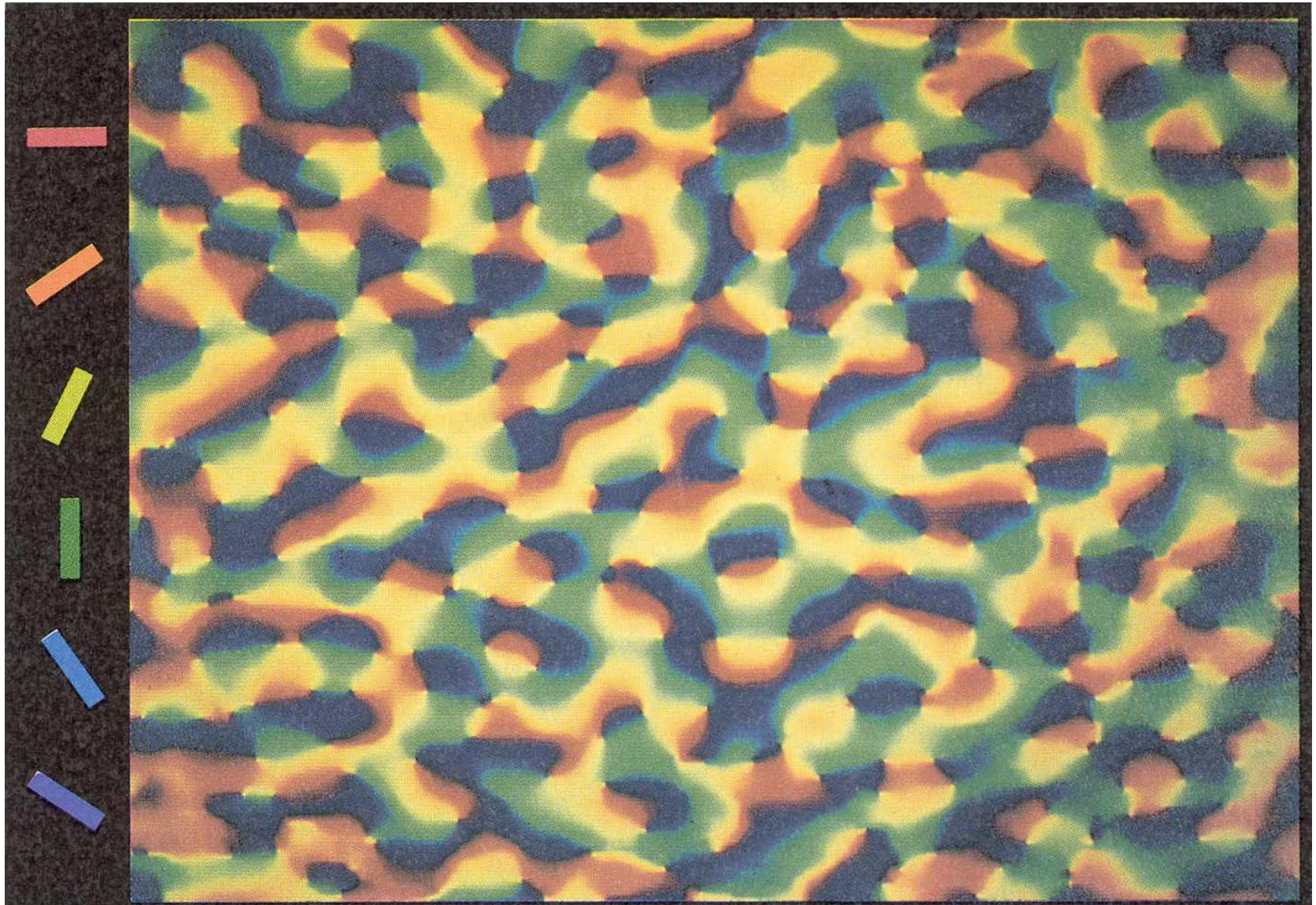
Orientierungskolumnen



