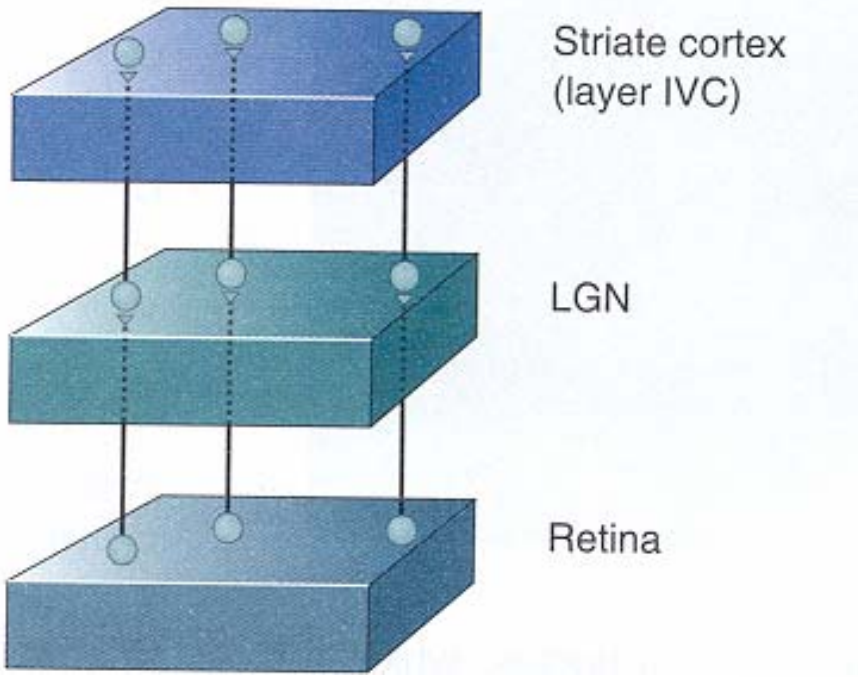
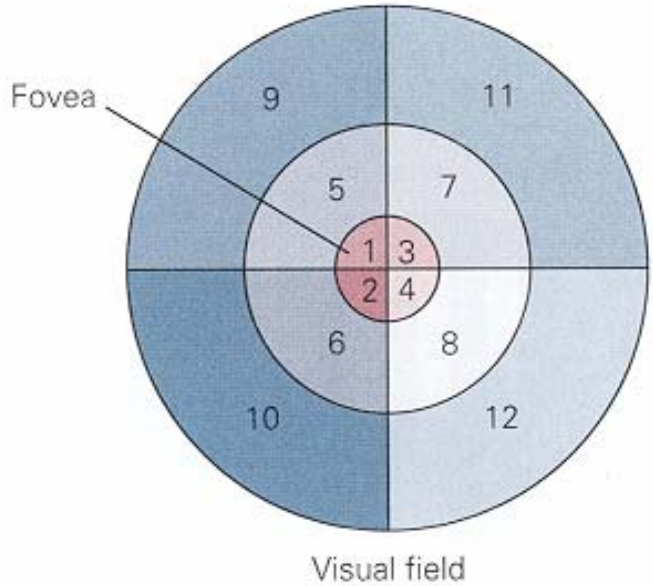
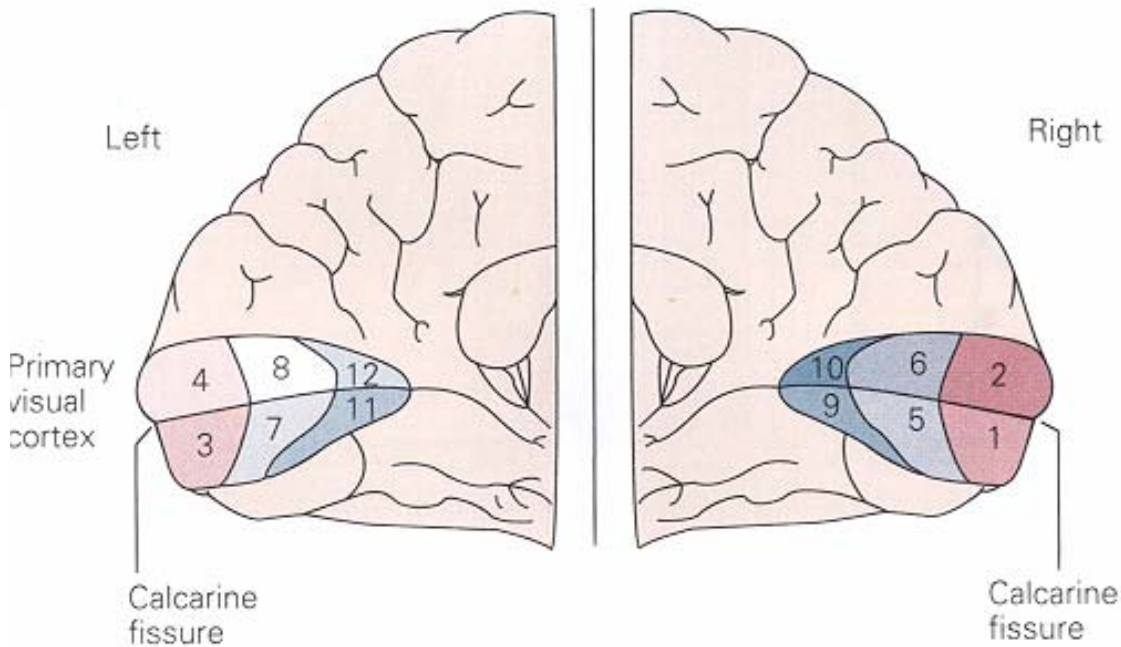


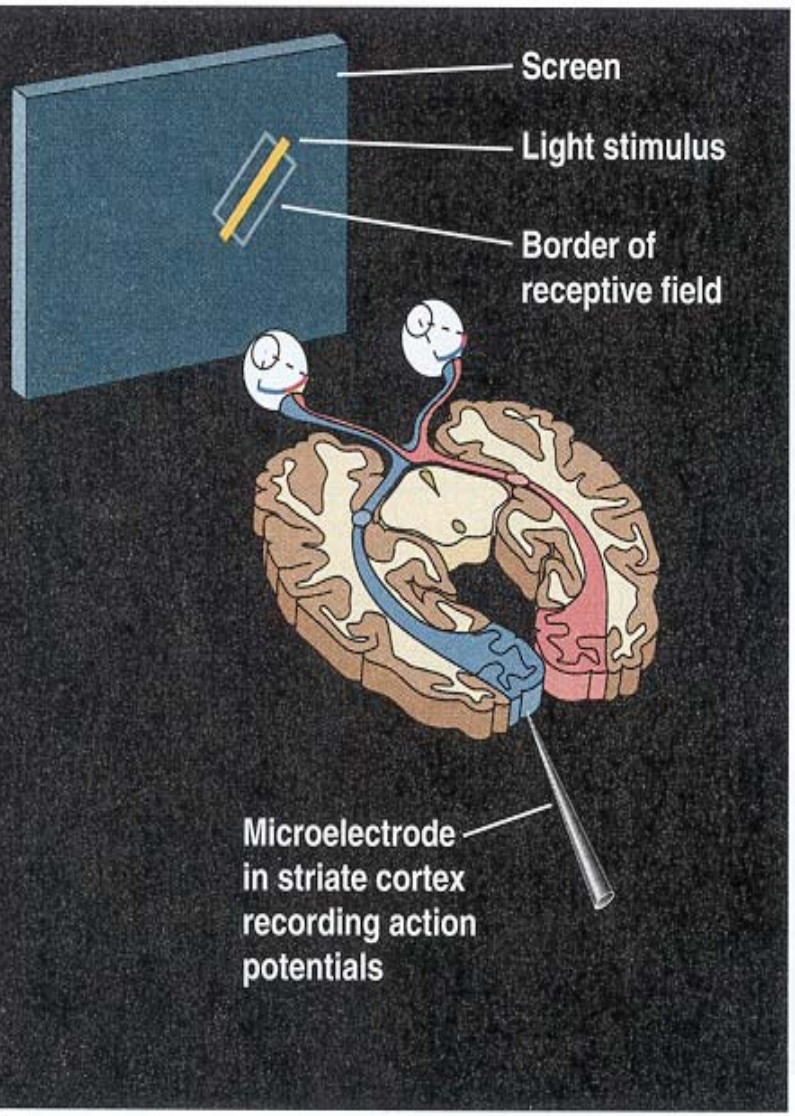


Aufrechterhaltung der Retinotopie

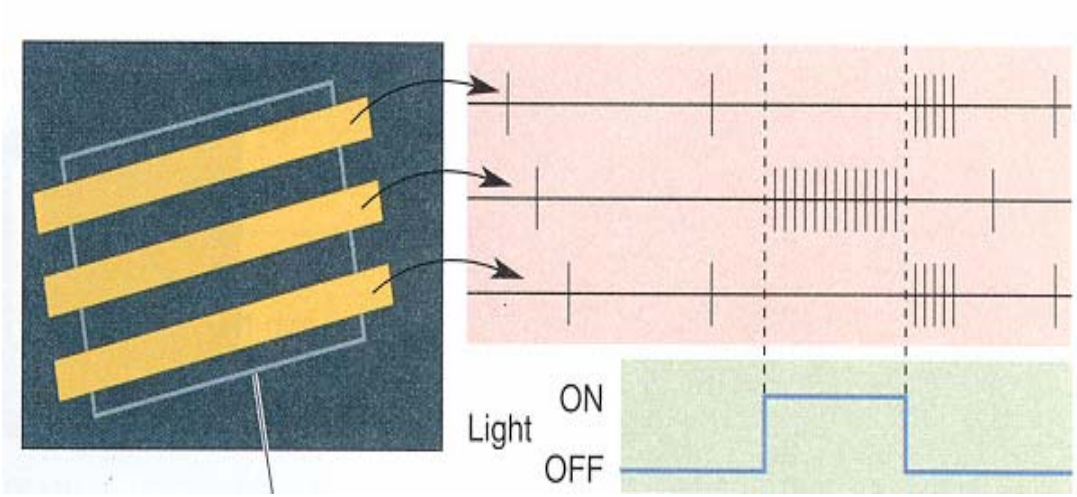


Bear 10.14; Kandel 27-9

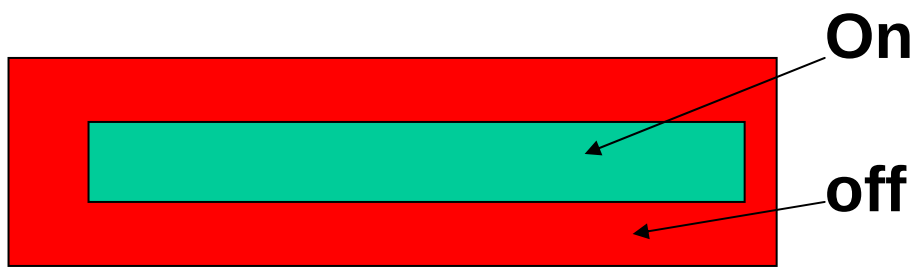
Antwortcharakteristik einer „Simple cell“



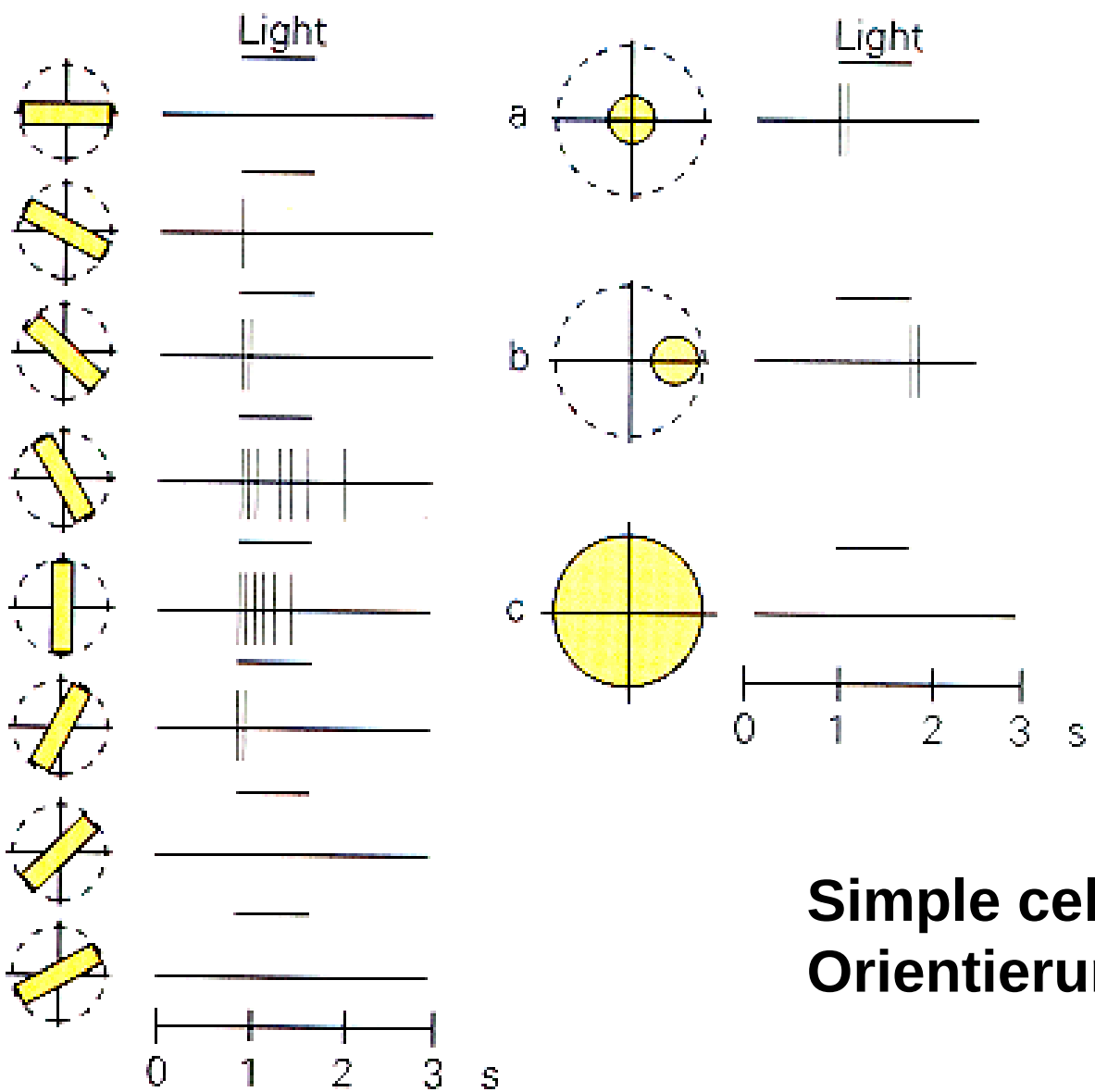
Bear 10.21

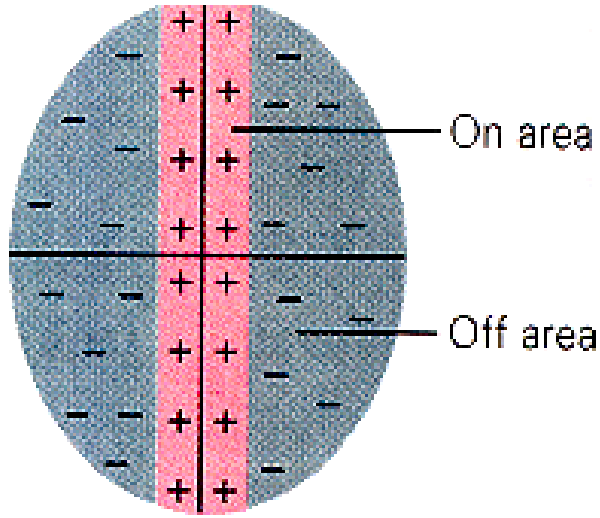


Rezeptives Feld:



Bevorzugte Antwort auf Lichtbalken Bestimmter Orientierung

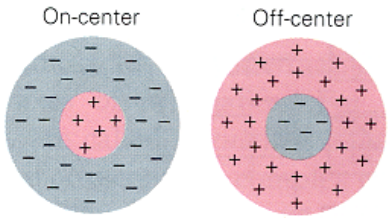




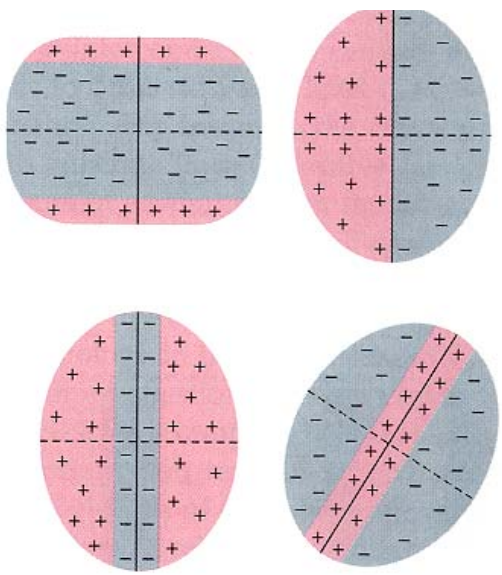
Simple cell
Orientierungssensitivität

Kandel 27-11

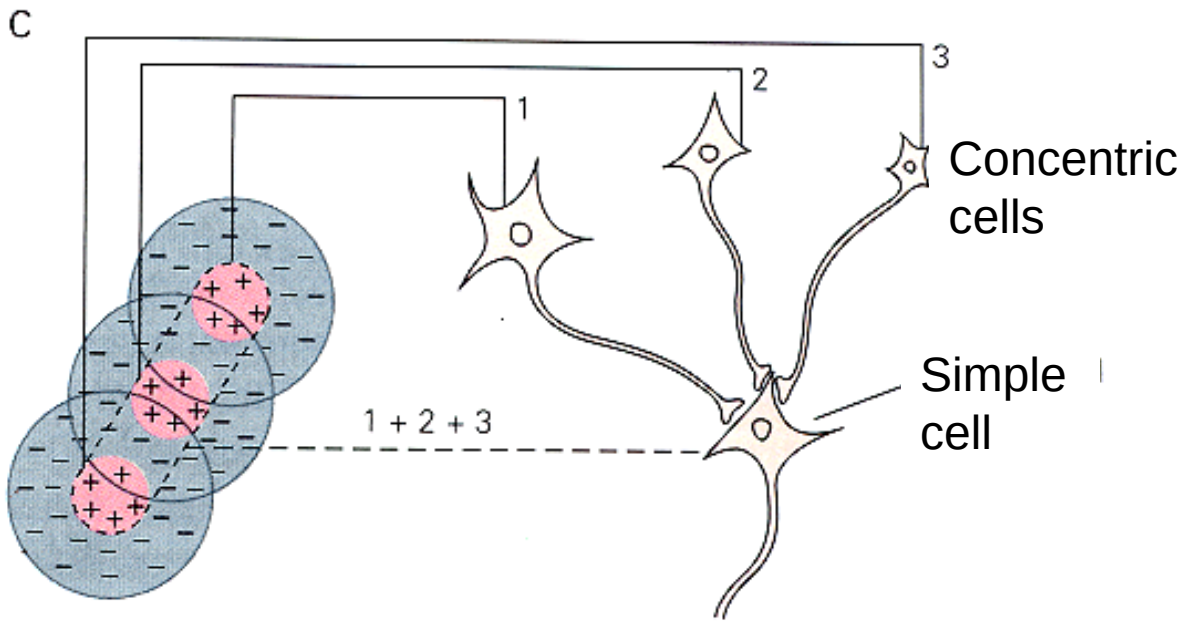
Retina + LGN



Simple cells V1

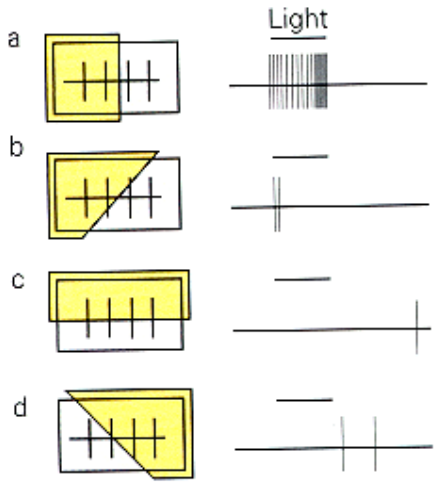


Konstruktion der simple cell rez.Felder durch Konvergenz von LGN-eingängen mit konzentrischen rez. Feldern

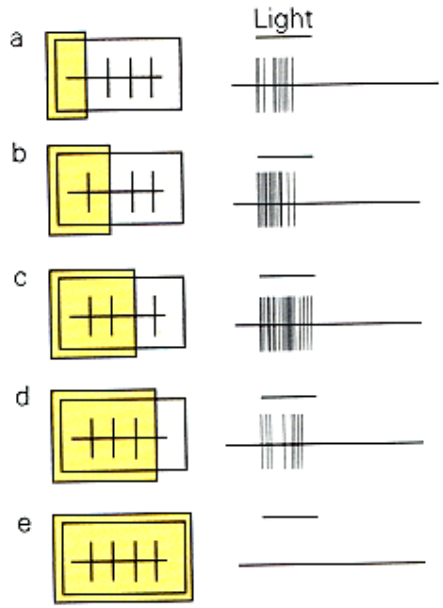


Kandel 27-12

Orientierungssensitiv

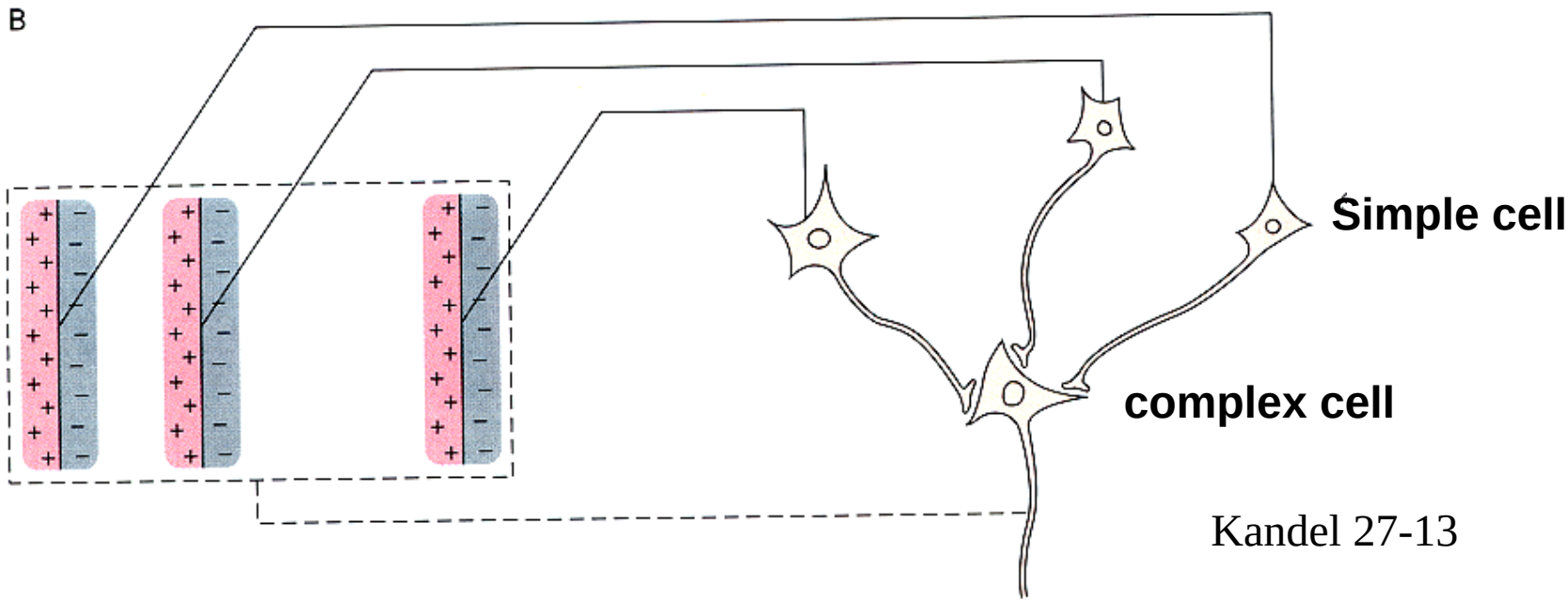


Positionsunabhängig



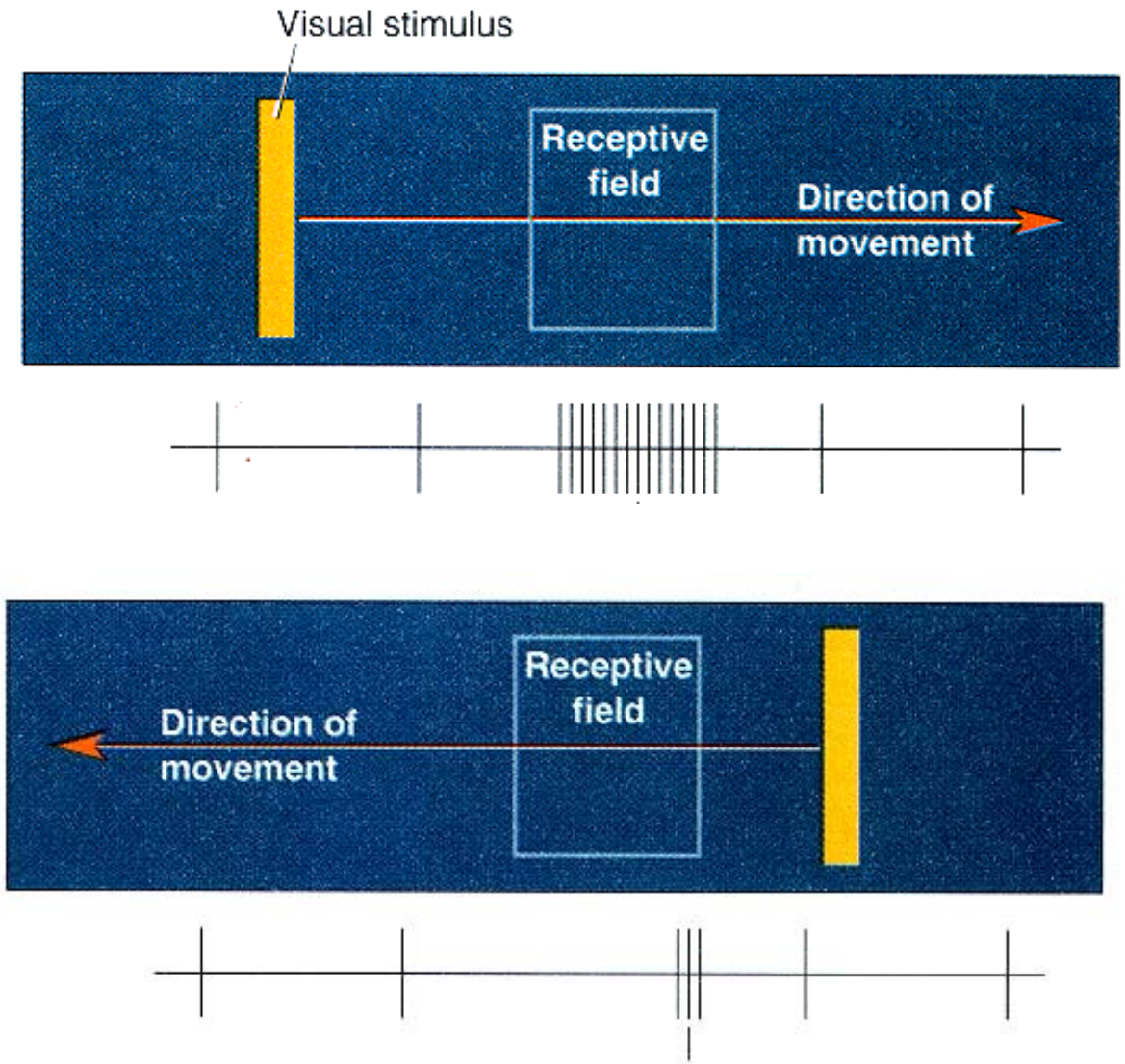
Complex cells:

Rez.Felder groß; keine Klaren On-Off Regionen; Konvergenz von Simple cells



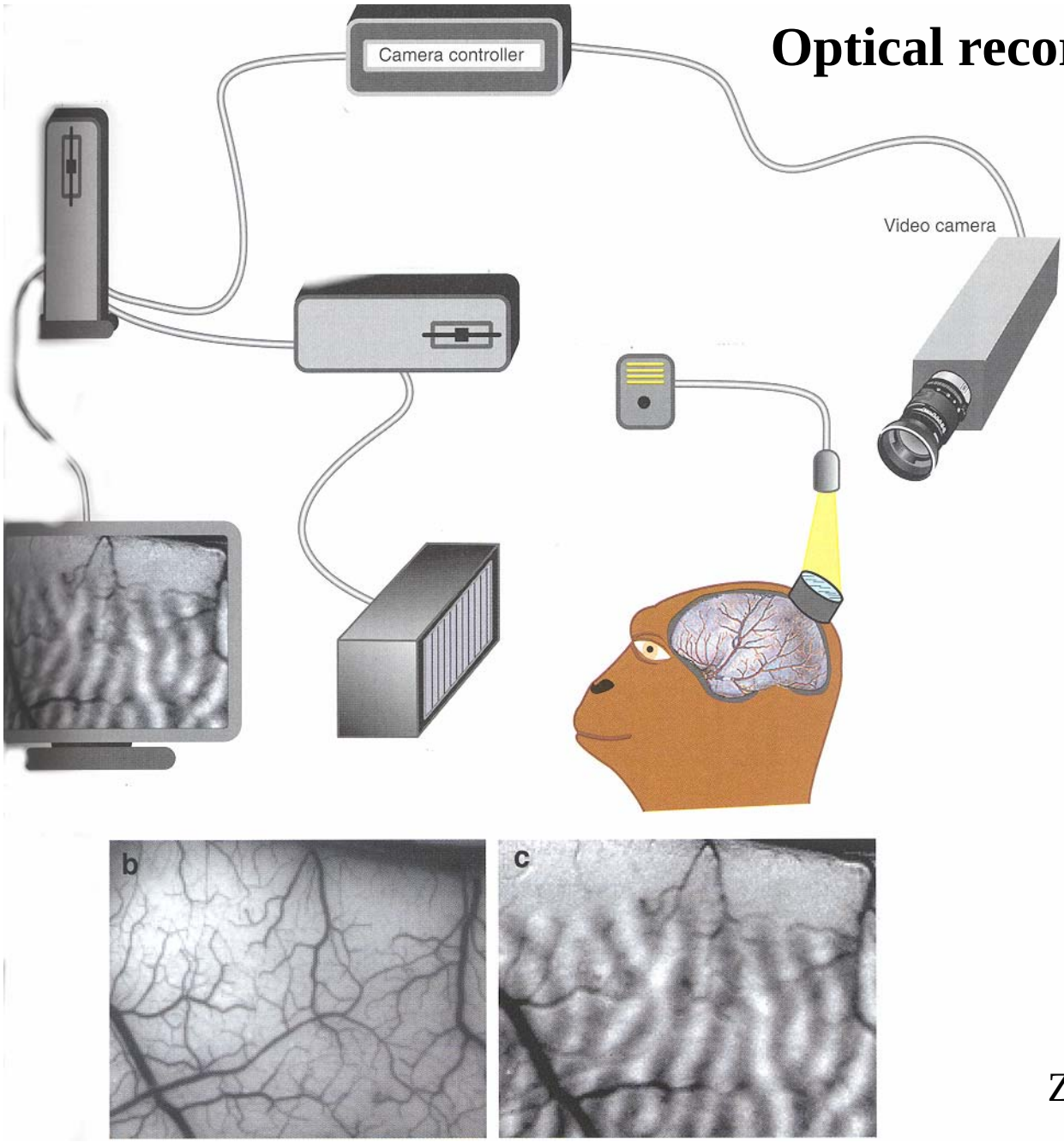
Kandel 27-13

Bewegungsrichtungsempfindlichkeit einer Zelle der Schicht IVB



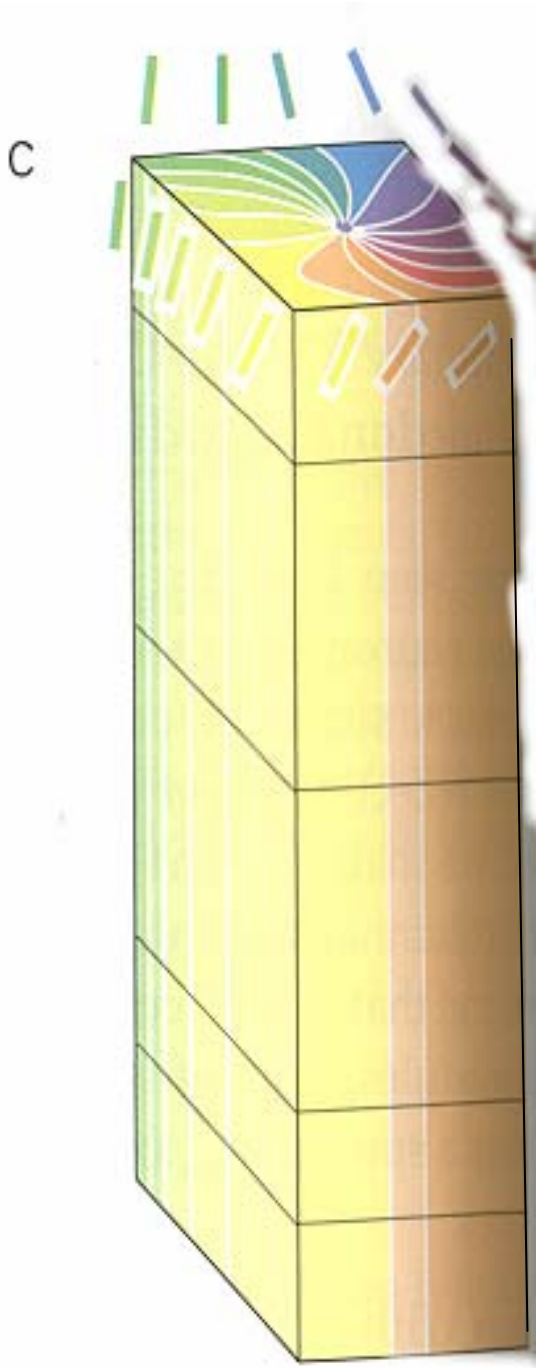
Bear 10.22

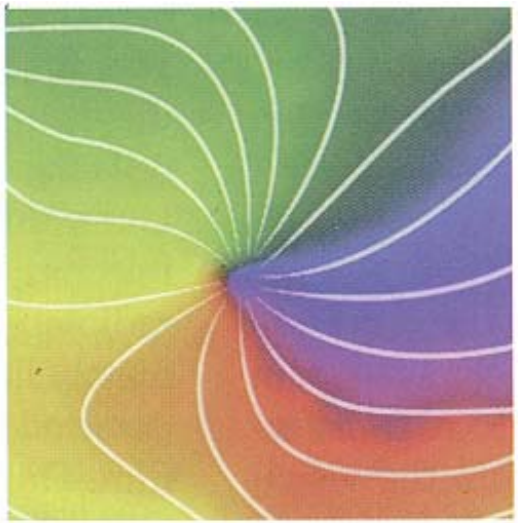
Optical recording

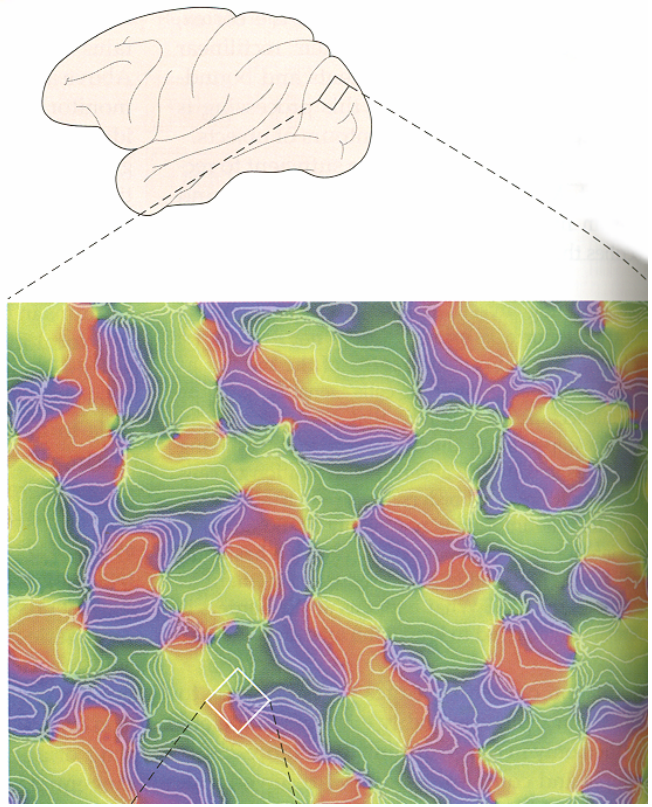


Zigmond 28.13

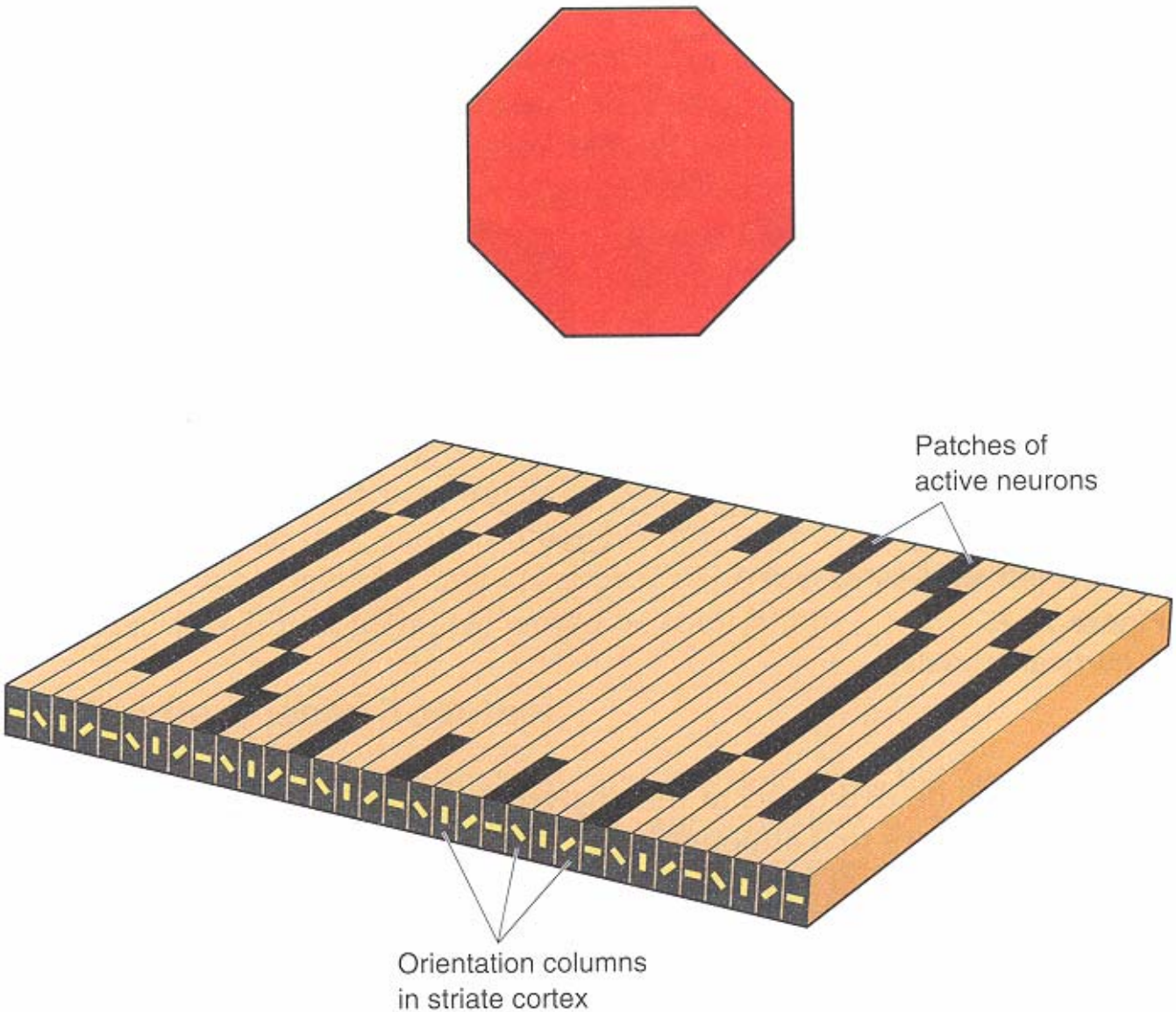
Orientierungssäulen



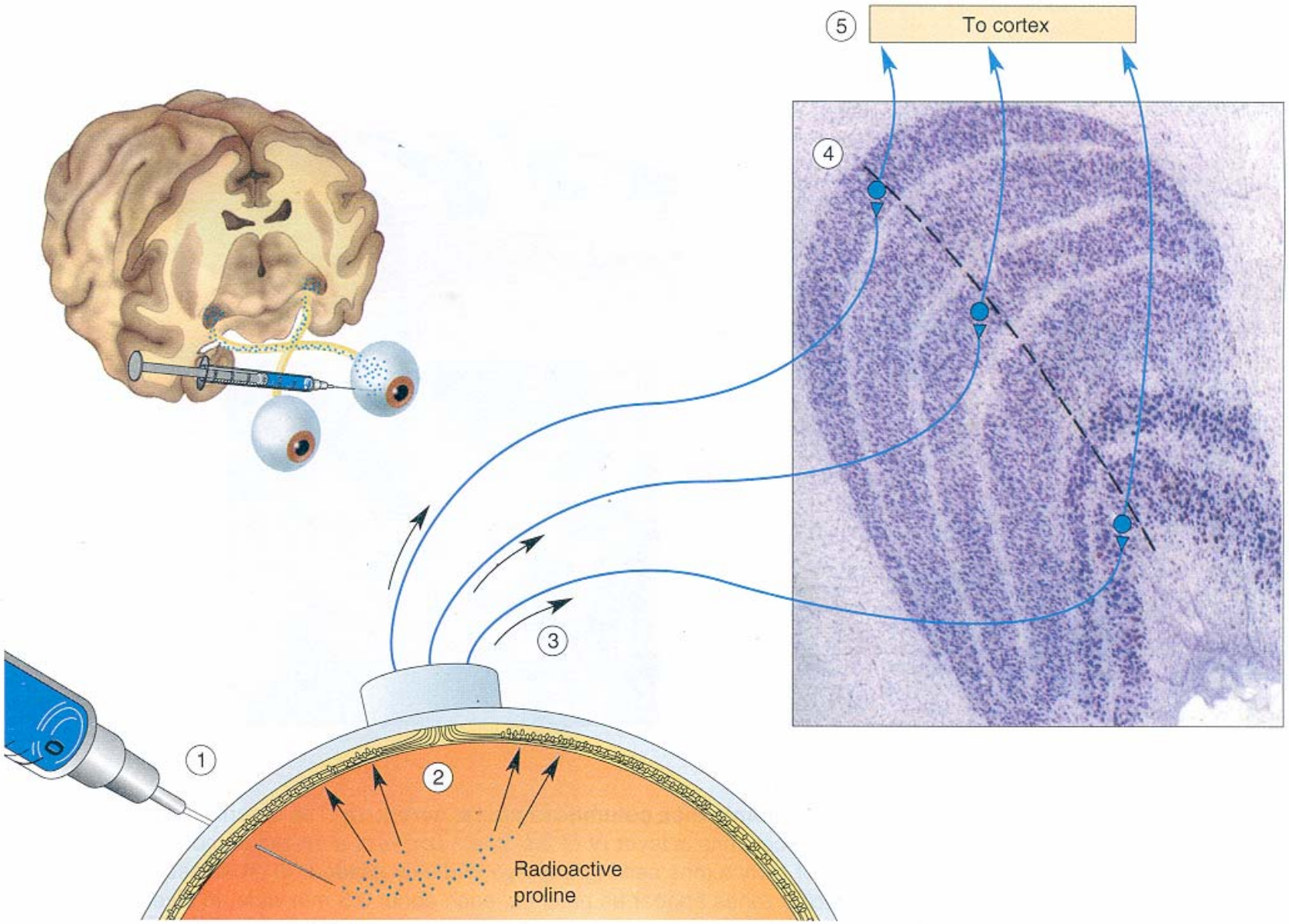




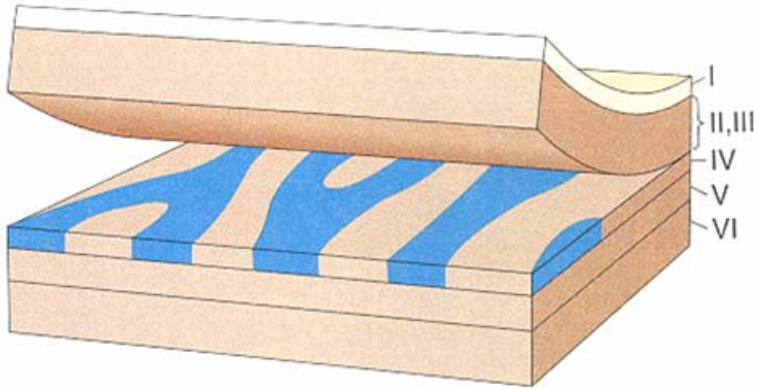
Kandel 27-14


Patches of
active neurons
Orientation columns
