Christian-Albrechts-Universität zu Kiel

# Bioelektromagnetismus
# Die neuronale Grundlage unseres Denkens und Handelns

https://tinyurl.com/Bio-Keil-Flensburg

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# Biologische Psychologie

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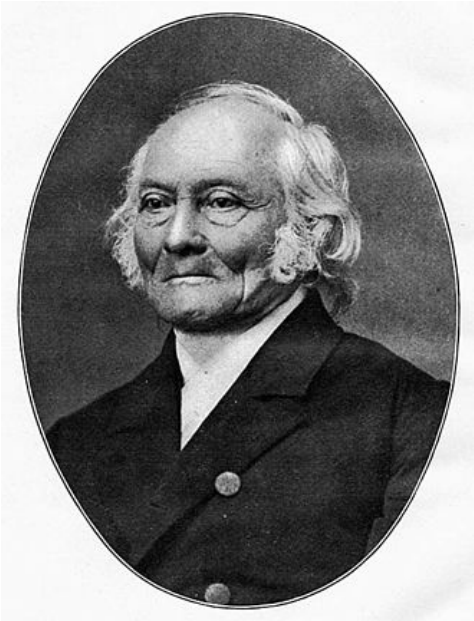
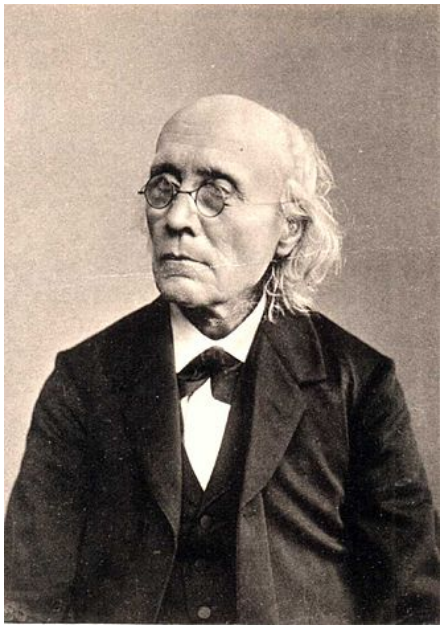
Die wissenschaftliche Untersuchung der biologischen Grundlagen von Verhalten