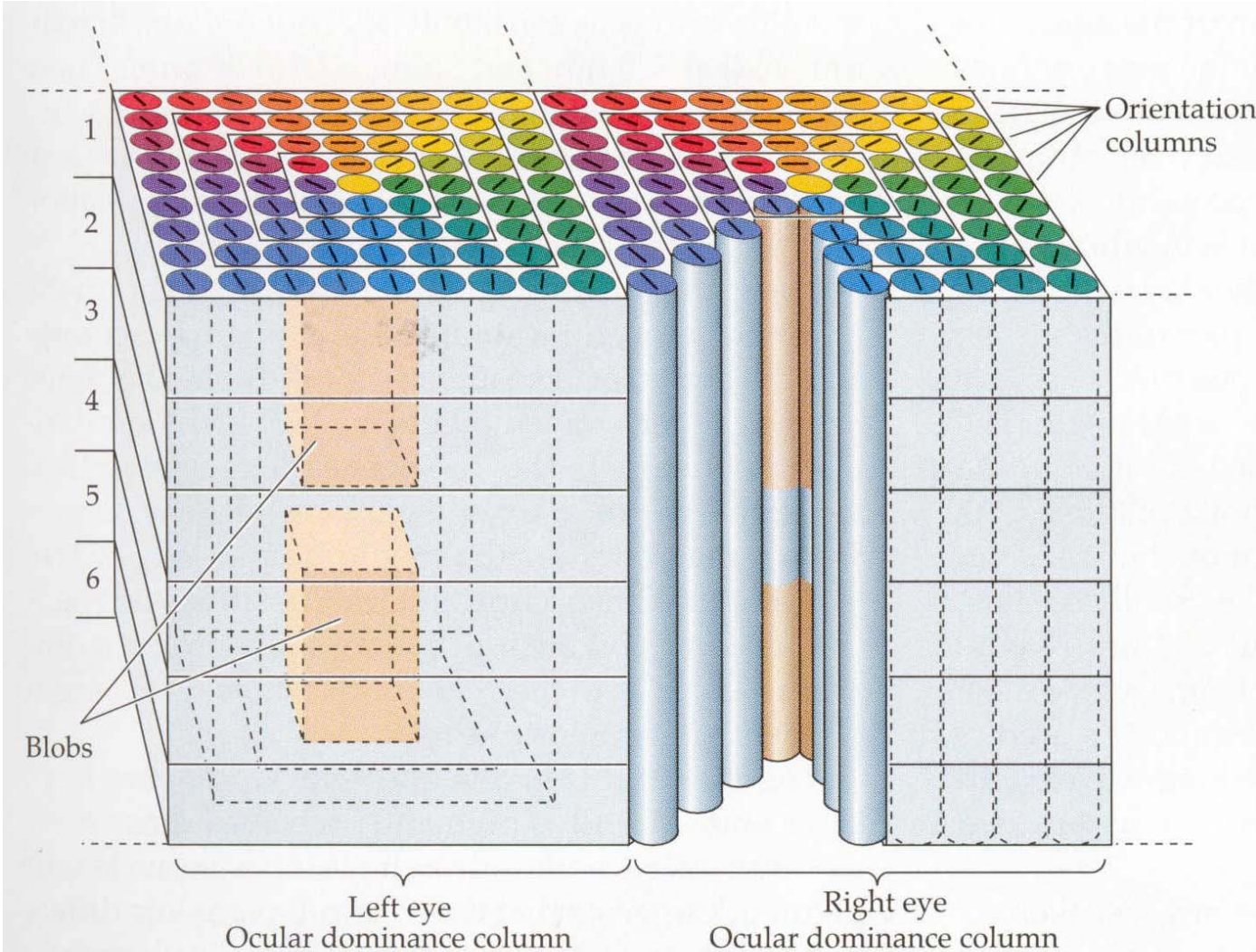
Das Eiswürfelmodell



Optische Bildgebung