in striate cortex

Bear 10-26

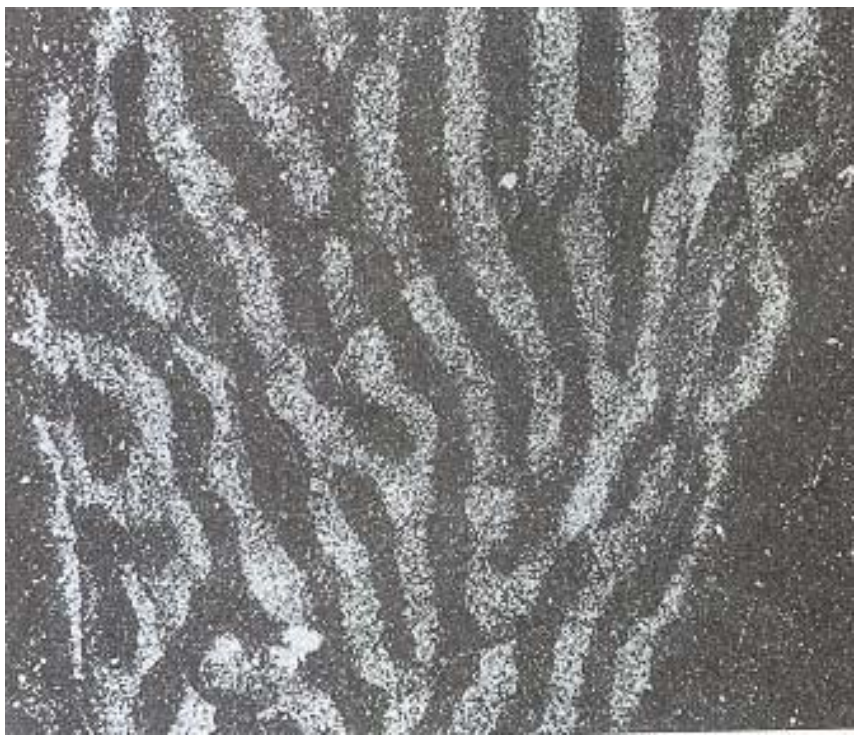


Bear 10.17

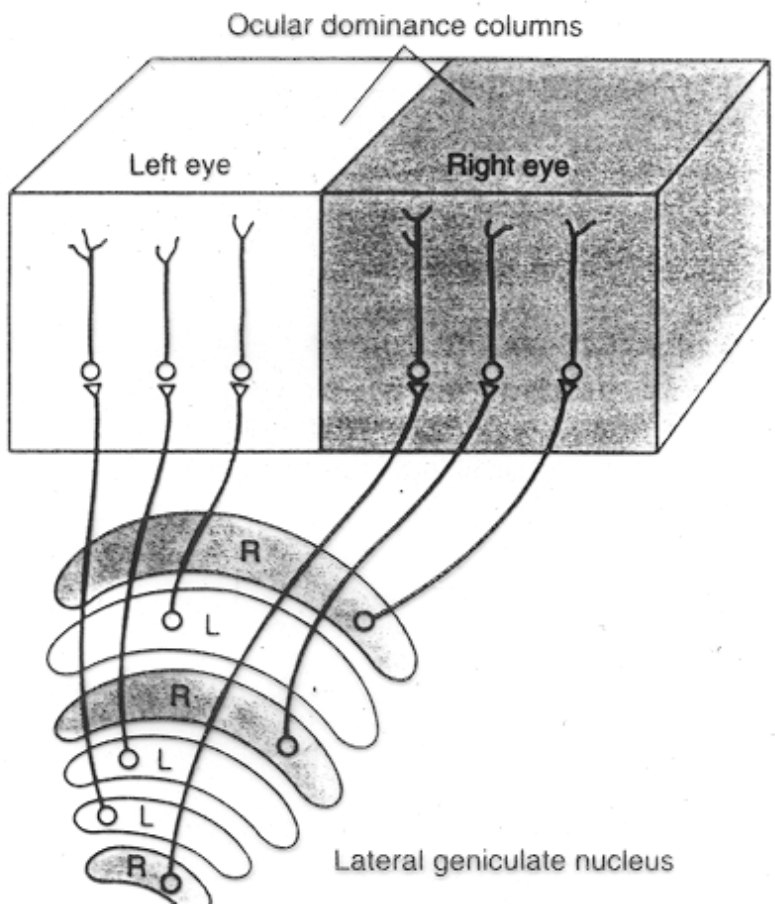


Okulardominanzsäulen im Visuellen Cortex

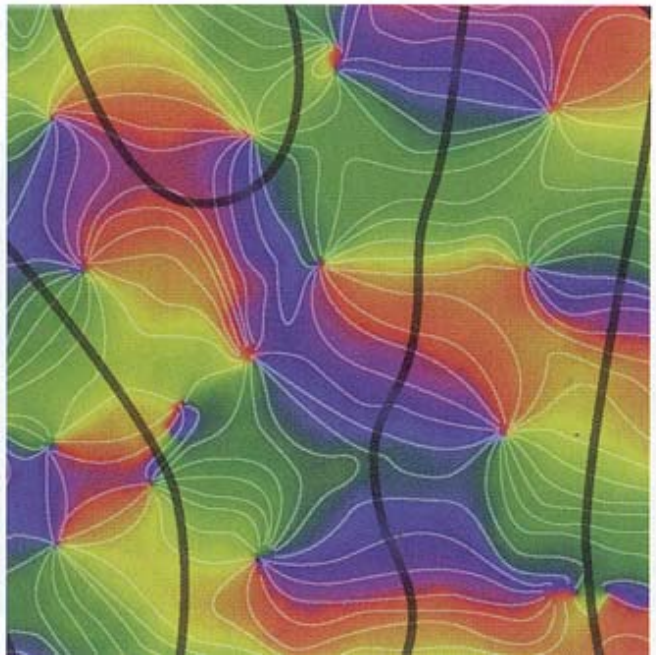
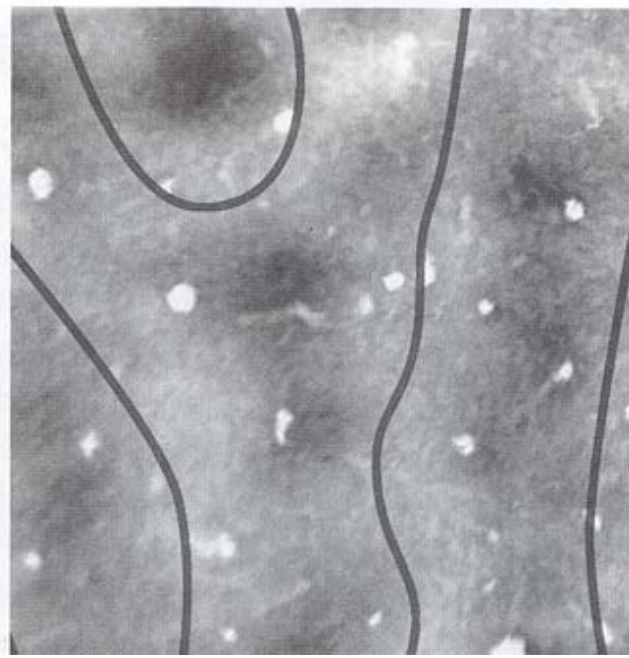
(Autoradiographie)



Eingänge vom LGN in Schicht Ivc sind räumlich segregiert



Bear 10.18

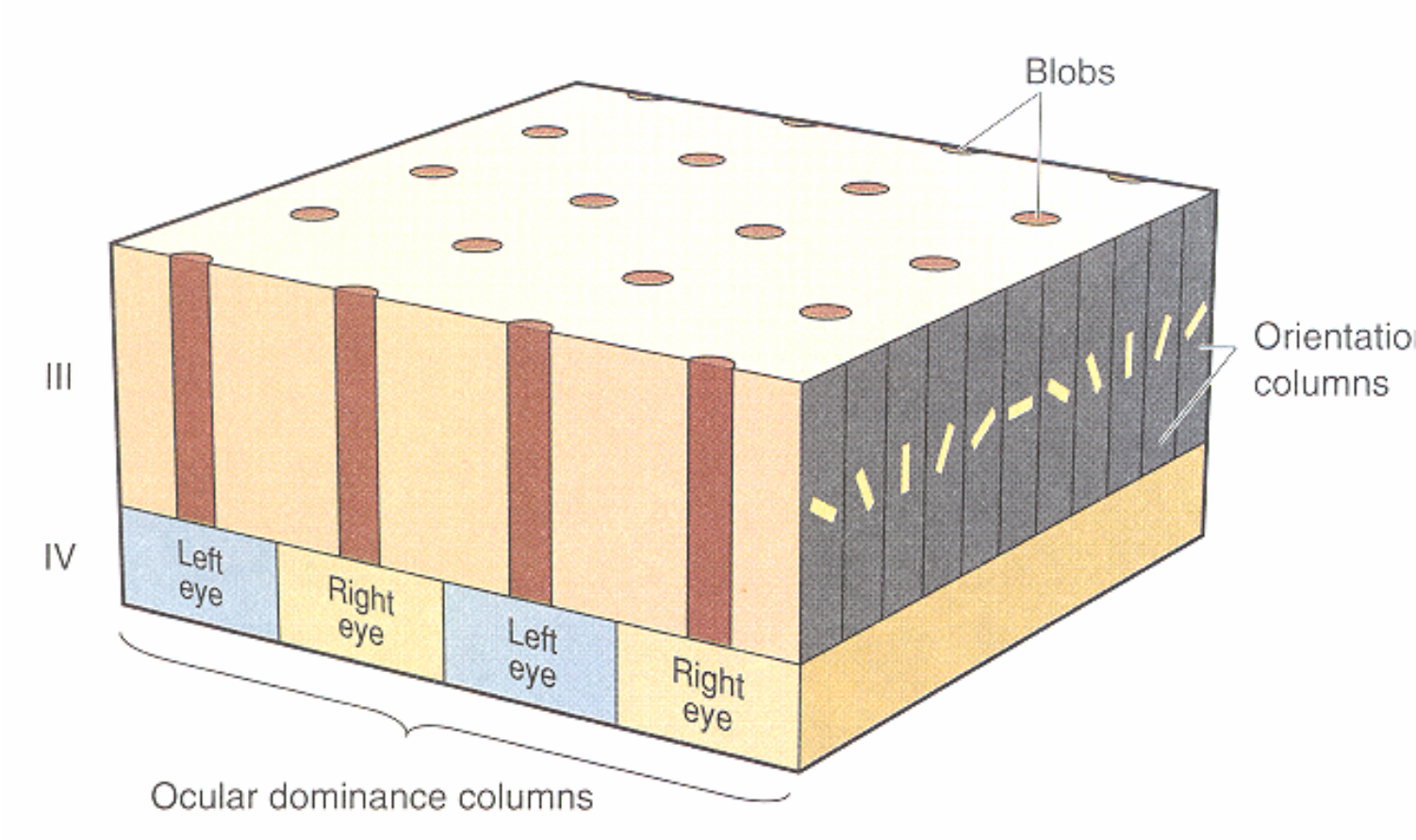




Okulardominanzsäulen, Orientierungssäulen und Blobs

Wie fügt sich das Puzzle zusammen?

Kandel 27-17

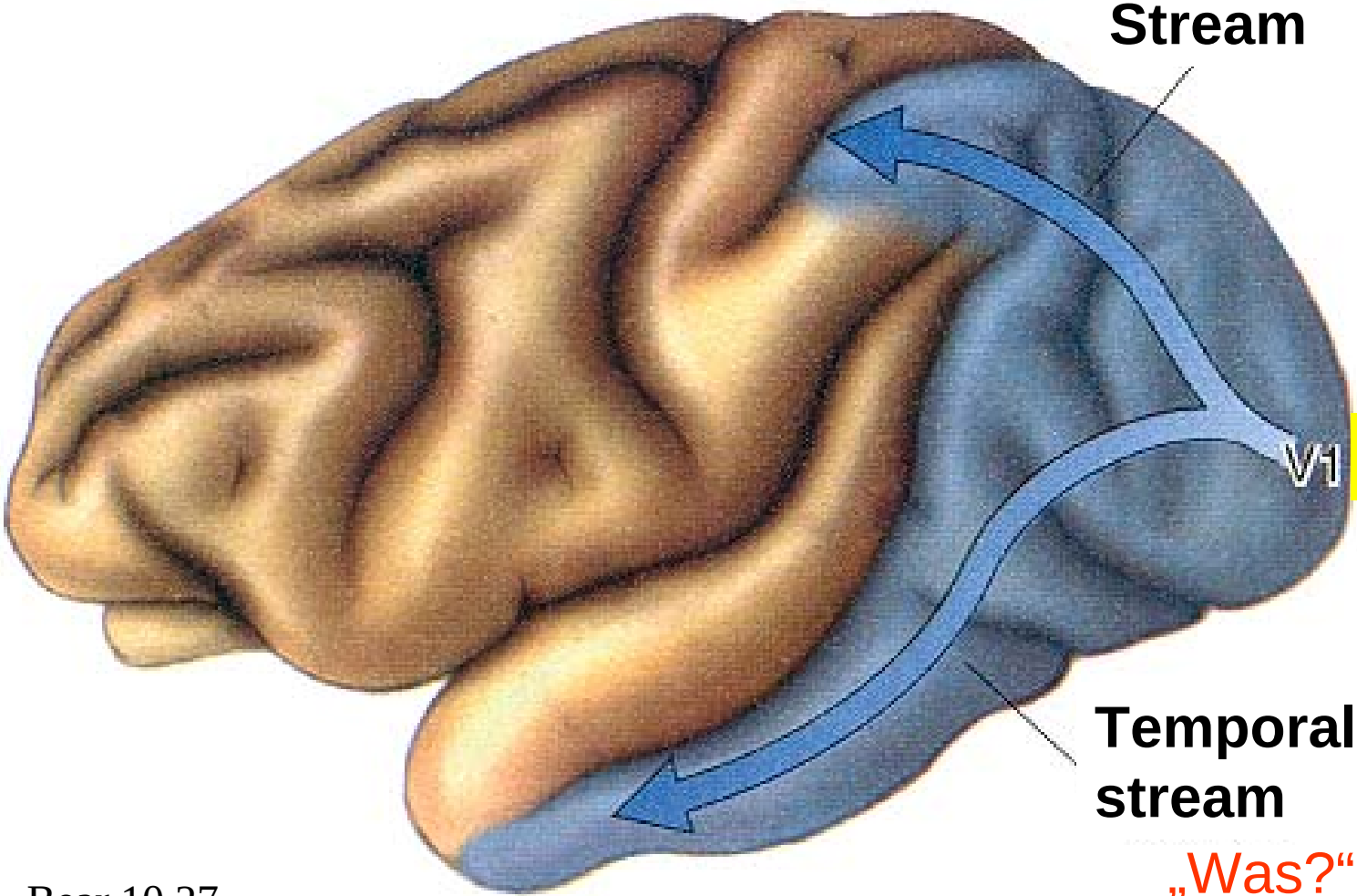
Cortikaler Modul (Hypercolumn)