- Empirische Untersuchungen
- Naturwissenschaftliche Methoden

- Grundlagenforschung
- Tier- und Mensch

- Wahrneh-mung
- Erleben
- Verhalten

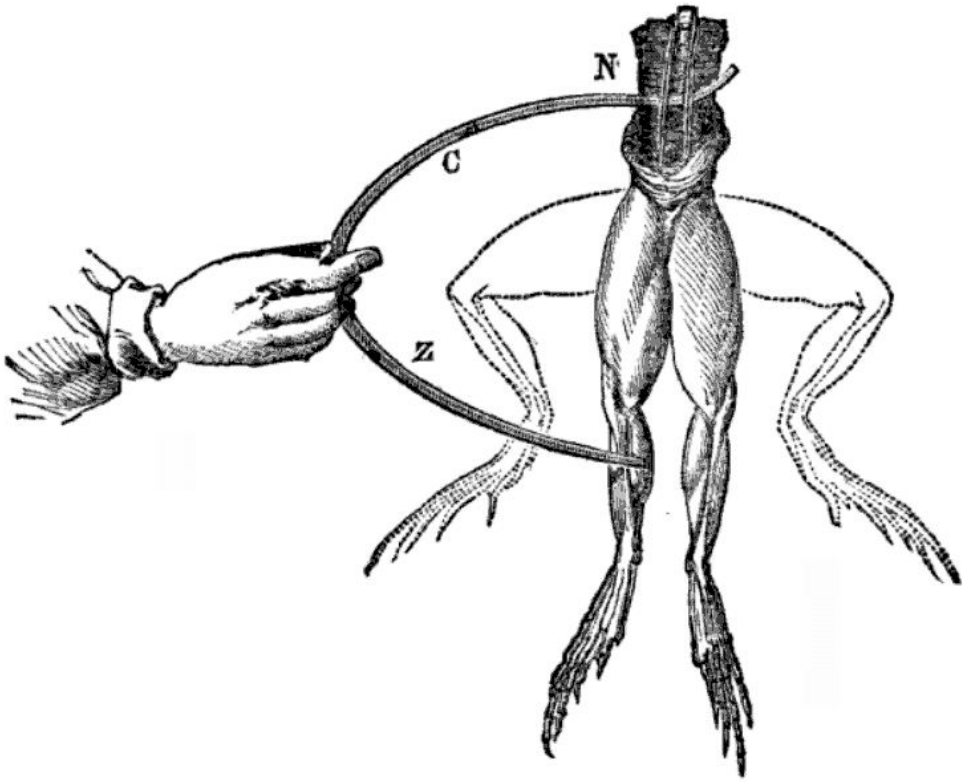


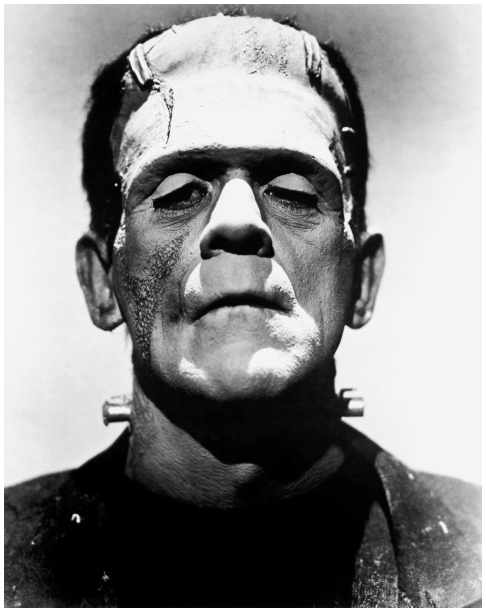


$$p = k \ln S/S_0$$

# Nervenleitung





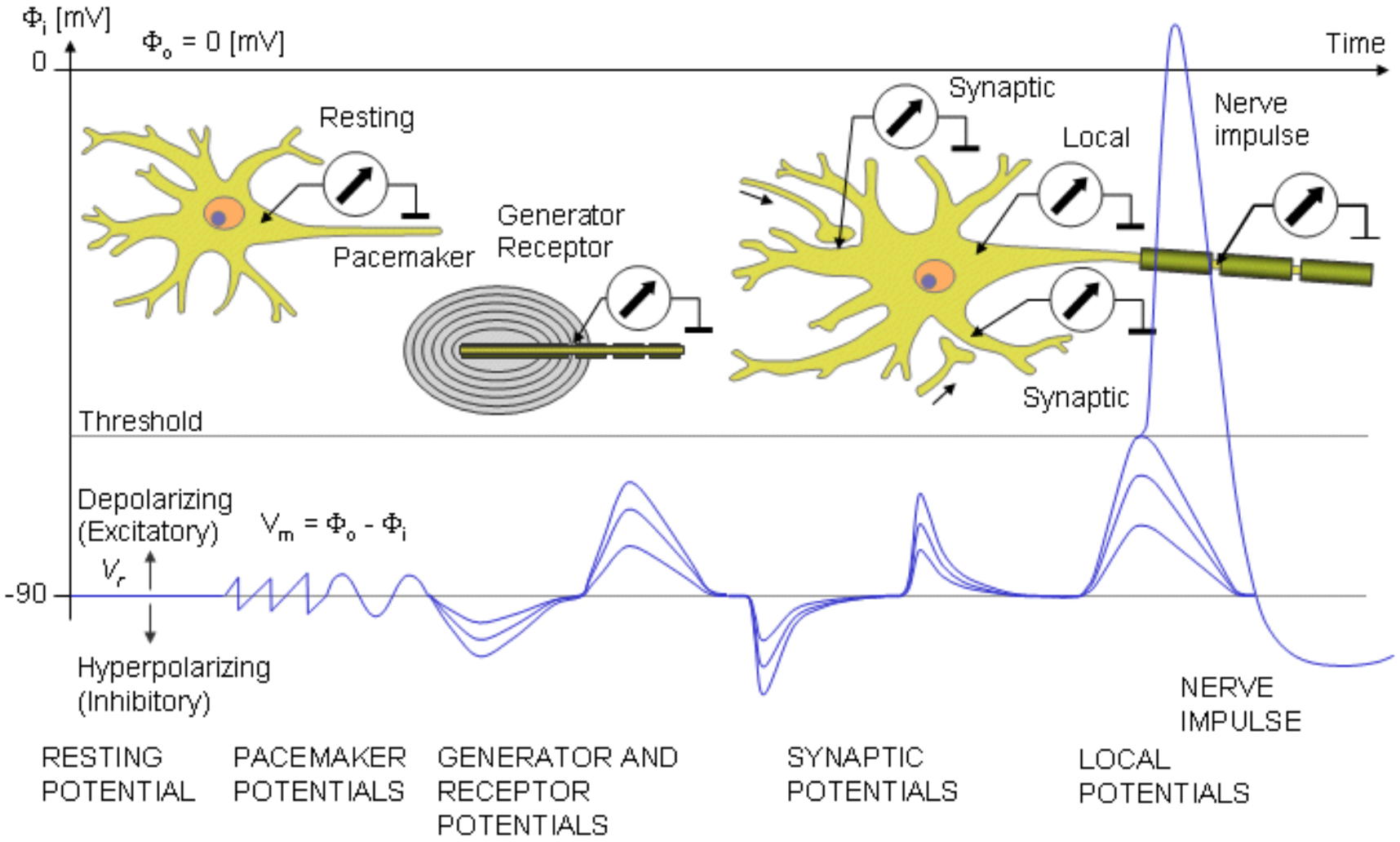



Luigi Galvani

(1737 – 1798)

# Elektrische Potentiale

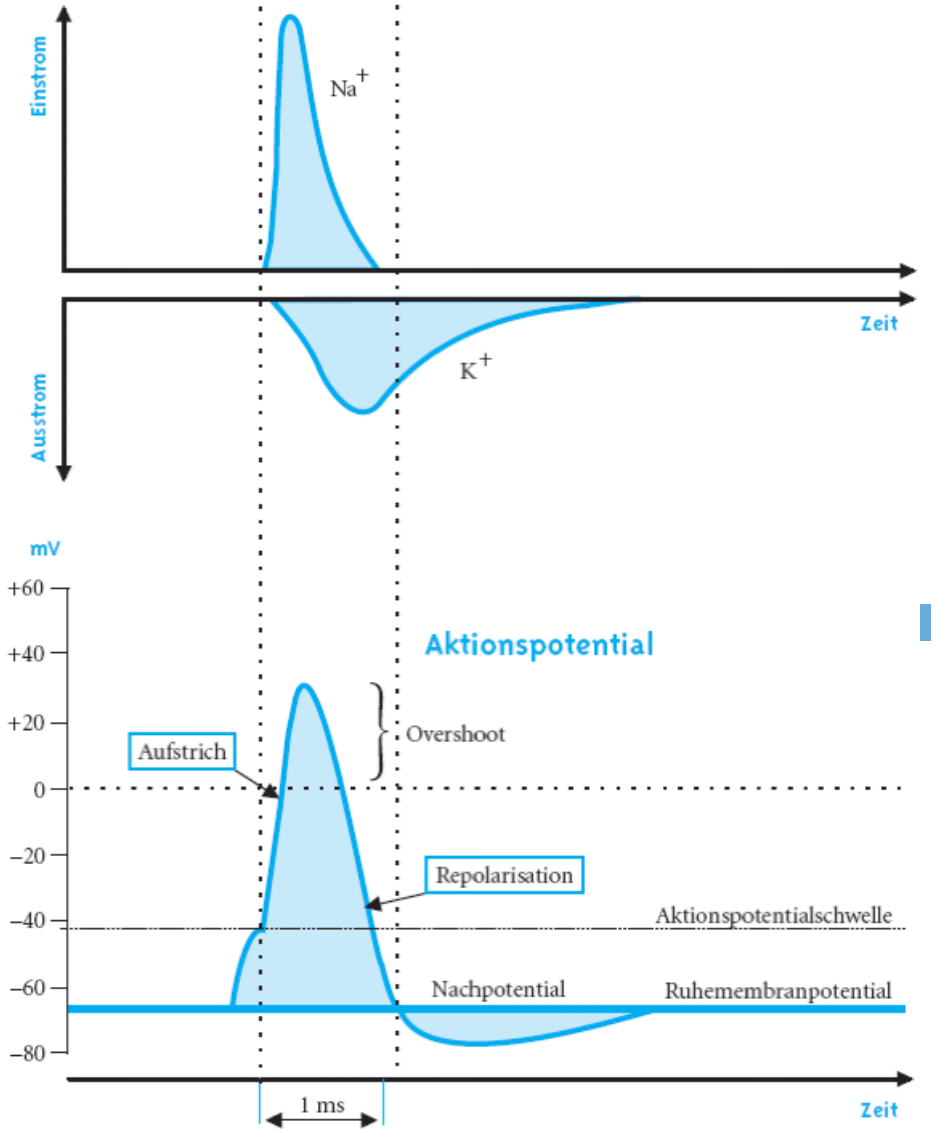




# Aktionspotentiale



1. Depolarisation durch Eingangssignal
2. Depolarisationsschwelle erreicht
   - Natriumkanäle öffnen sich
   - Natrium strömt ein
3. Natriumkanäle inaktiviert
4. Kalium wird aus der Zelle getrieben
   - Repolarisation
   - Hyperpolarisierung
5. Nachpotential
   - Na-K-Pumpe sorgt für Ausgleich