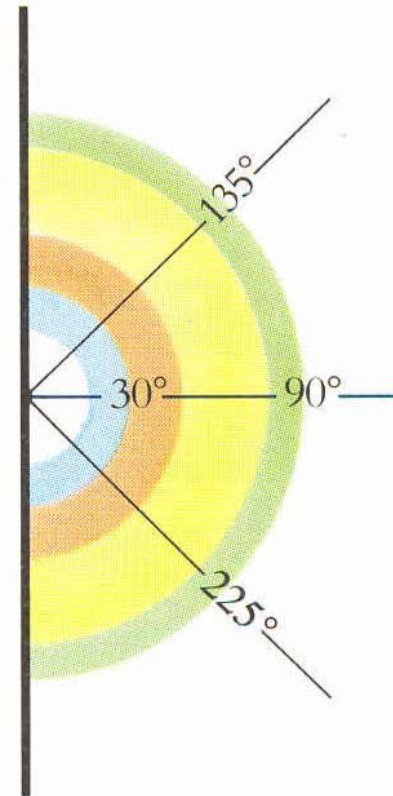
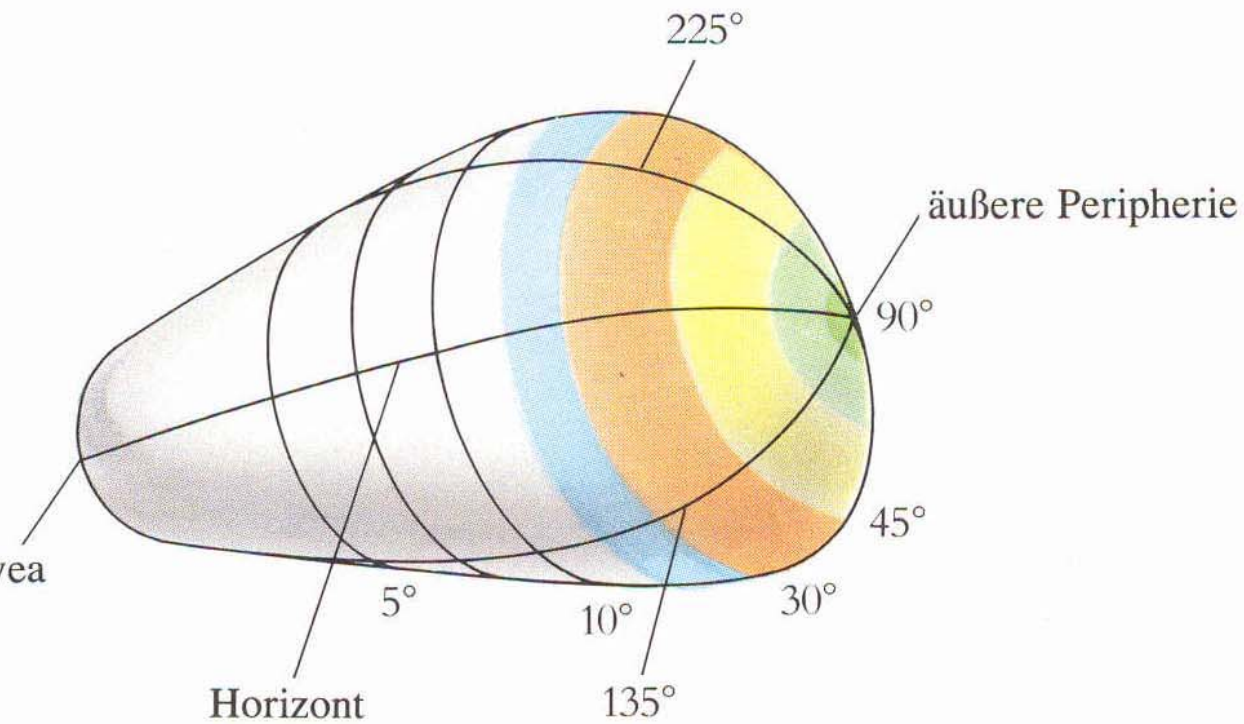
Erweitertes Modell