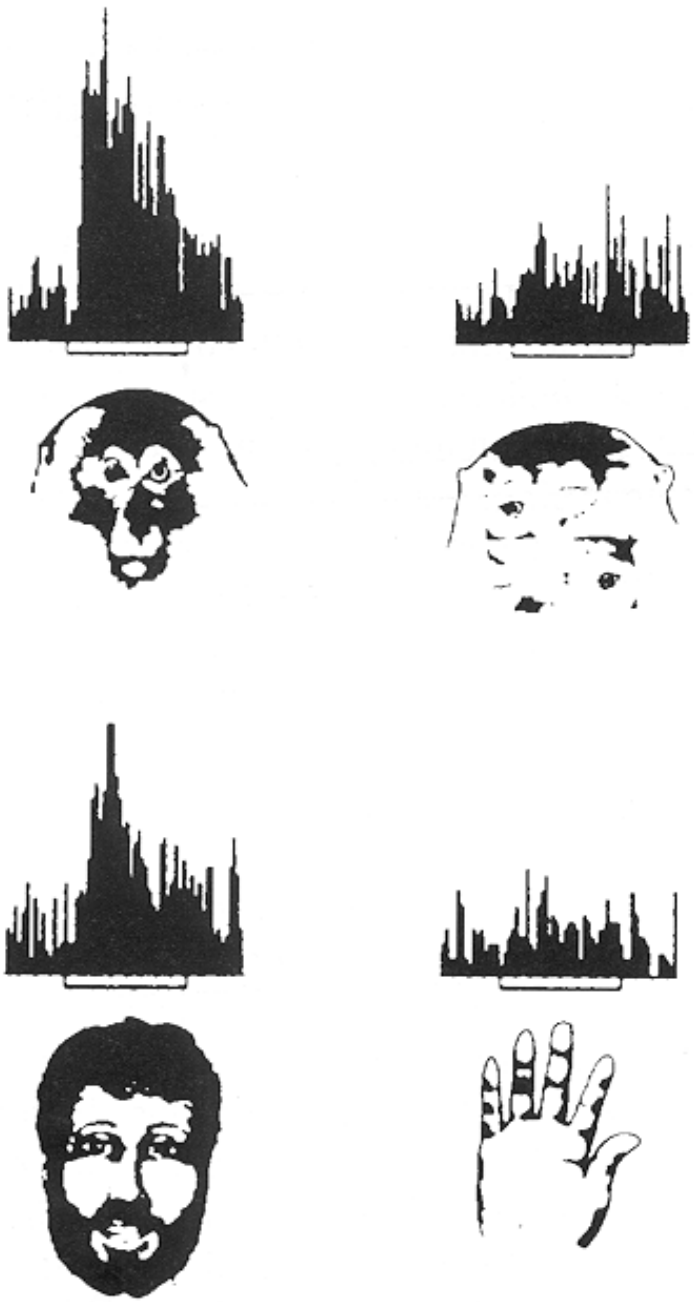
1 mm^2 Cortexgewebe: Verantwortlich für die Analyse eines kleinen Ausschnitts des Gesichtsfelds = elementarer Verarbeitungsmodul.
2 Sets Okulardominanzsäulen,16 blobs und kompletes Muster an Orientierungssäulen (360°)

Bear 10.25

Höhere visuelle Areale



Bear 10.27



Gesichtsspezifische Neurone im Inferior temporalen Cortex

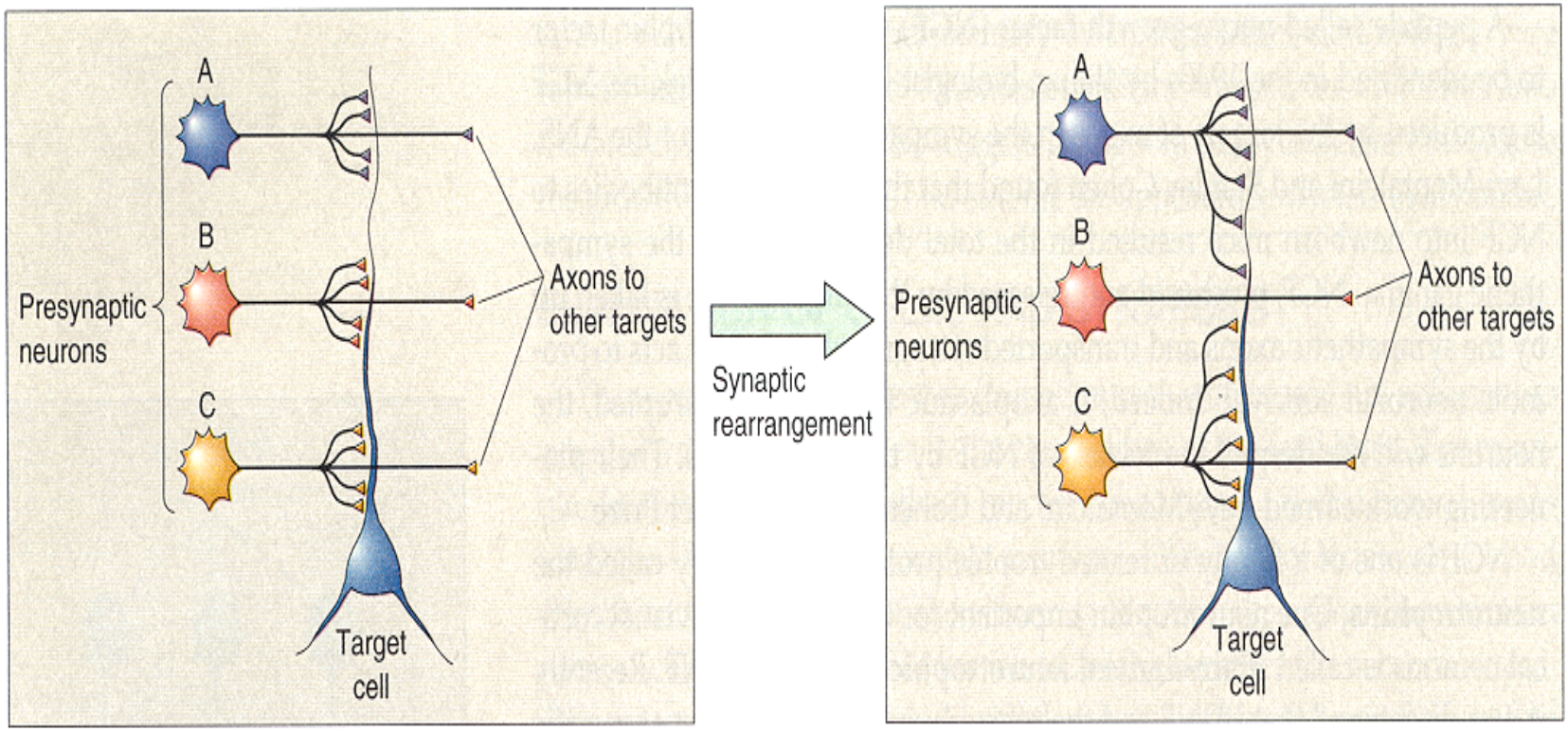
Kandel deutsch 23.19

Zusammenfassung: **zentrale Sehverarbeitung**

- **primäre Sehbahn** : Retina → Thalamus (LGN) → **Sehcortex (6-schichtig)**
- **cortikale Rezeptive Felder:**
  - **Orientierungsselektiv** (**simple cell**: lokaler Balken, **complex cell**: globale Balken**)**
  - **Bewegungsselektiv:** Reaktion nur auf beweg. Balken in bestimmter Richtung
- **Orientierungssäulen** enthalten Repräsentation der vollen 360° möglicher Balkenorientierung, wechselnde **Okulardominanzsäulen** bilden Zebramuster auf dem Cortex
- **cortikale Hypercolumne** fasst Orientierungsäulen, Okulardominanzsäulen und blobs (Farbwahrnehmung) zu einer Verarbeitungseinheit zusammen
- visuelle Objekterkennung entweder aufgrund **hierarchischer Verarbeitung** (Großmutterzelle) oder aufgrund von **Parallelverarbeitung** basierend auf neuronalen Netzen welche flexibel zusammengebunden werden