# Chemische Synapse



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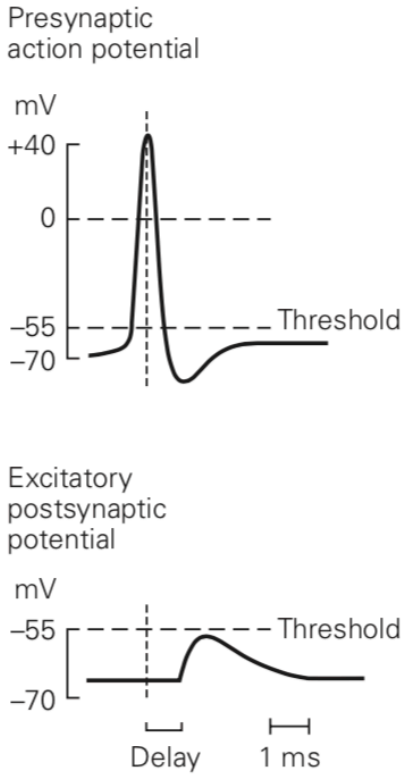
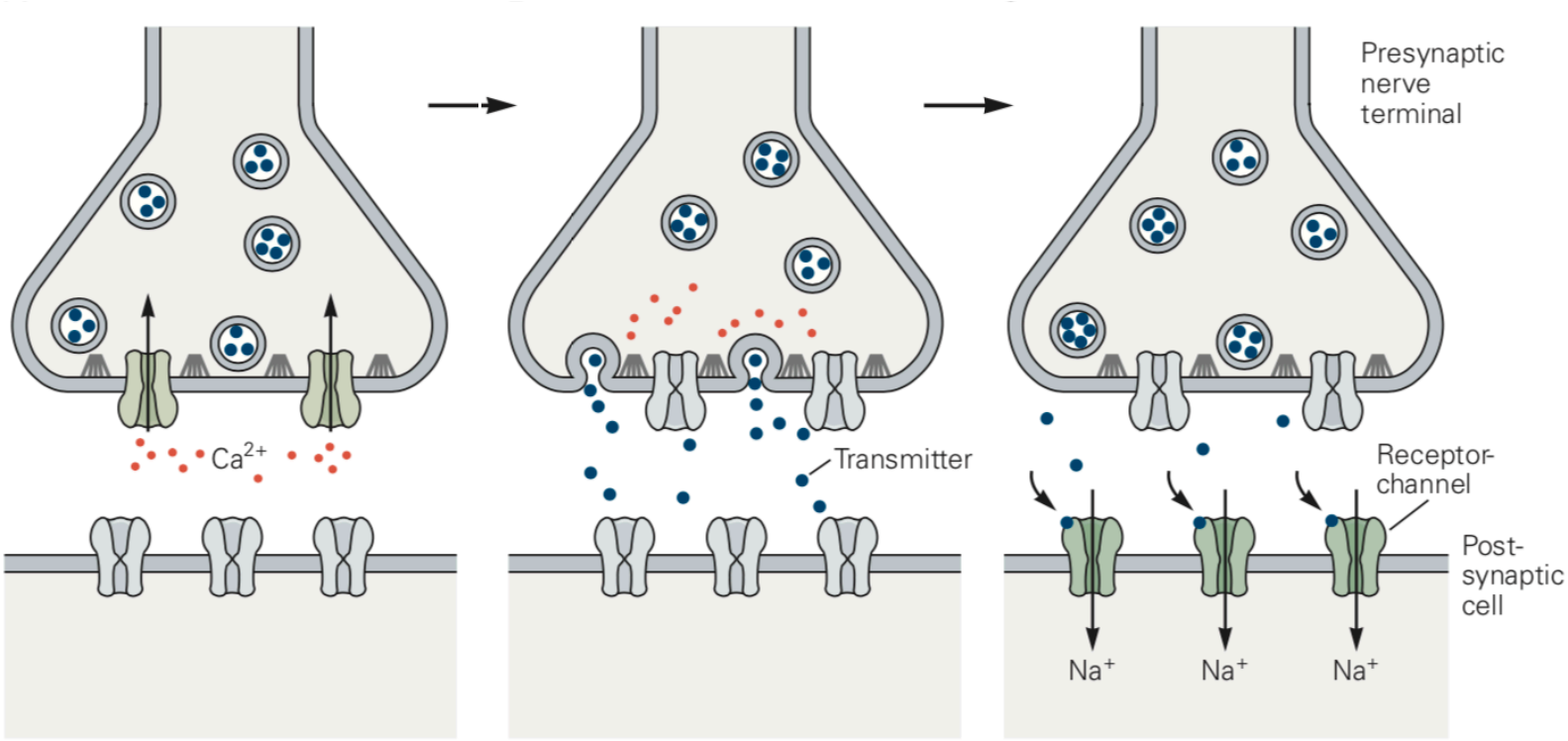



Spannungs-abhängige Aktivierung

Exozytose: Fusion der Vesikel

Endozytose: Aufnahme der Vesikel



# Rate Coding durch Aktionspotentiale

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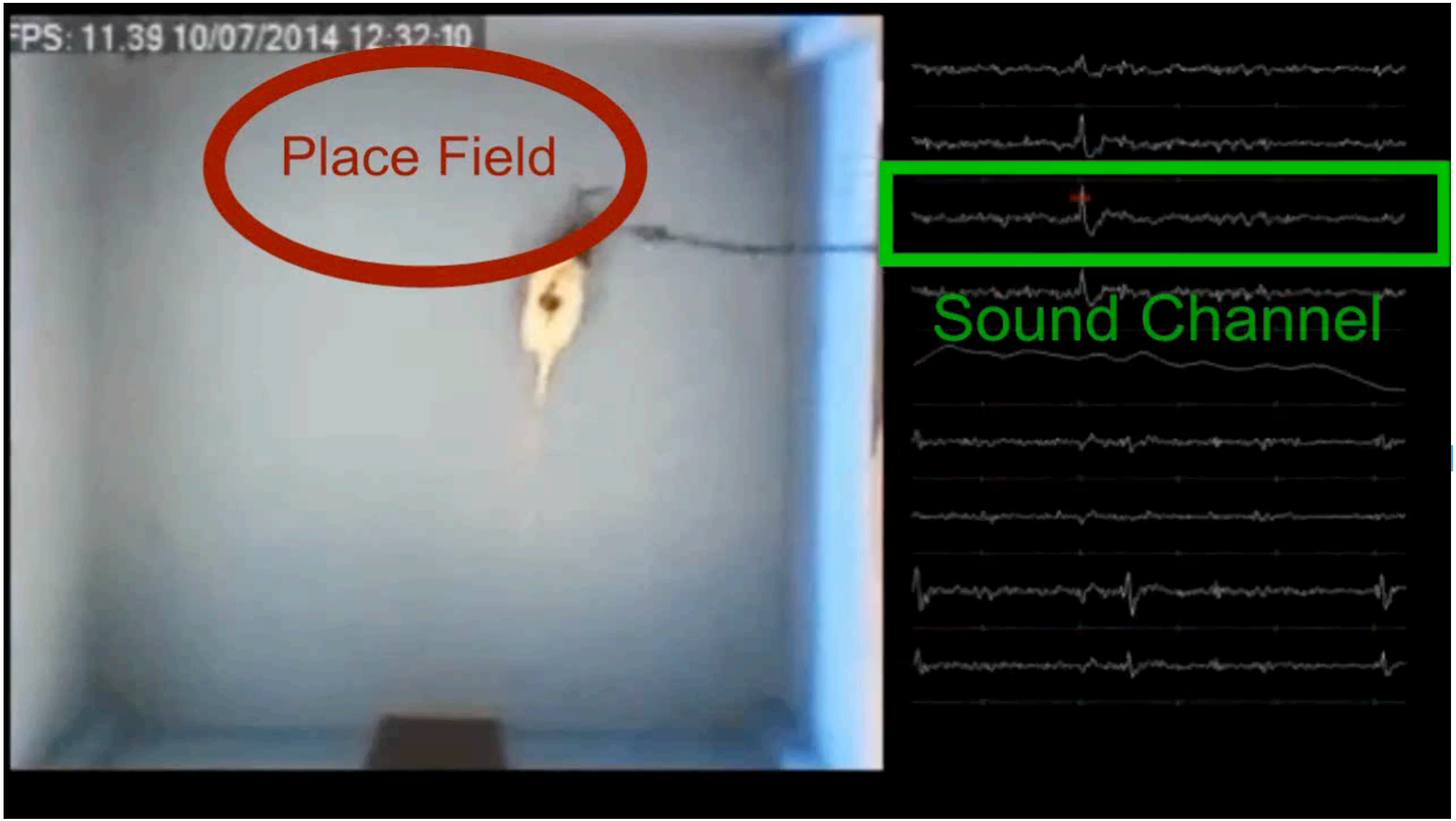