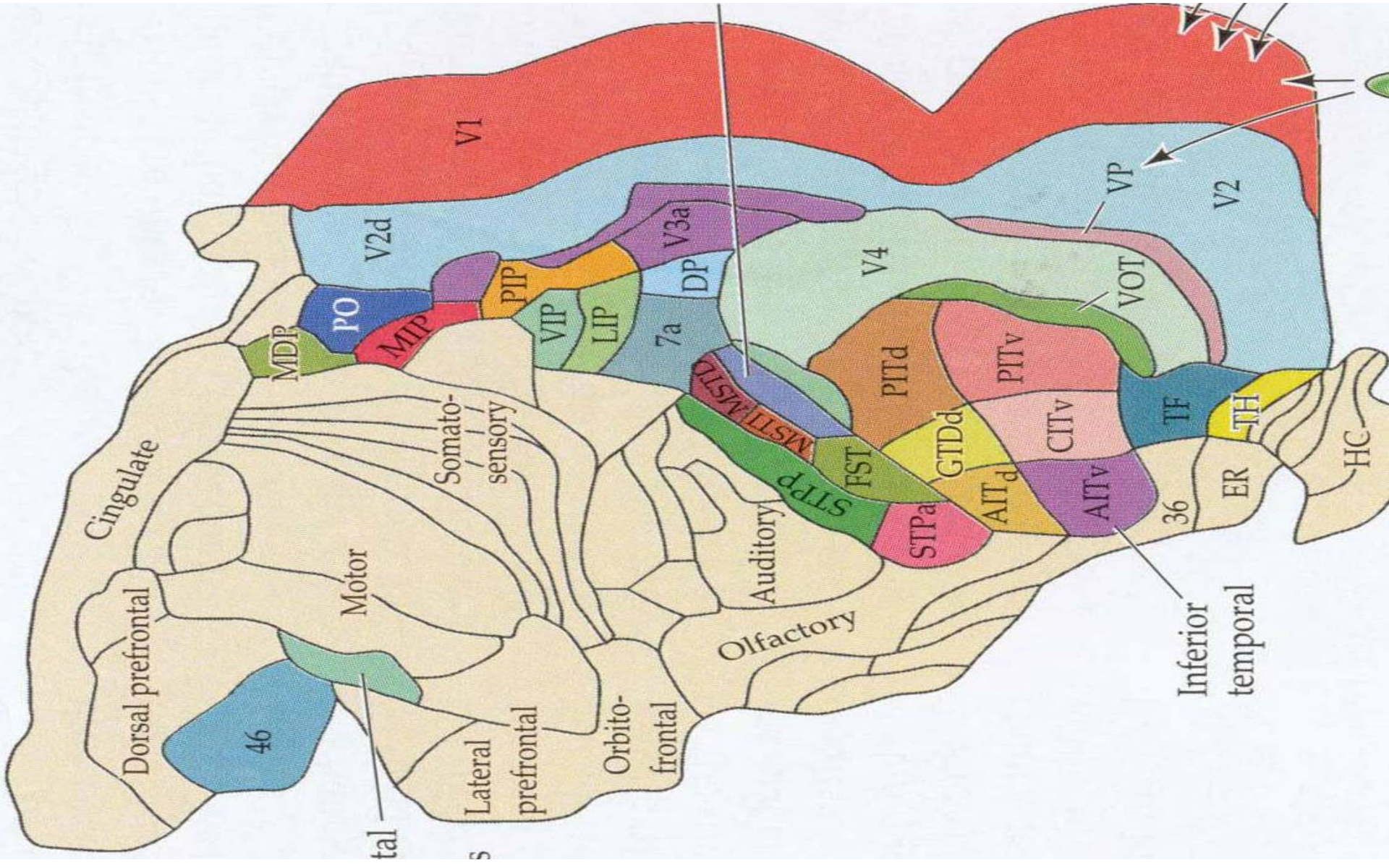
Color code for orientation columns

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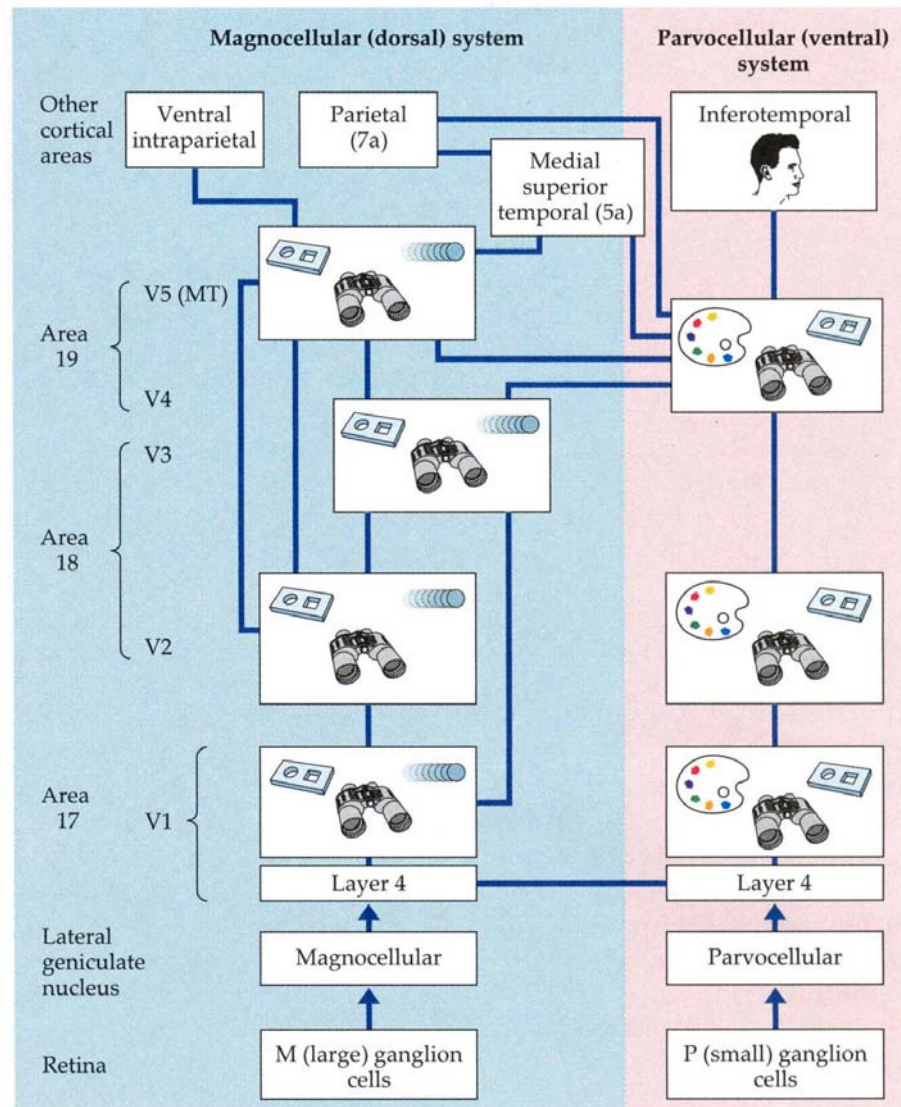
Retinotopie