Entwicklung und Plastizität des visuellen Systems

Synaptische Plastizität und Musterbildung im Sehsystem

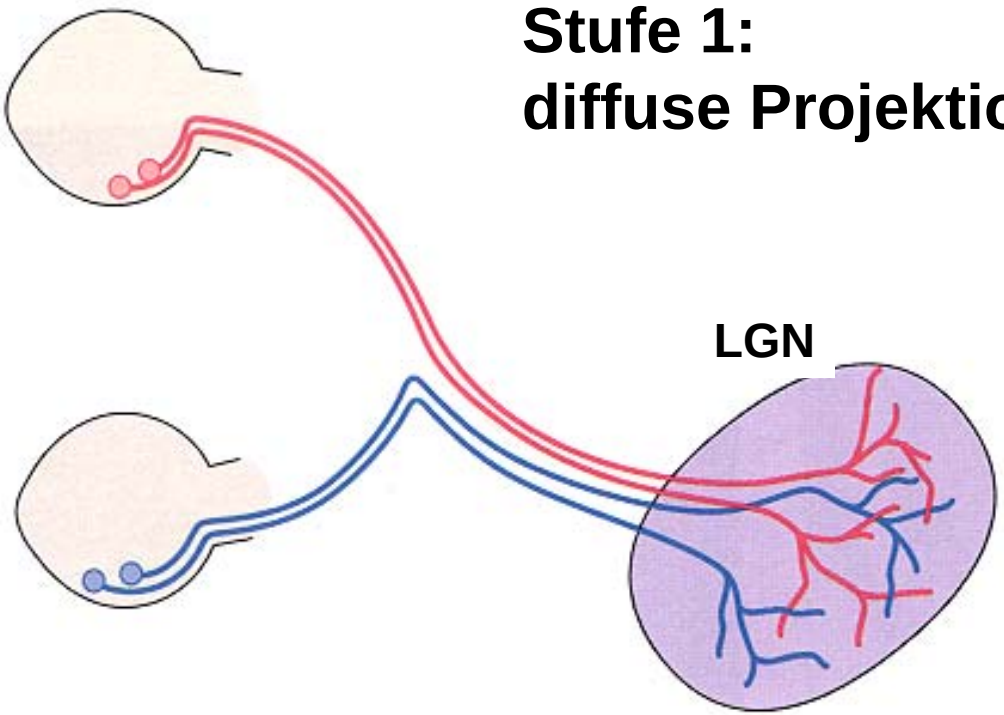


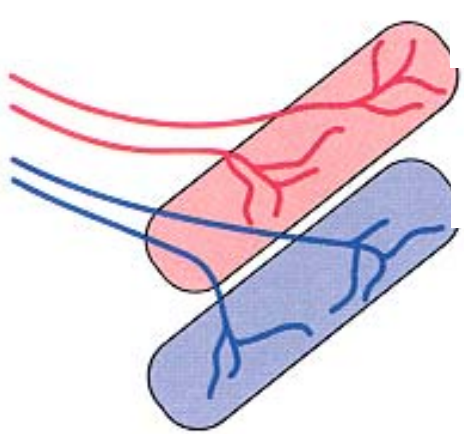
Bear 18.12

Entwicklung der retinothalamischen Verschaltung erfolgt pränatal

Stufe 1:
diffuse Projektion

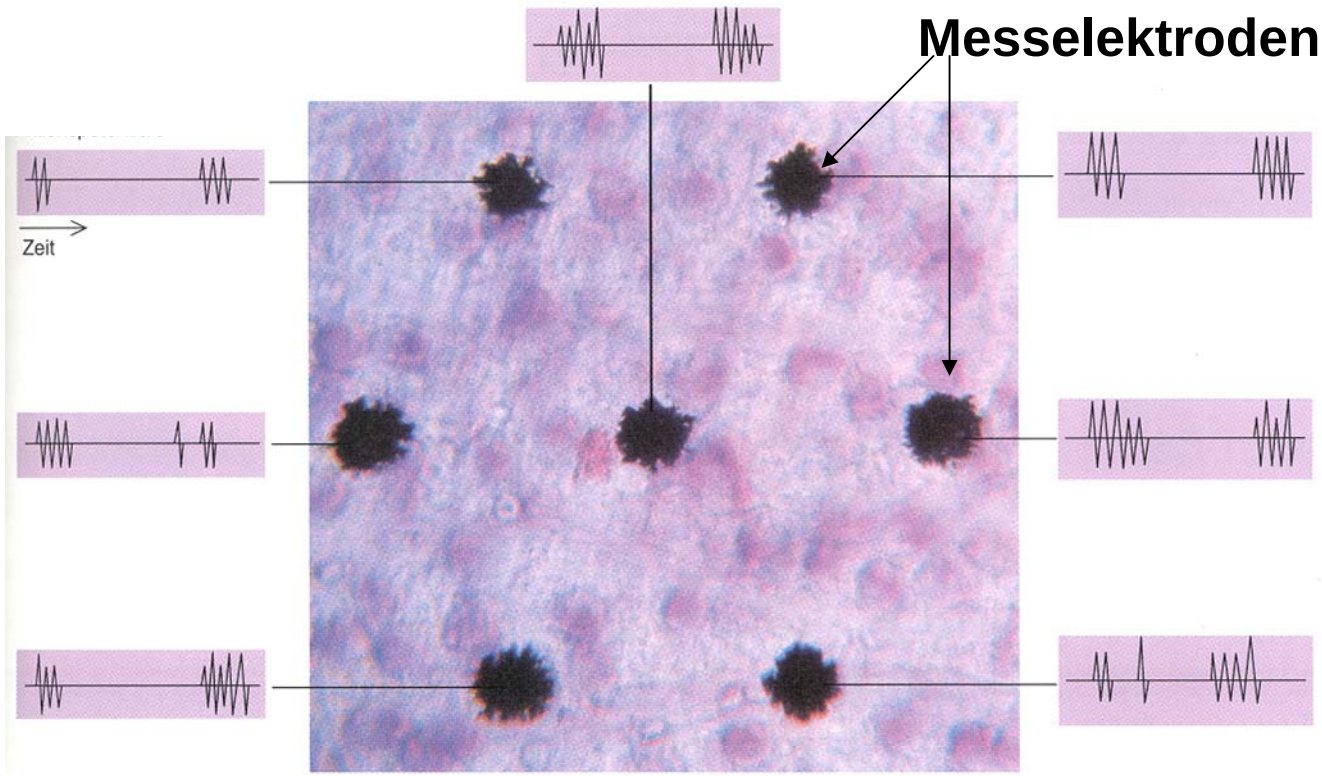
Stufe 2:
augenspezifische Schichten

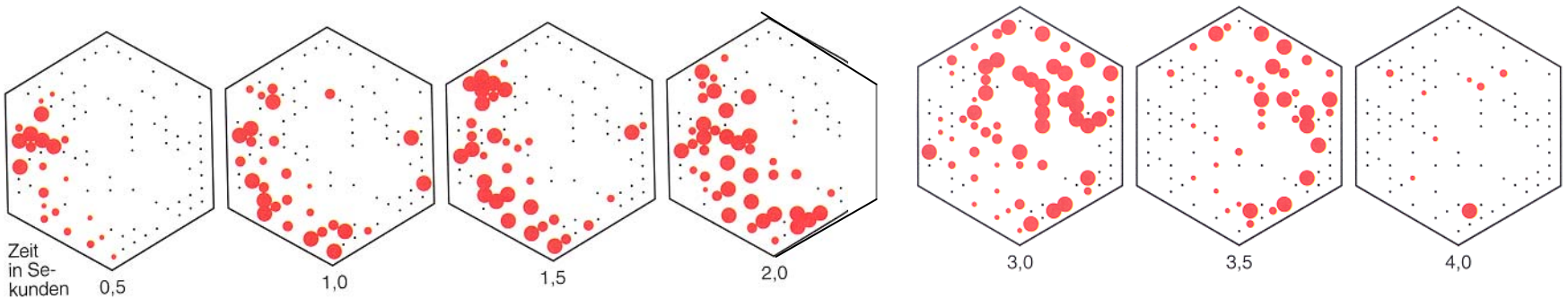




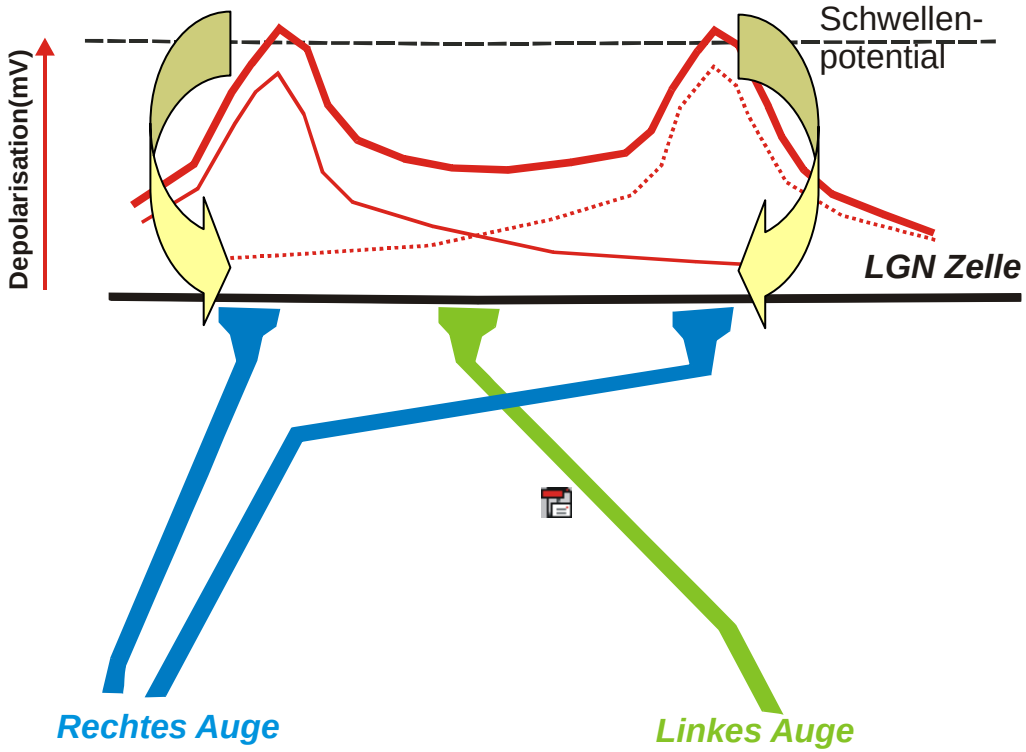
Kandel 56-9

Elektrodenarray: Spontane Aktivitätswellen in der Retina





Shatz 1994 spektrum



Verstärkung der Synapse

NMDA-Rezeptoren

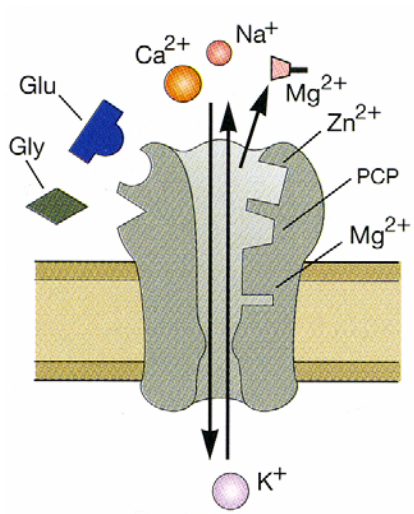
→Ca $^{2+}$ Einstrom

→2nd messenger Systeme

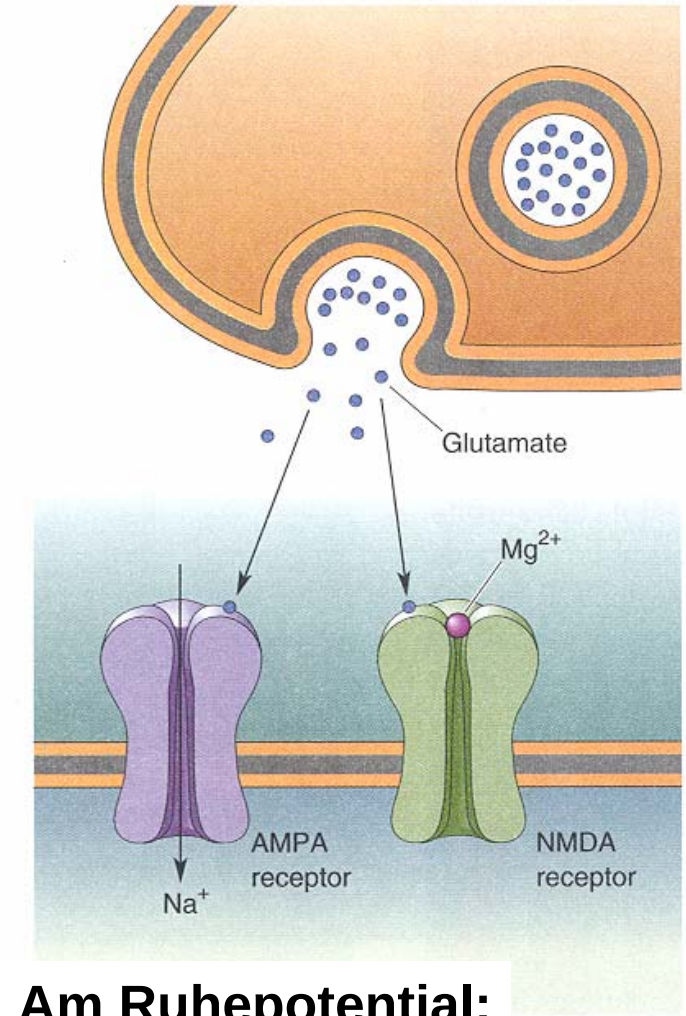
→Aktivierung postsynaptischer Na-Kanäle

→Ausschüttung von Wachstumsfaktoren

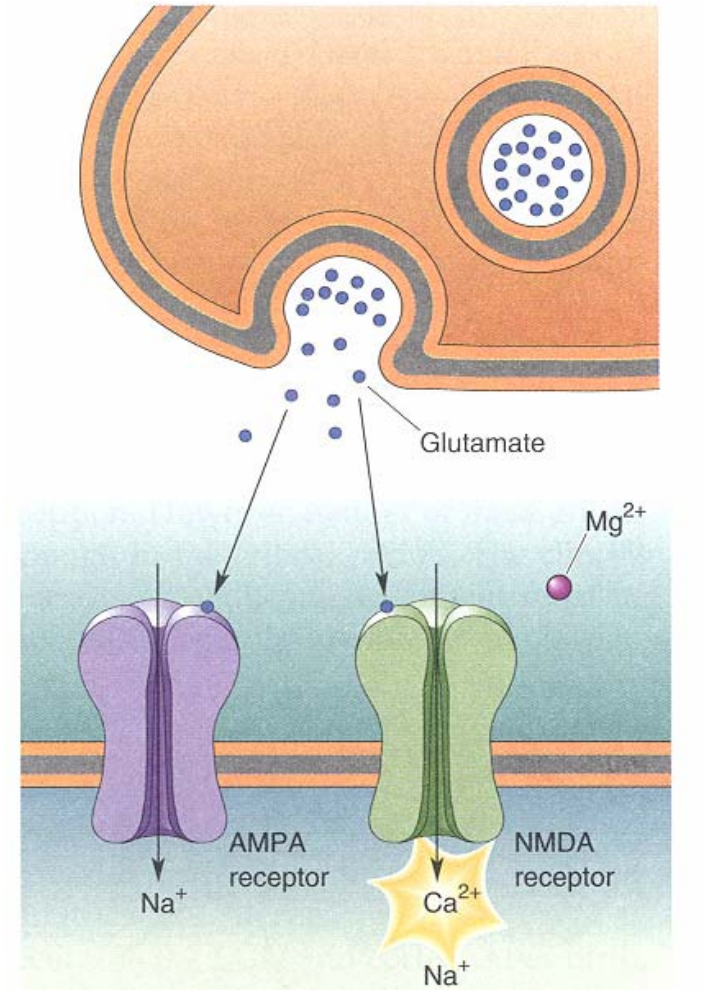
NMDA - Rezeptor



Sind NMDA-Rezeptor vermittelte Effekte Ursache der Plastizität?

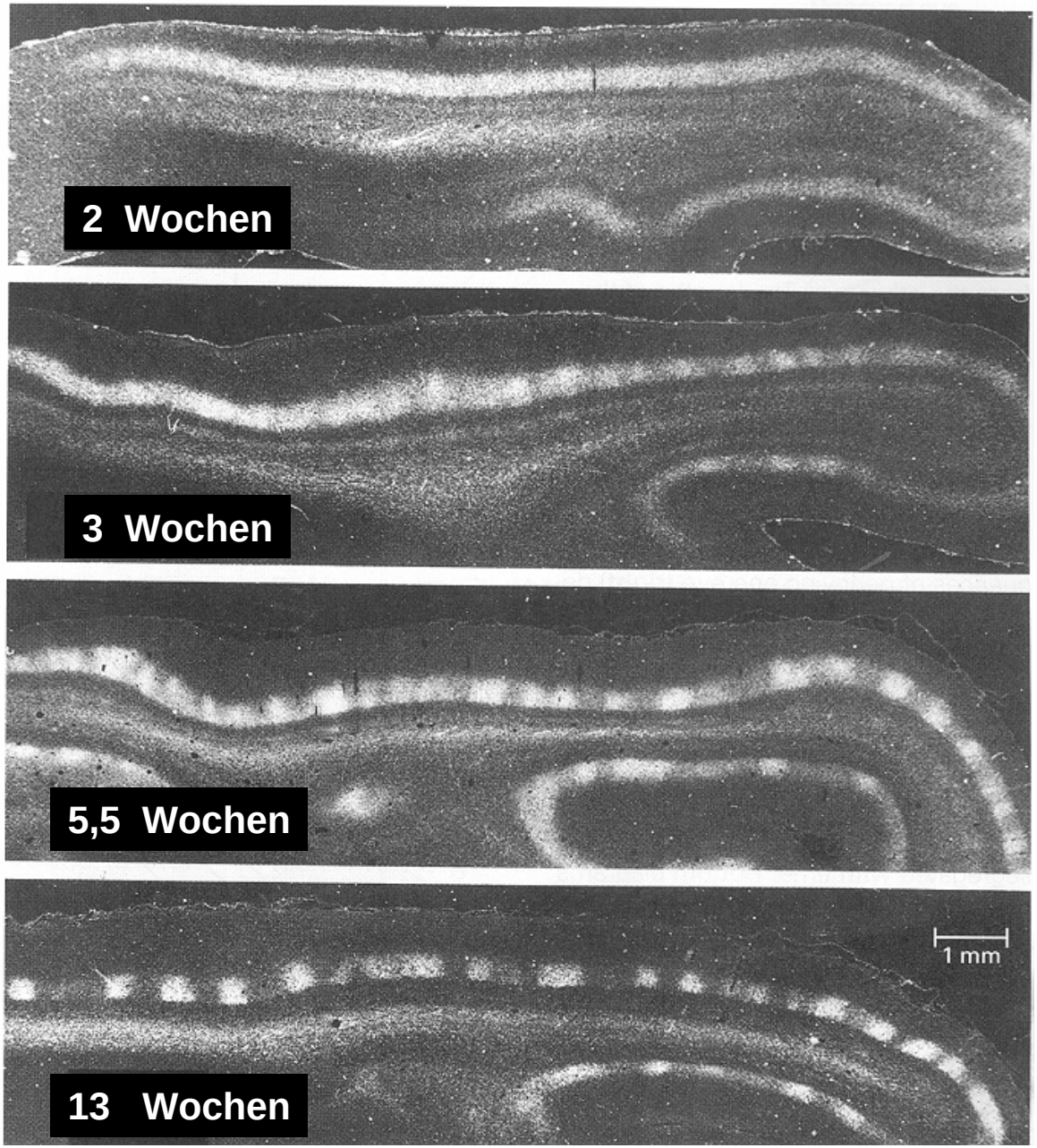


Am Ruhepotential: Mg++ Block



Depolarisierte postsynaptische Zelle: Ca++-Einstrom

Bear 18.20

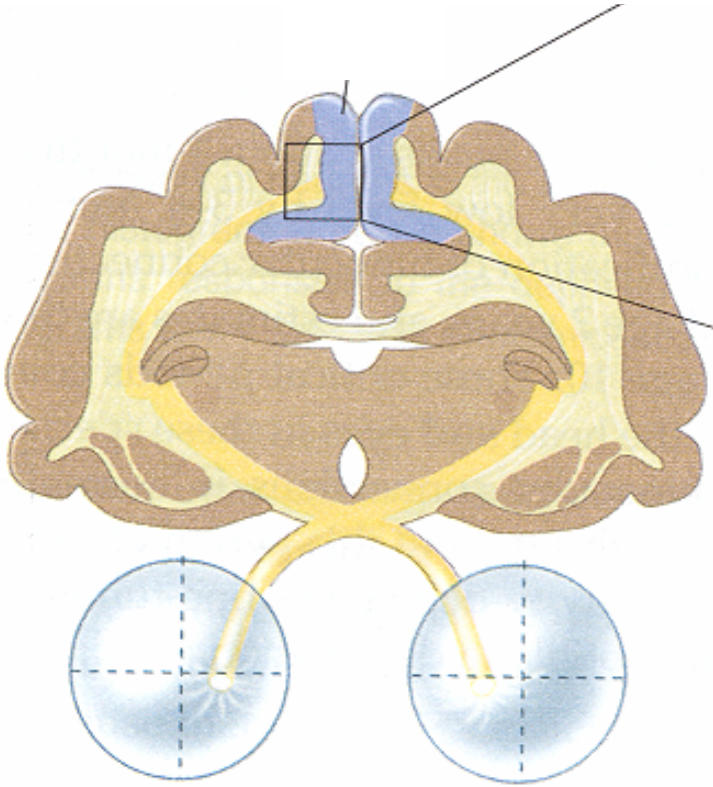


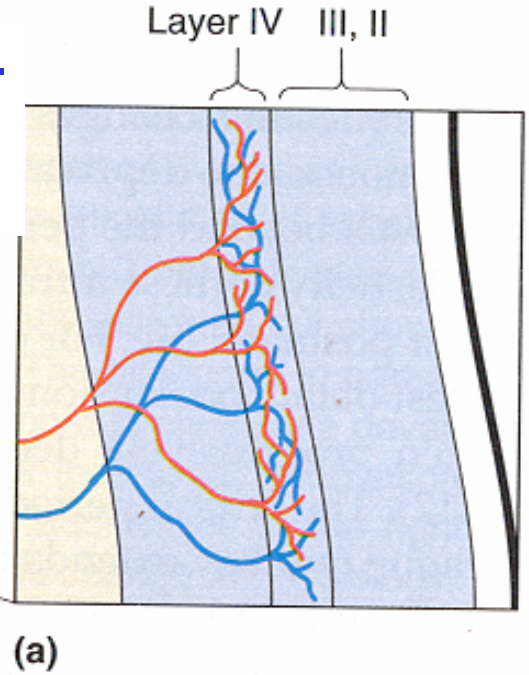
Postnatale Entwicklung der Okulardominanzsäulen im visuellen Cortex