# Hippocampus

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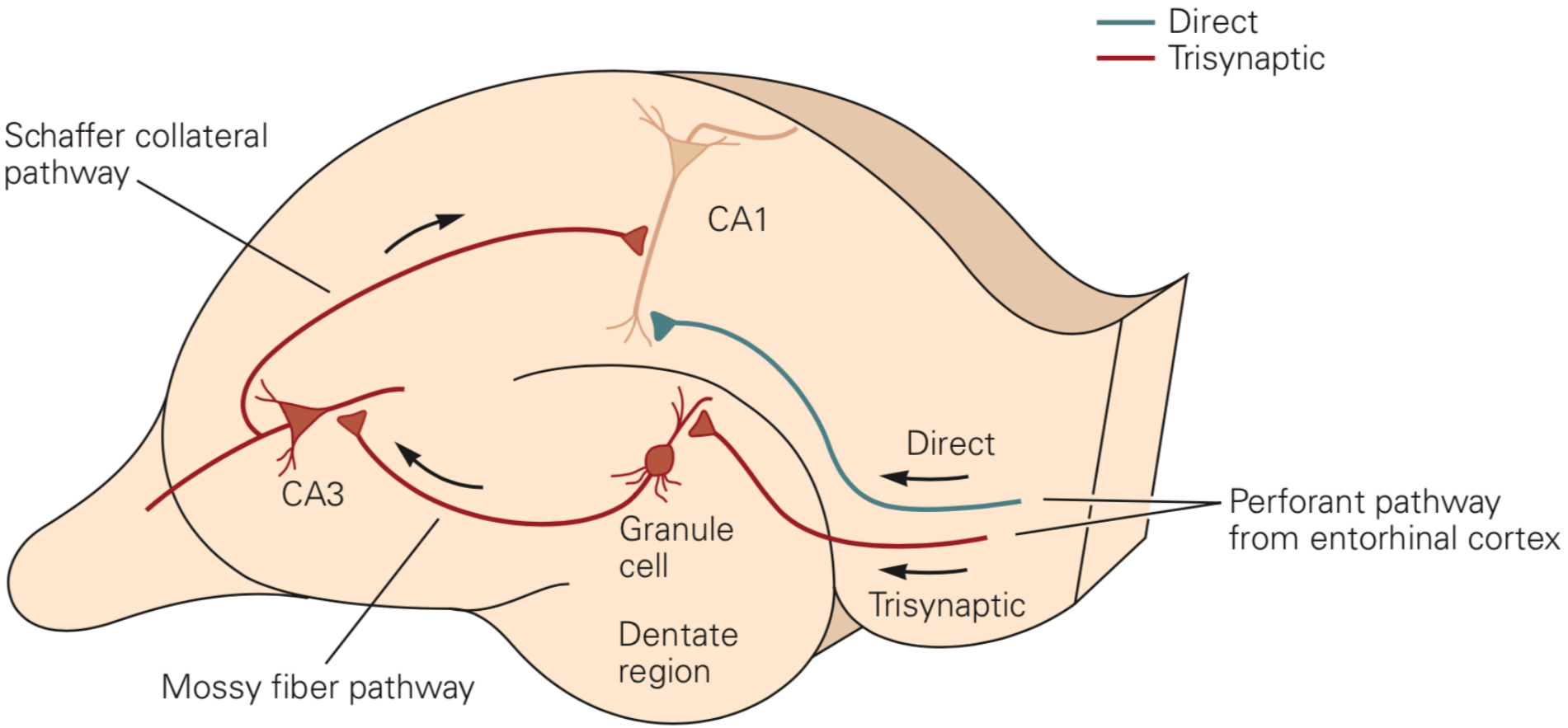

# H.M.

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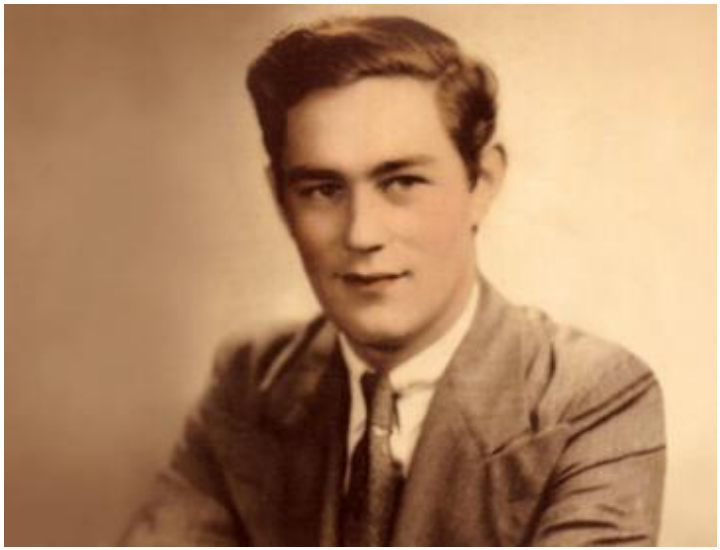