Visueller Assoziationskortex



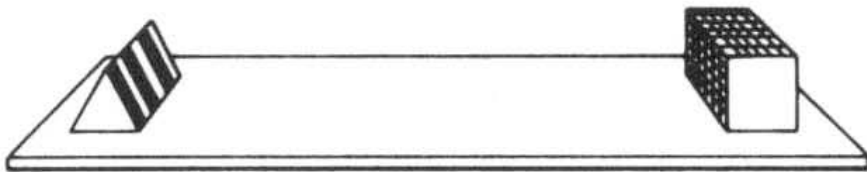
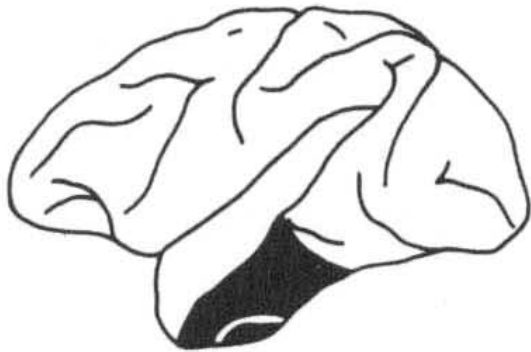
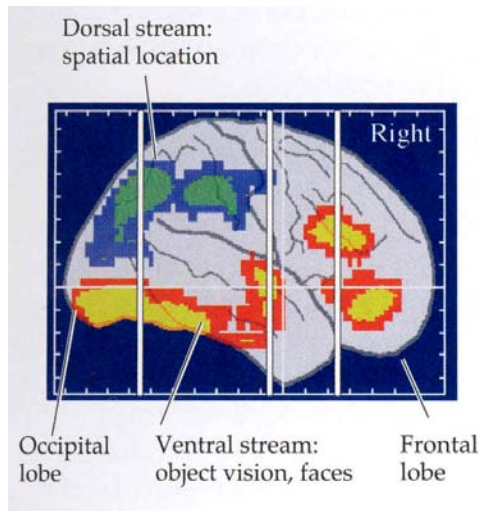
Funktionelle Spezialisierung



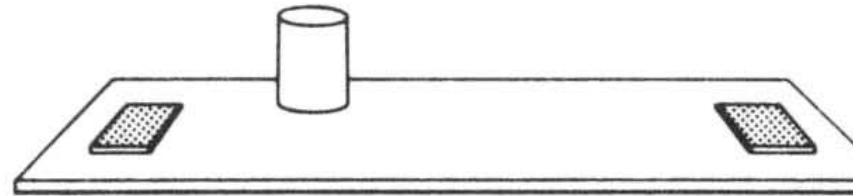
Key:



Was? und Wo?



Object Discrimination



Landmark Discrimination

Zusammenfassung

- Neurone sind die grundlegende Einheit für das Verständnis des Gehirns
- Das Auge sorgt für eine effiziente, aber getreue Repräsentation der Umwelt
- Der visuelle Kortex ist modular und kolumnar organisiert
- Die Umwelt ist im Gehirn retinotop abgebildet