Autoradiographie

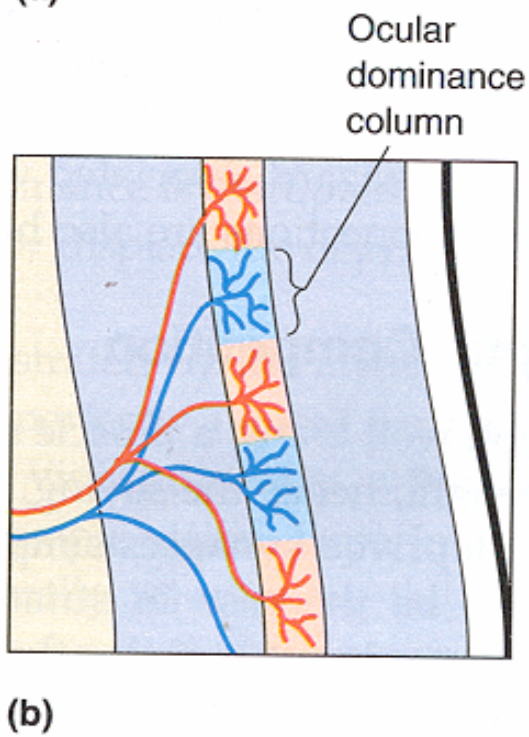
Kandel 56-4

Entwicklung der Okulardominanz-Säulen im primären visuellen Cortex erfolgt postnatal





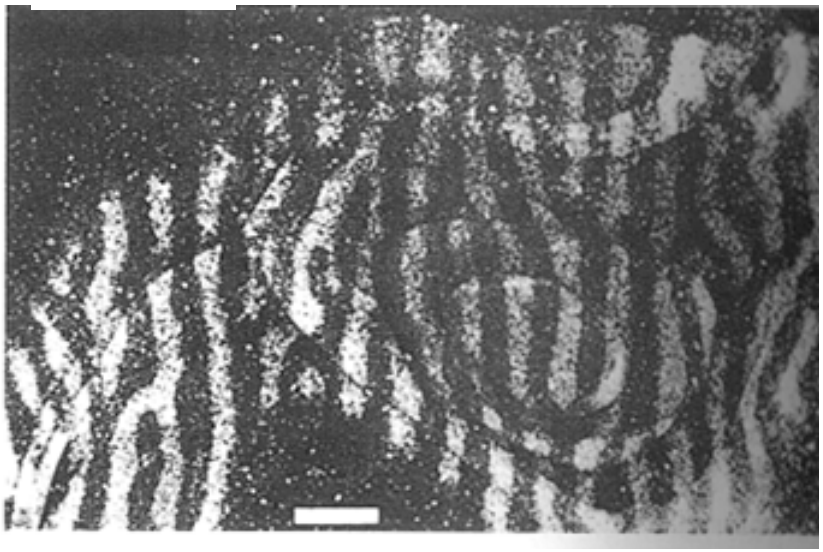
Perinataler Zeitpunkt



Alter ca. 6 Wochen

Bear 18-4

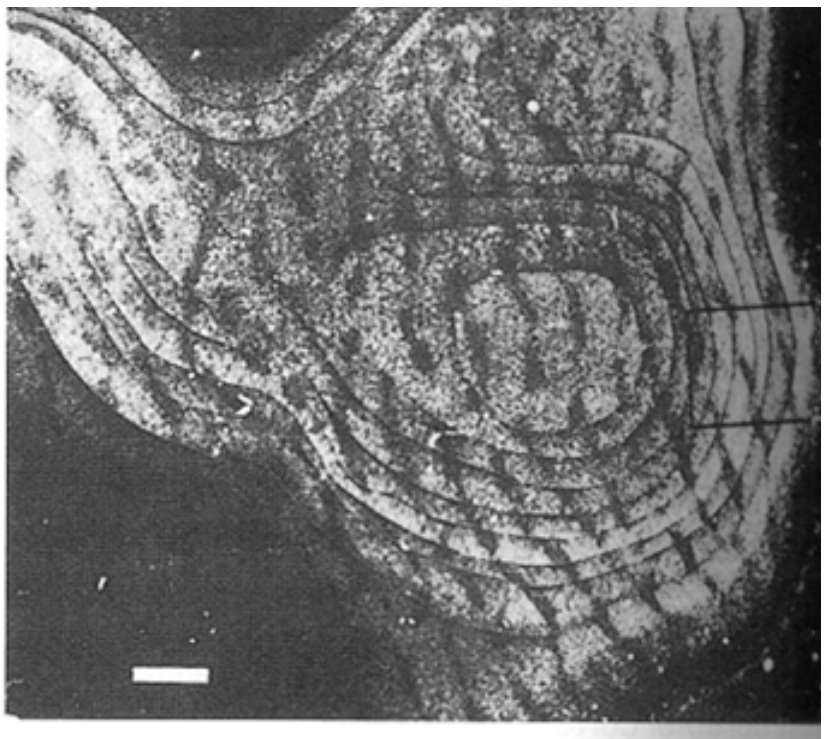
Normal



Okulardominanzsäulen im Visuellen Cortex

(Autoradiographie)

Depriviert (offenes Auge markiert –weiß-)