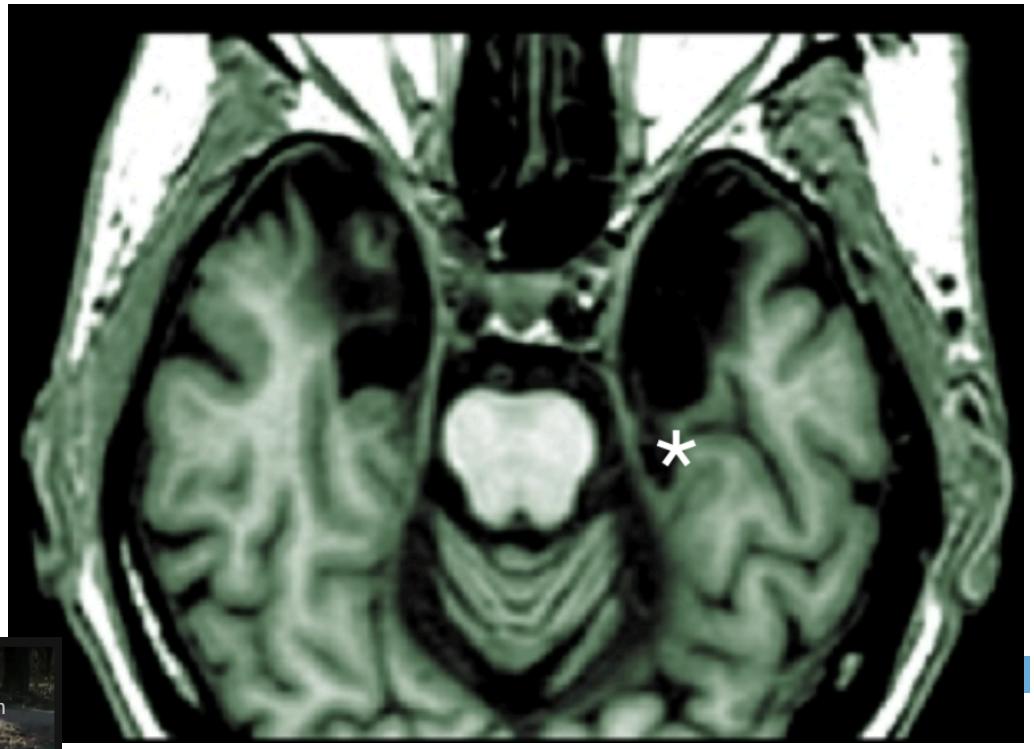

# 2-Phasen-Modell

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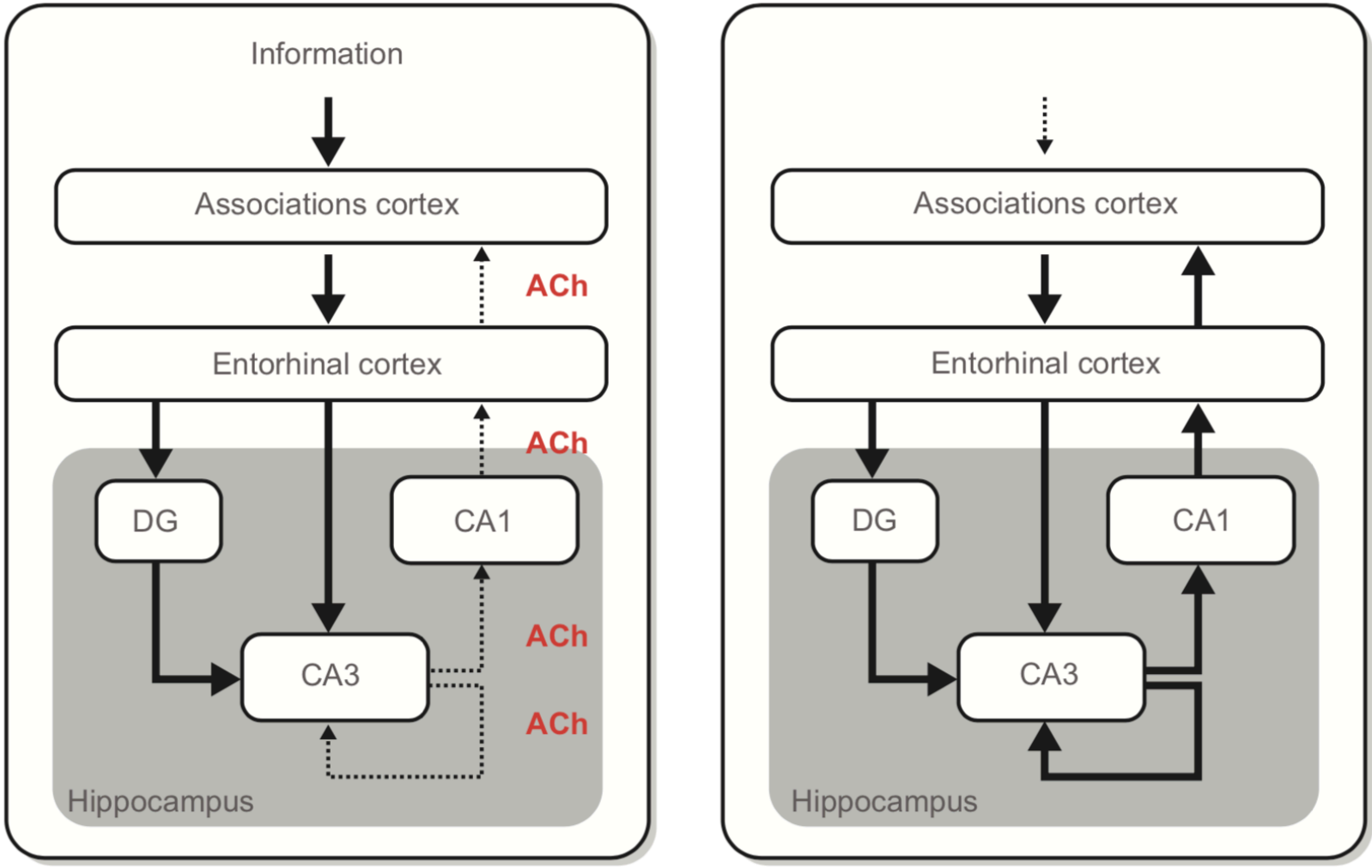
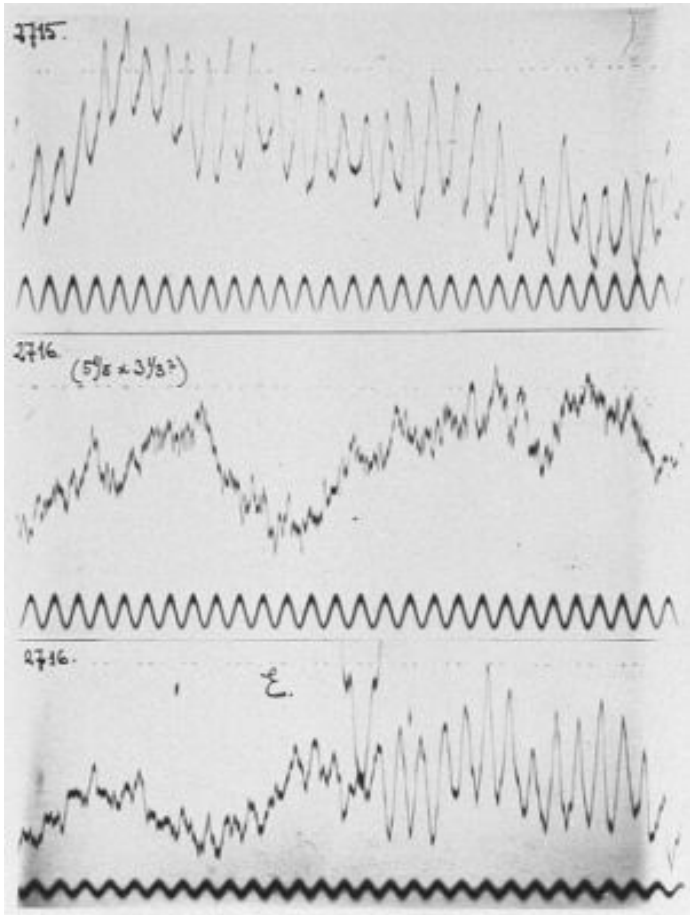


# EEG






1924 von Hans Berger in Jena entwickelt

Ziel: Telepathische Kräfte nachweisen

Ergebnis: Noninvasive Methode zur Messung von Hirnaktivität

# EEG

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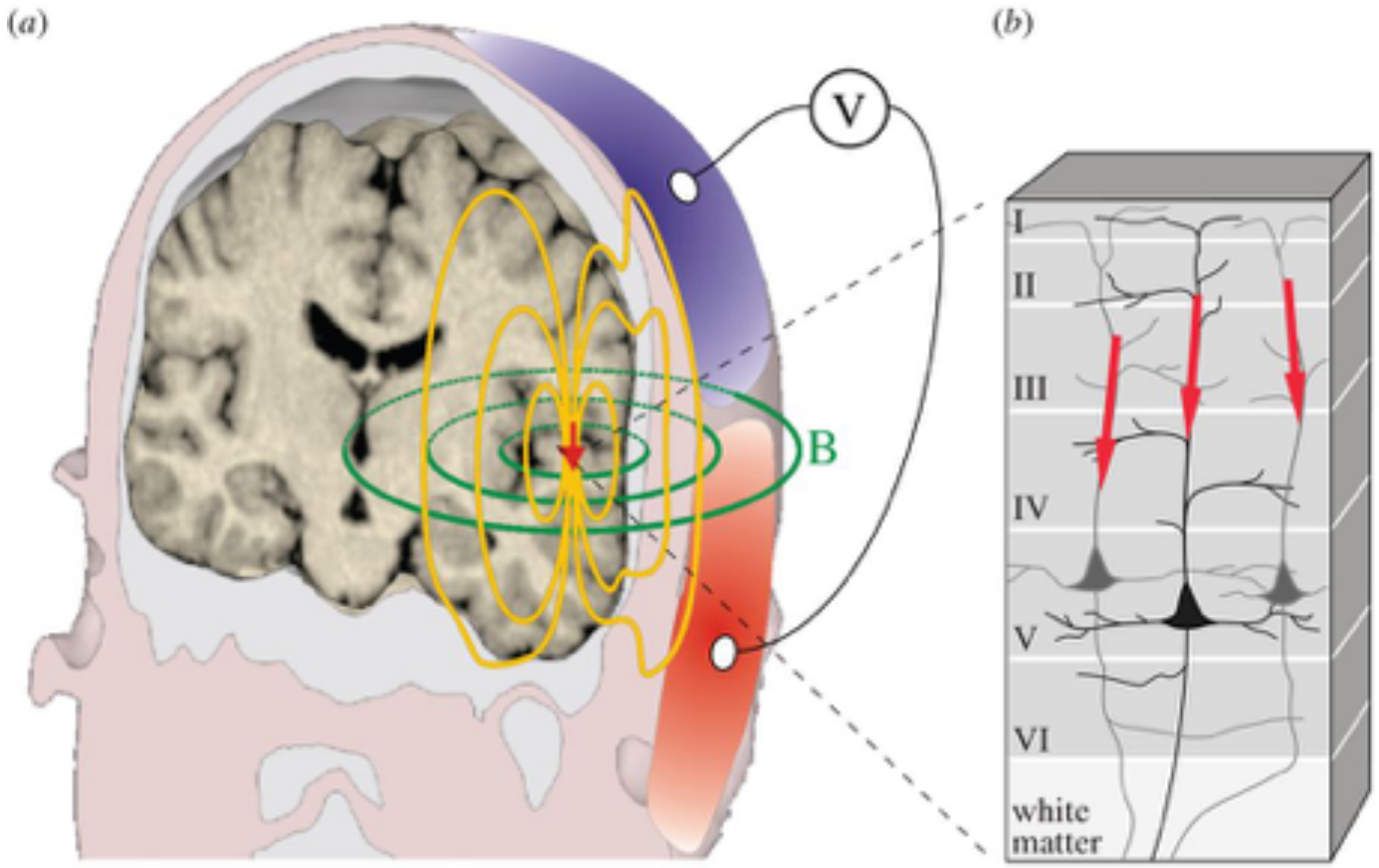


Afferente Bahnen:
Layers 2 & 3: Intracortical
Layer 4: Thalamus

Efferente Bahnen:
Layer 5: Basalganglien, Hirnstamm, Rückenmark
Layer 6: Thalamus

# Steuerungsmechanismen

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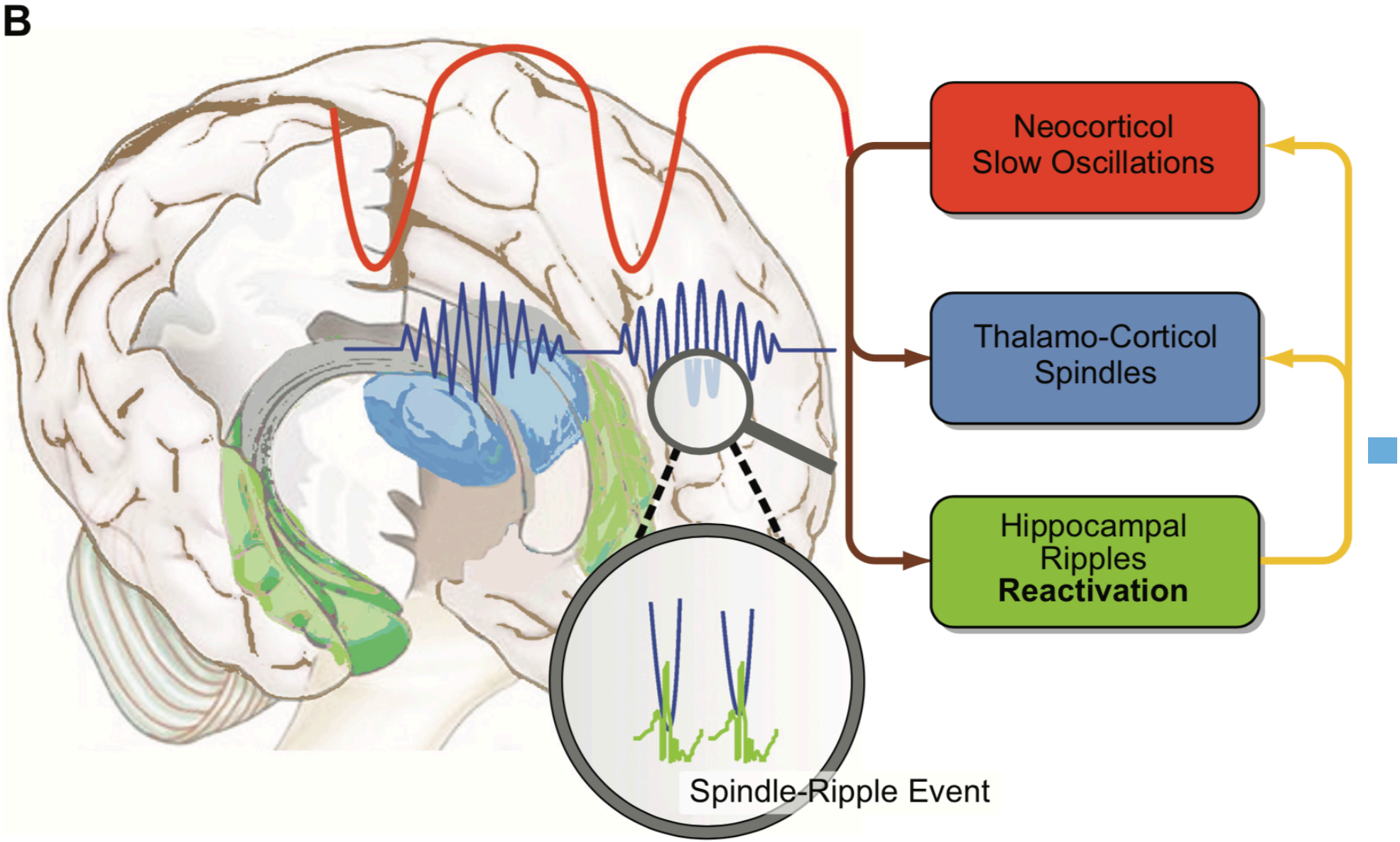

# Hirnstimulation

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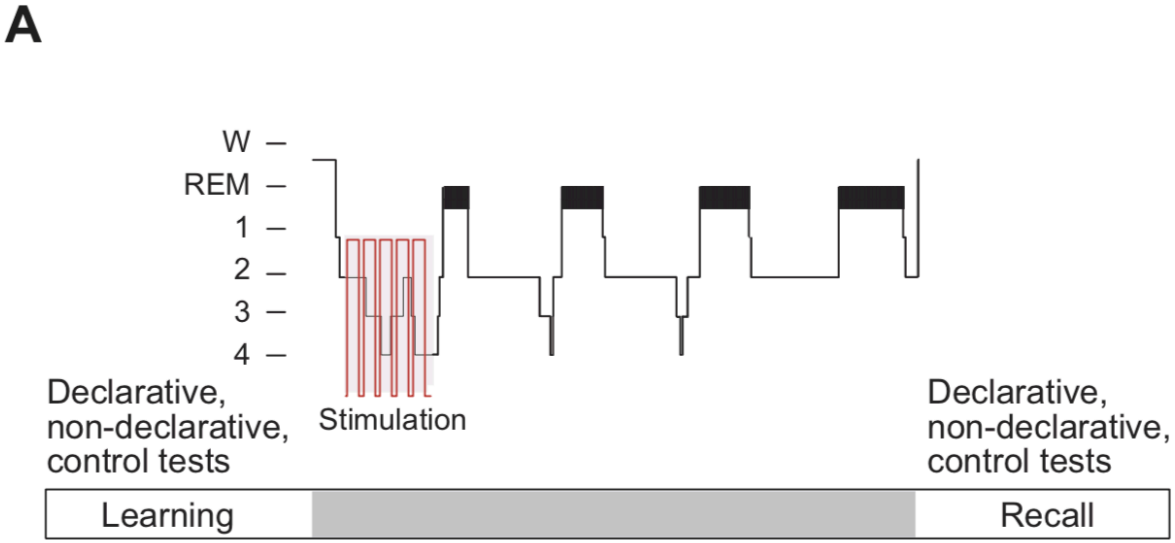