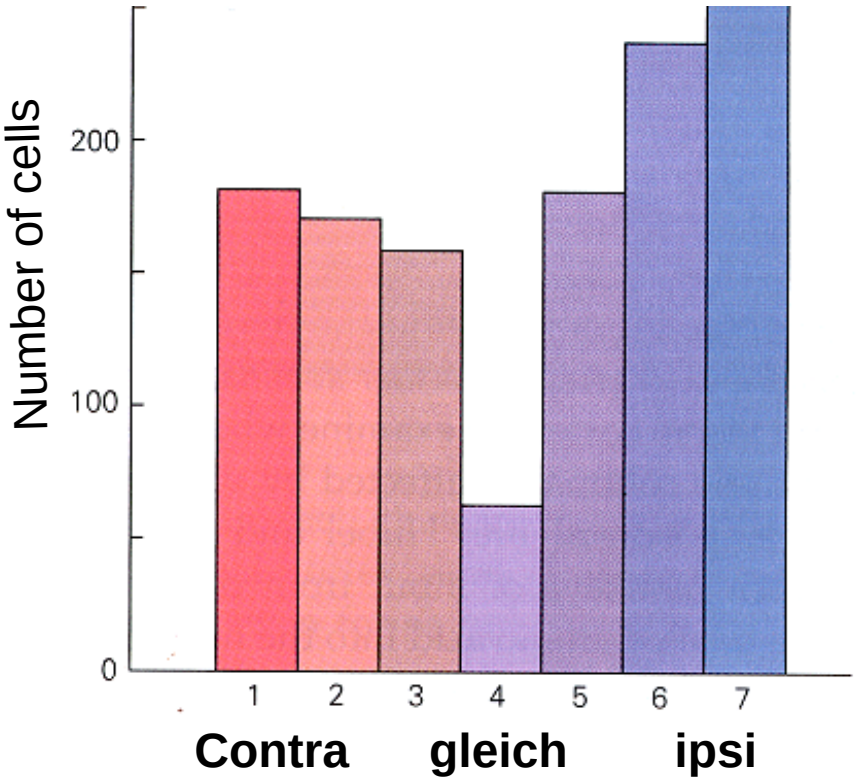
B

Axonverzweigungen

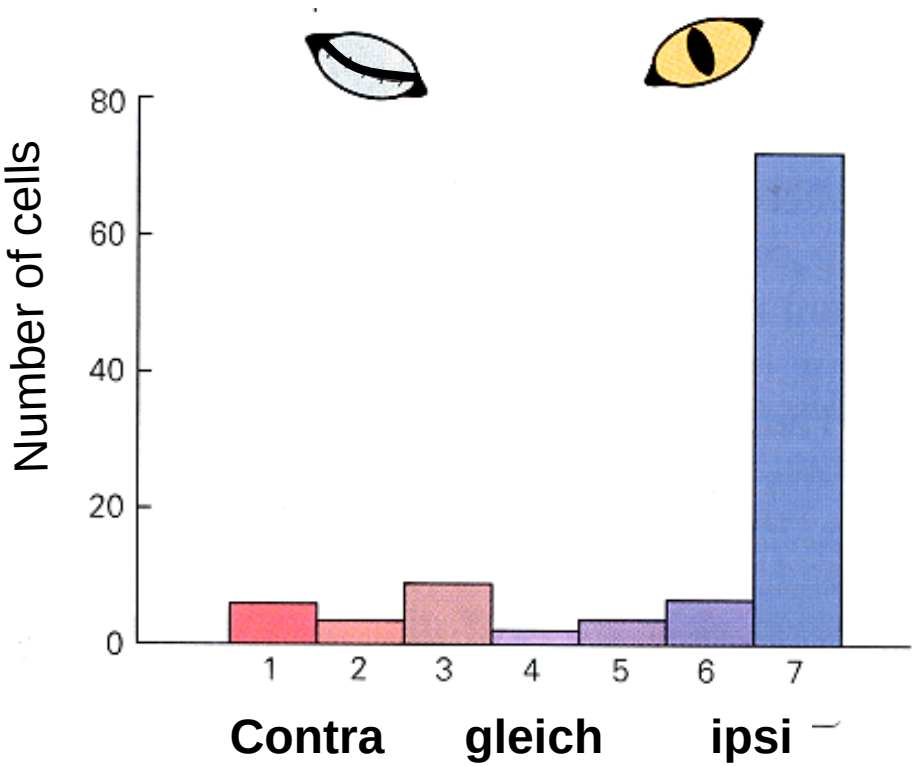
Offenes Auge **Depriviertes Auge**

Kandel 56-3; 56-6

Normale Area 17 (V1) Schicht IV

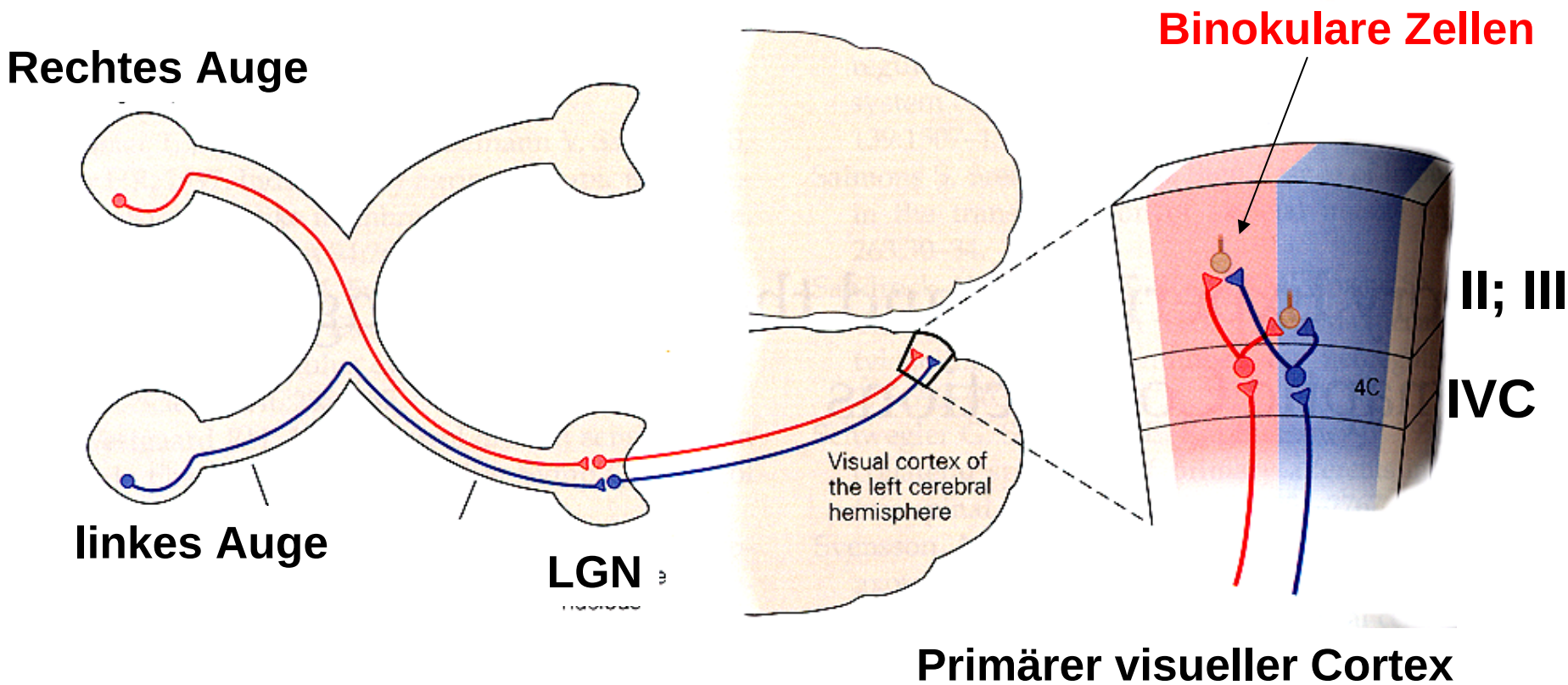


Area 17 nach monokularer Deprivation des contralateralen Auges

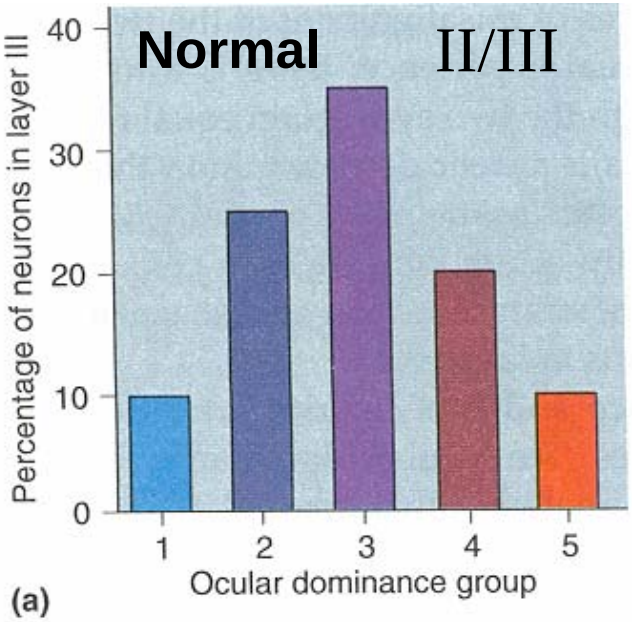


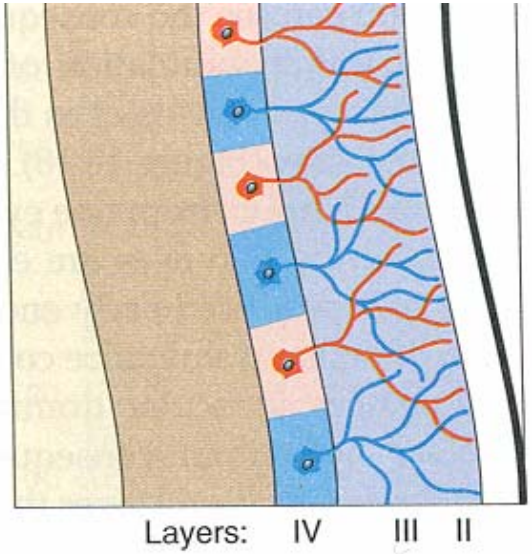
Kandel 56-2

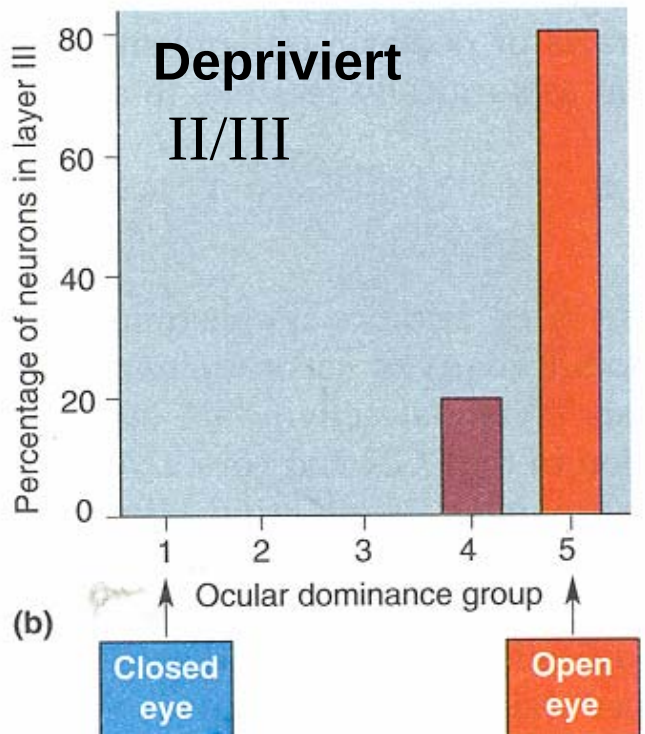
Intracortikale Verschaltungen reifen zuletzt

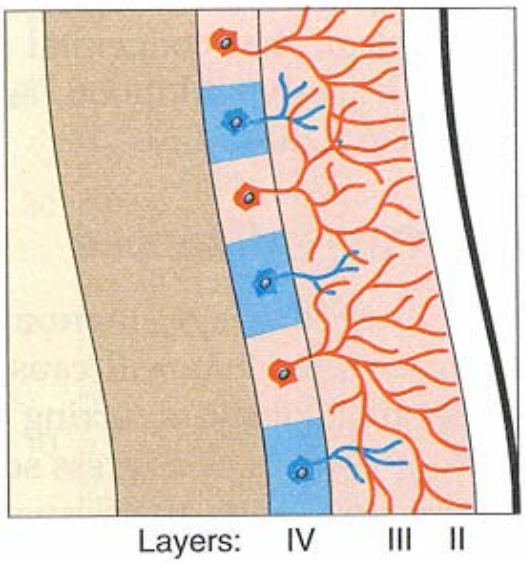


Kandel 56-1







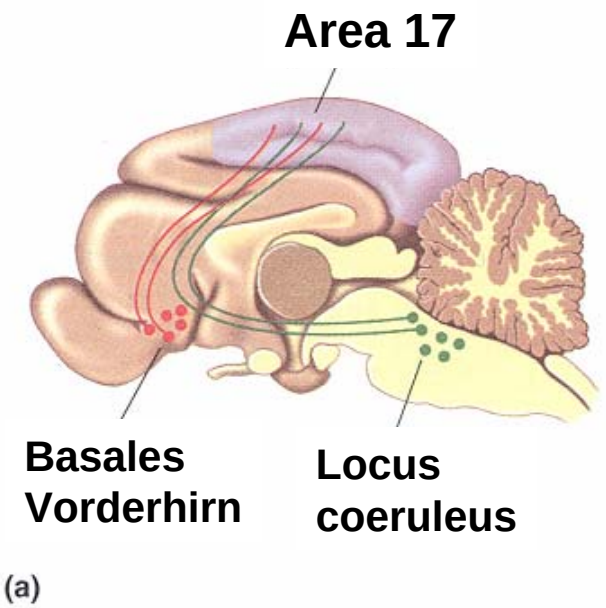


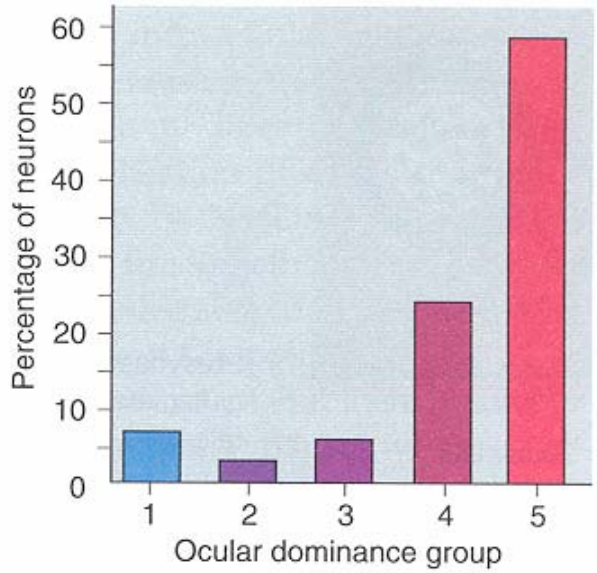
starker Okulardominanz-shift in Schicht II, III

es fehlen nun vor allem binokulare Zellen

Bear 18-6

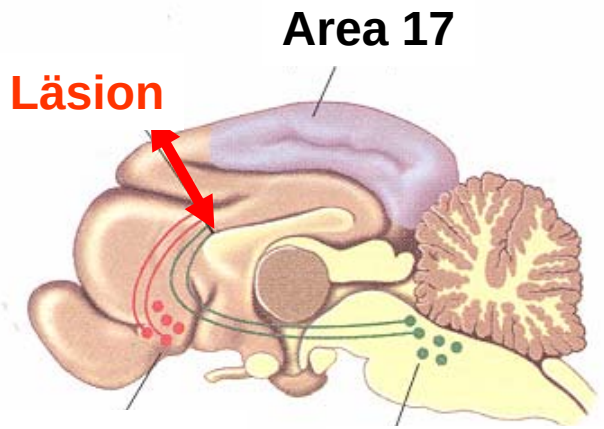
Modulatorische Systeme

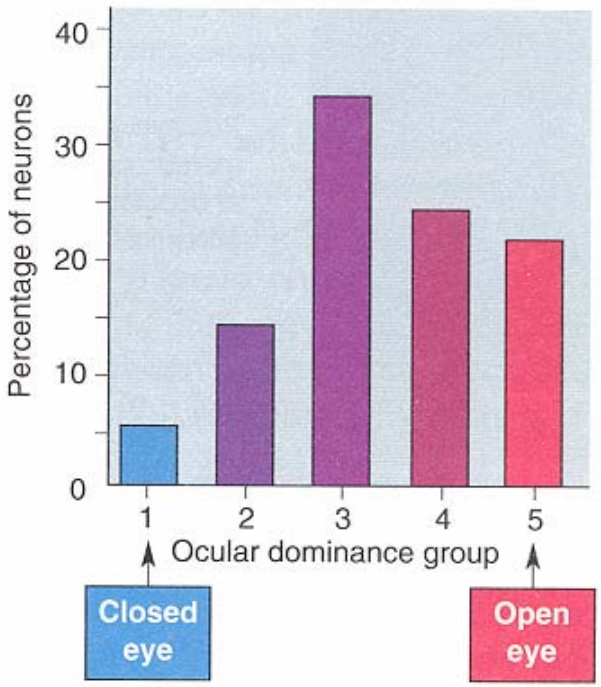




Monoamine (Dopamine,Noradrenalin)

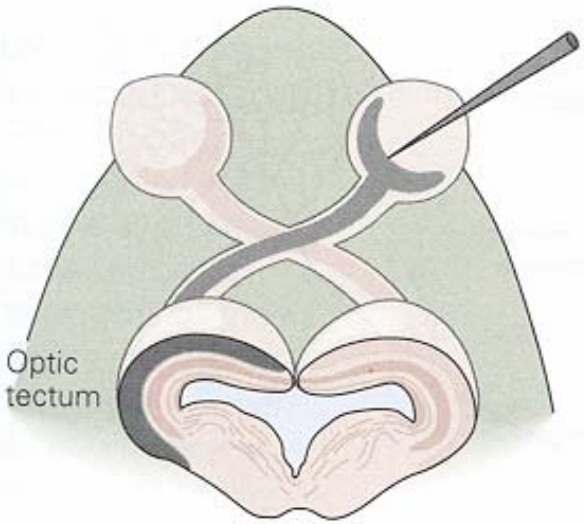
GABAerge Systeme (Reifung beeinflusst durch BDNF, MHC?)

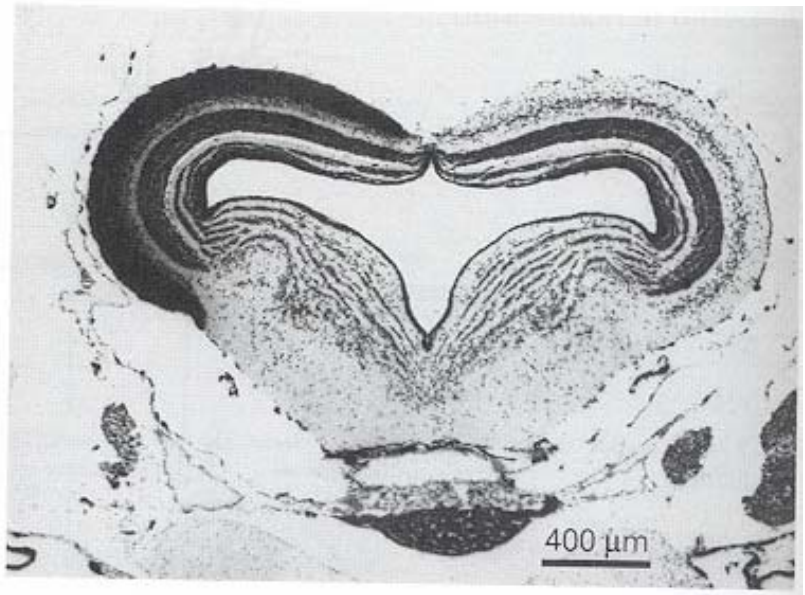




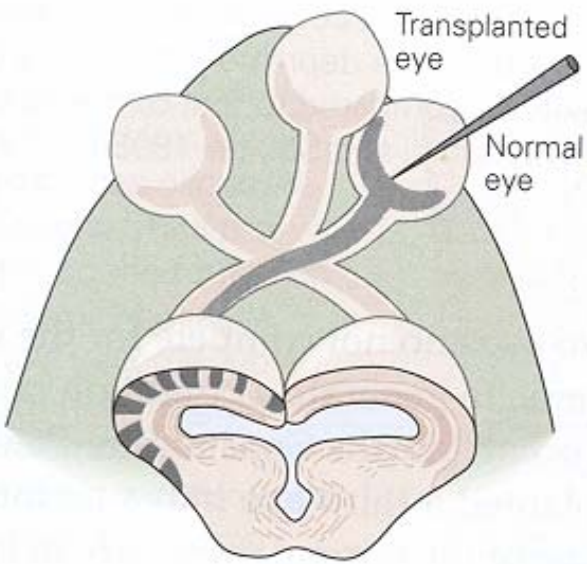
Bear 18.19

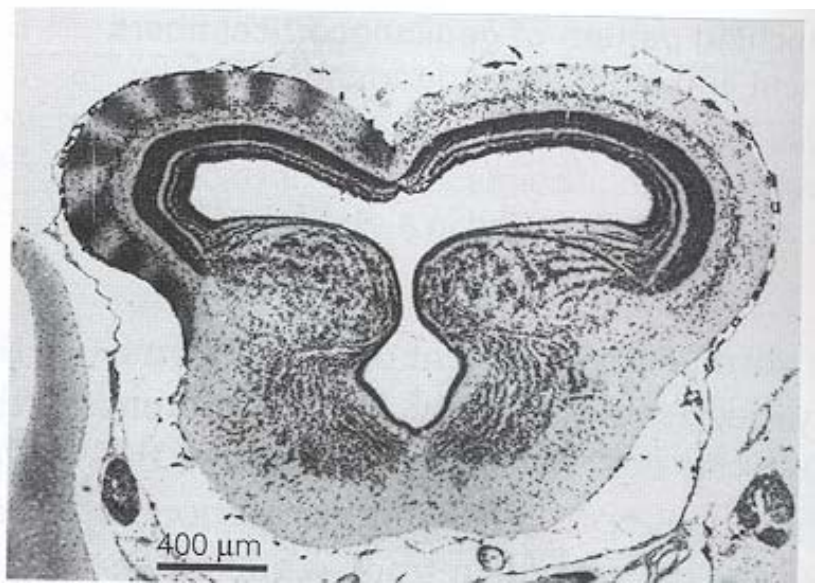
Normal





„3äugiger Frosch: Entwicklung von Okulardominanz





Kandel
56-7;8