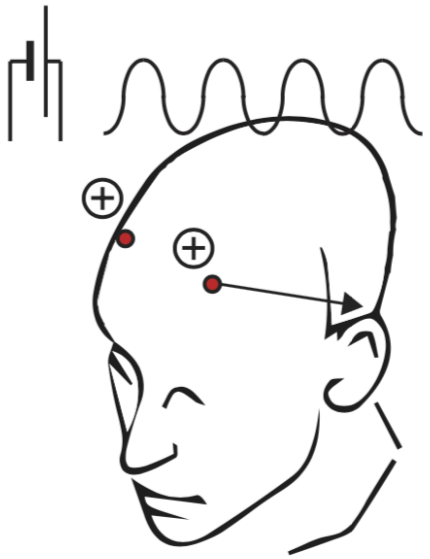

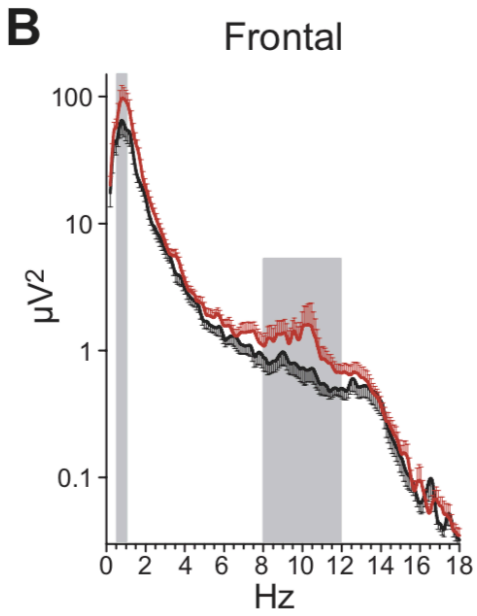


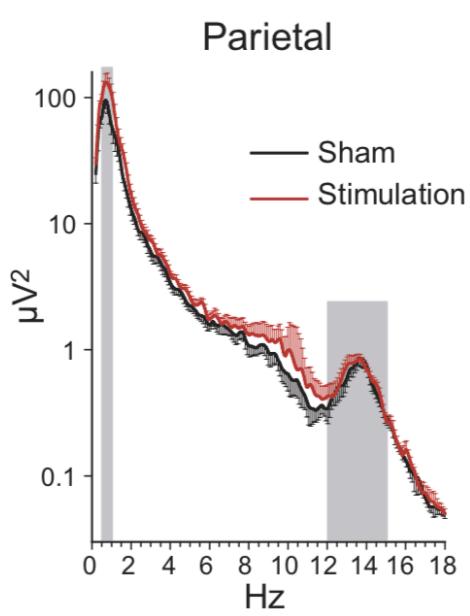


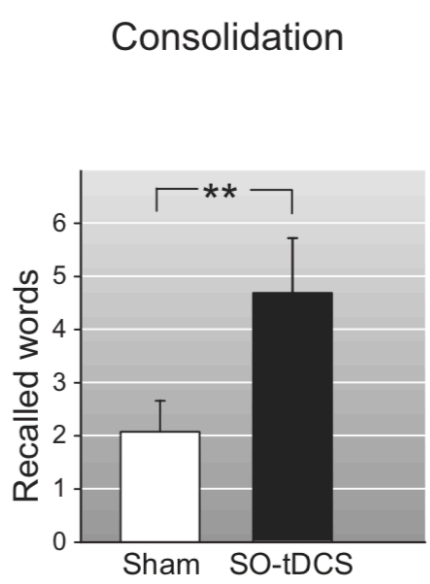

# Ausblick: Lernen und Gedächtnis



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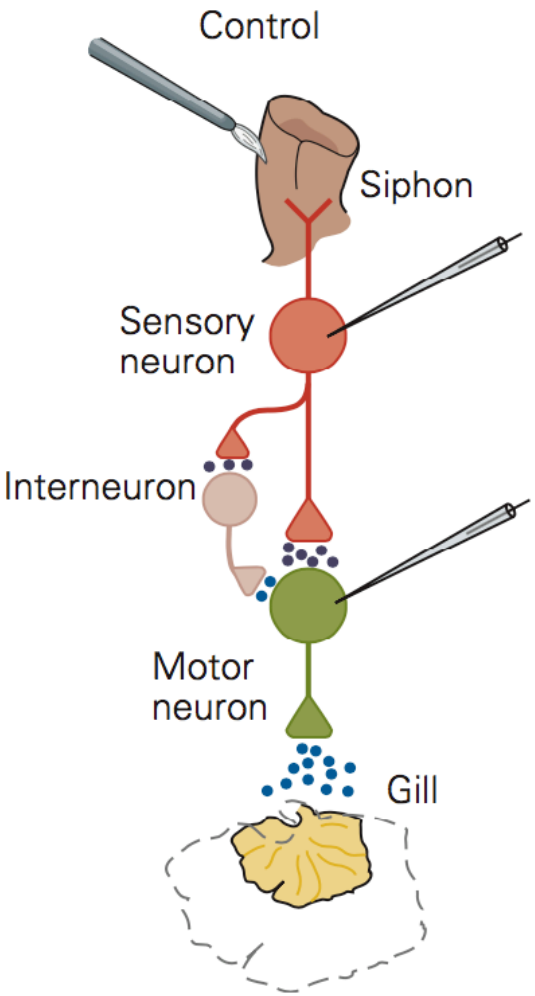


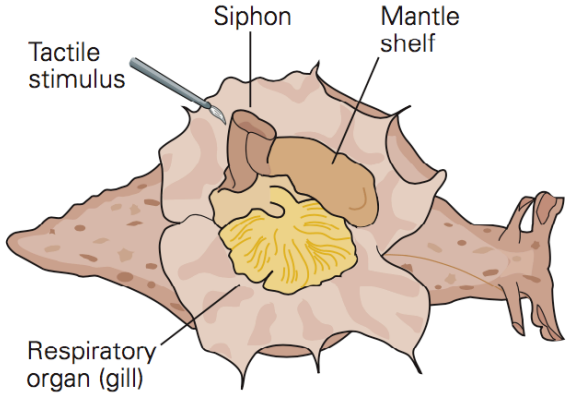


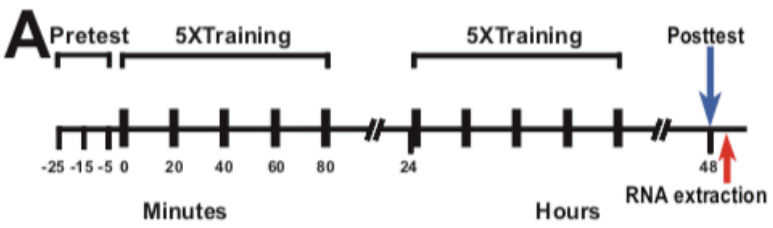


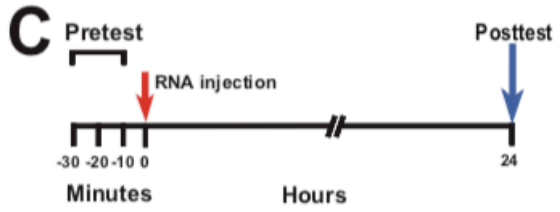


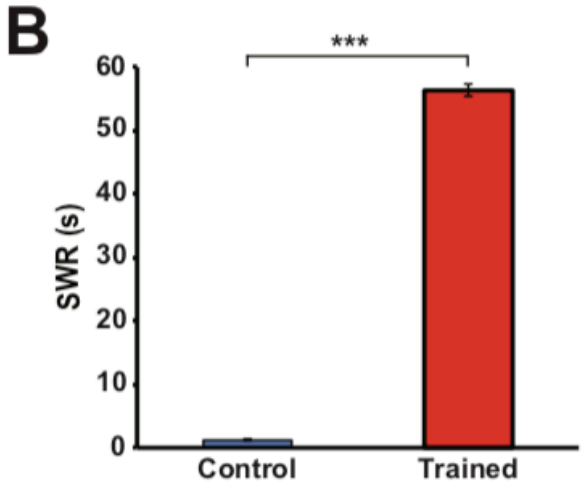


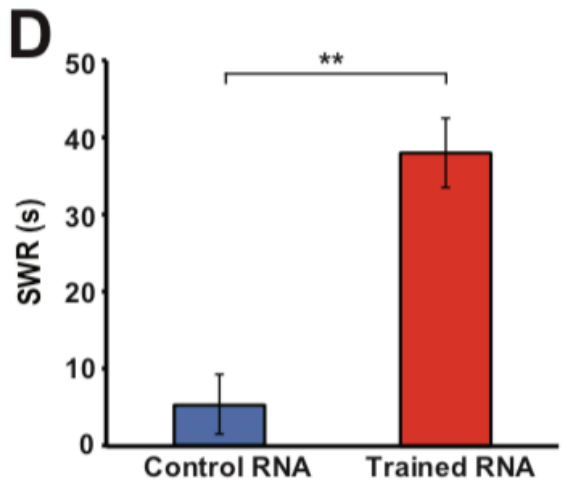


Bédécarrats et al., 2018

# Zusammenfassung

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- Bioelektrizität als Grundlage der Informationsübertragung in Nervenzellen
  - Informationen verändern das Membranpotential (Sensoren)
  - Summierte Depolarisation aktiviert $Na^+$-Kanäle
    - Aktionspotential
  - Aktionspotential am Axonterminal aktiviert $Ca^{2+}$-Kanäle
    - Neurotransmitterfreisetzung
  - Neurotransmitter binden an Rezeptoren, die Ionen passieren lassen
    - Veränderung des Membranpotentials
- Informationen lassen sich unter anderem in der Feuerrate codieren (Rate Coding)
  - Feurrate hängt mit stärke der synaptischen Übertragung zusammen
  - Langfristige Veränderungen synaptischer Übertragung sind Grundlage von Lernen und Gedächtnis

# Literatur

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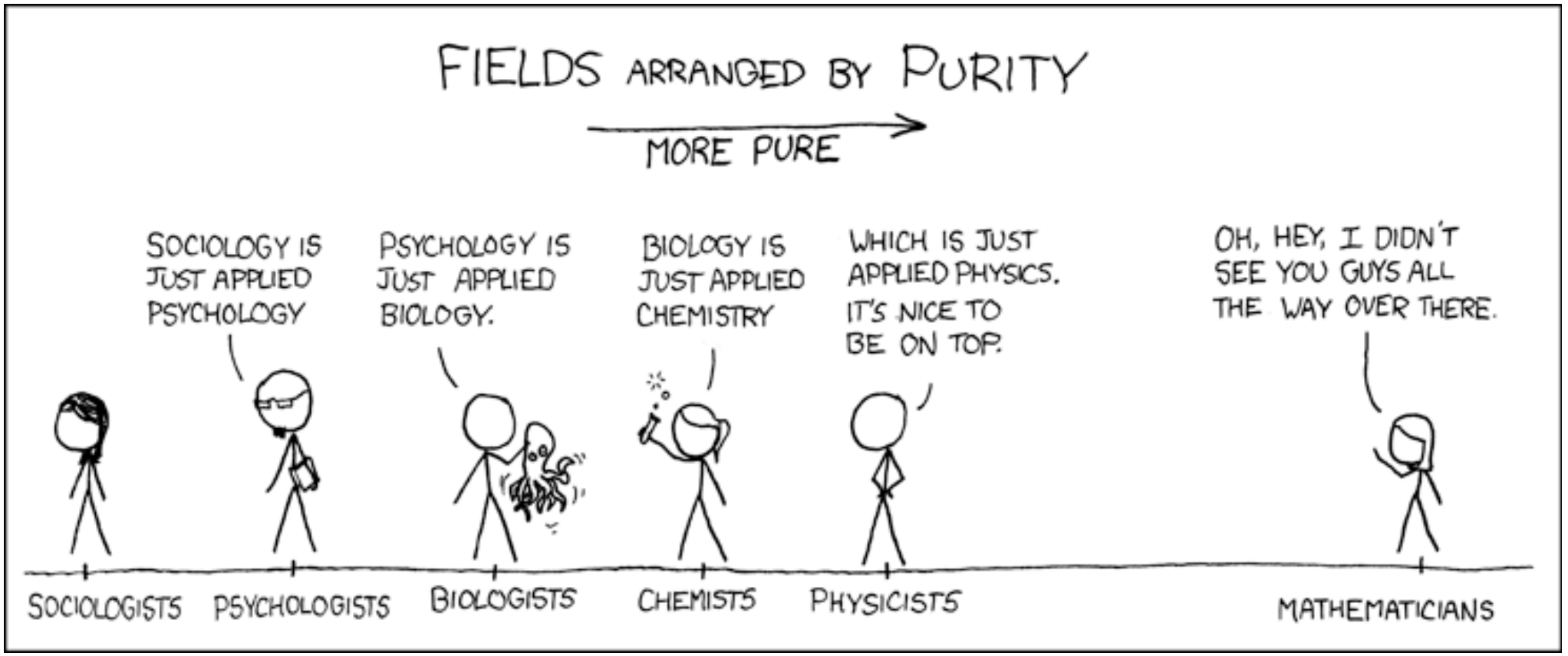
# Psychologie






https://xkcd.com/435/

# Teilfächer der Psychologie

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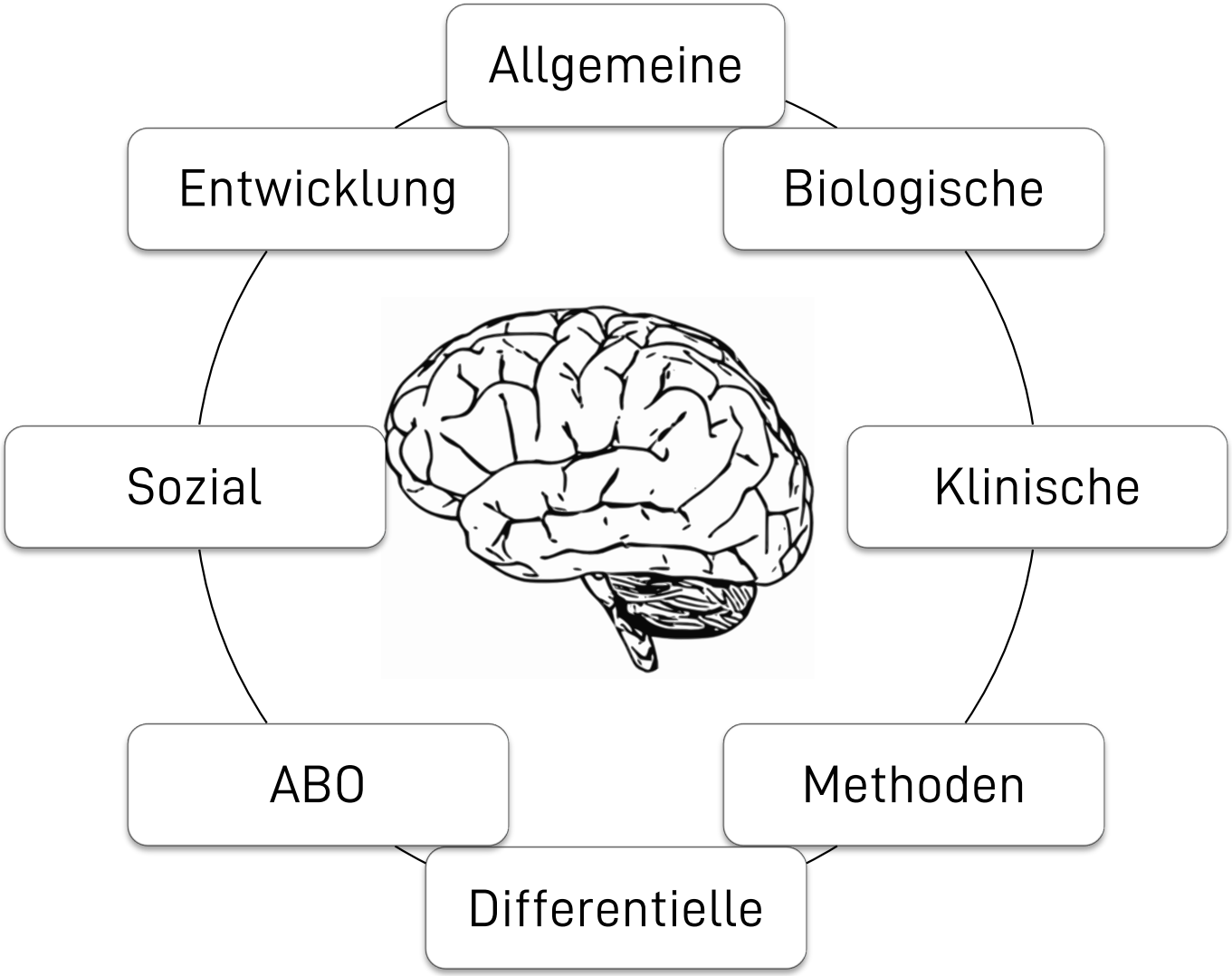

# Verwandte Fächer