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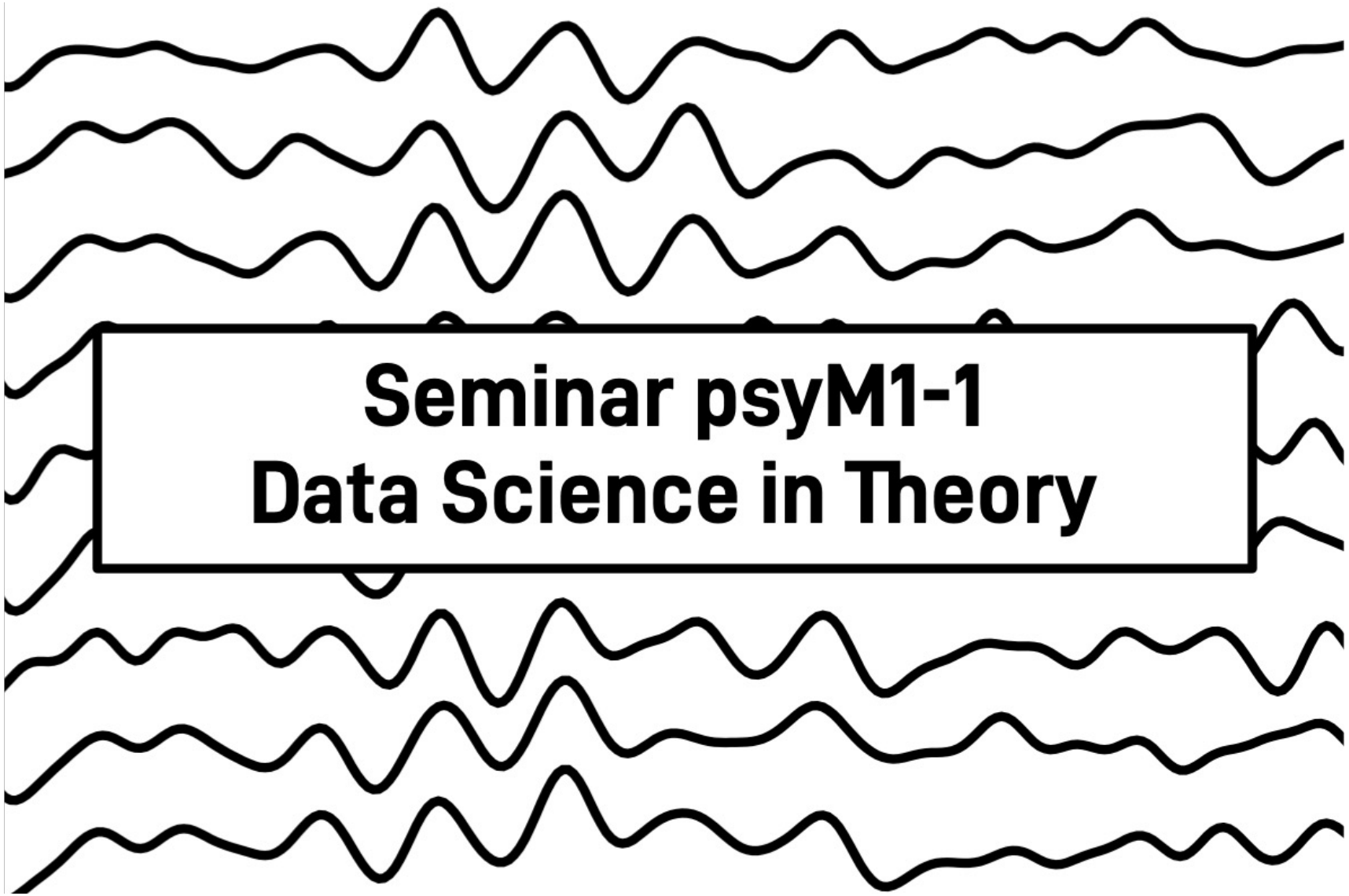

Letzte Woche:
Weight Vectors? Was ist das?

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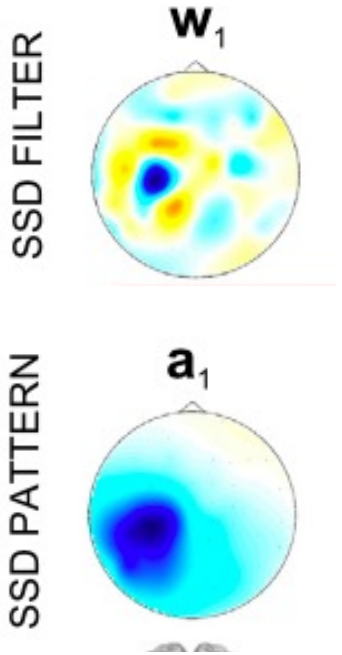
On the interpretation of weight vectors of linear models in multivariate neuroimaging ☆

Stefan Haufe [a,b,*], Frank Meinecke [c,a], Kai Görgen [d,e,f], Sven Dähne [a], John-Dylan Haynes [d,e,b], Benjamin Blankertz [f,b], Felix Bießmann [g,a,*]

Often it is desired to interpret the outcome of these methods with respect to the **cognitive processes under study**. Here we discuss **which methods allow for such interpretations** [...].

- What are “forward” and “backward" models?
  - What are **key concepts**?
- How can we **interpret** the parameters (results) of these models?
- What is the **problem** with the interpretation?



Raum vs. Zeit

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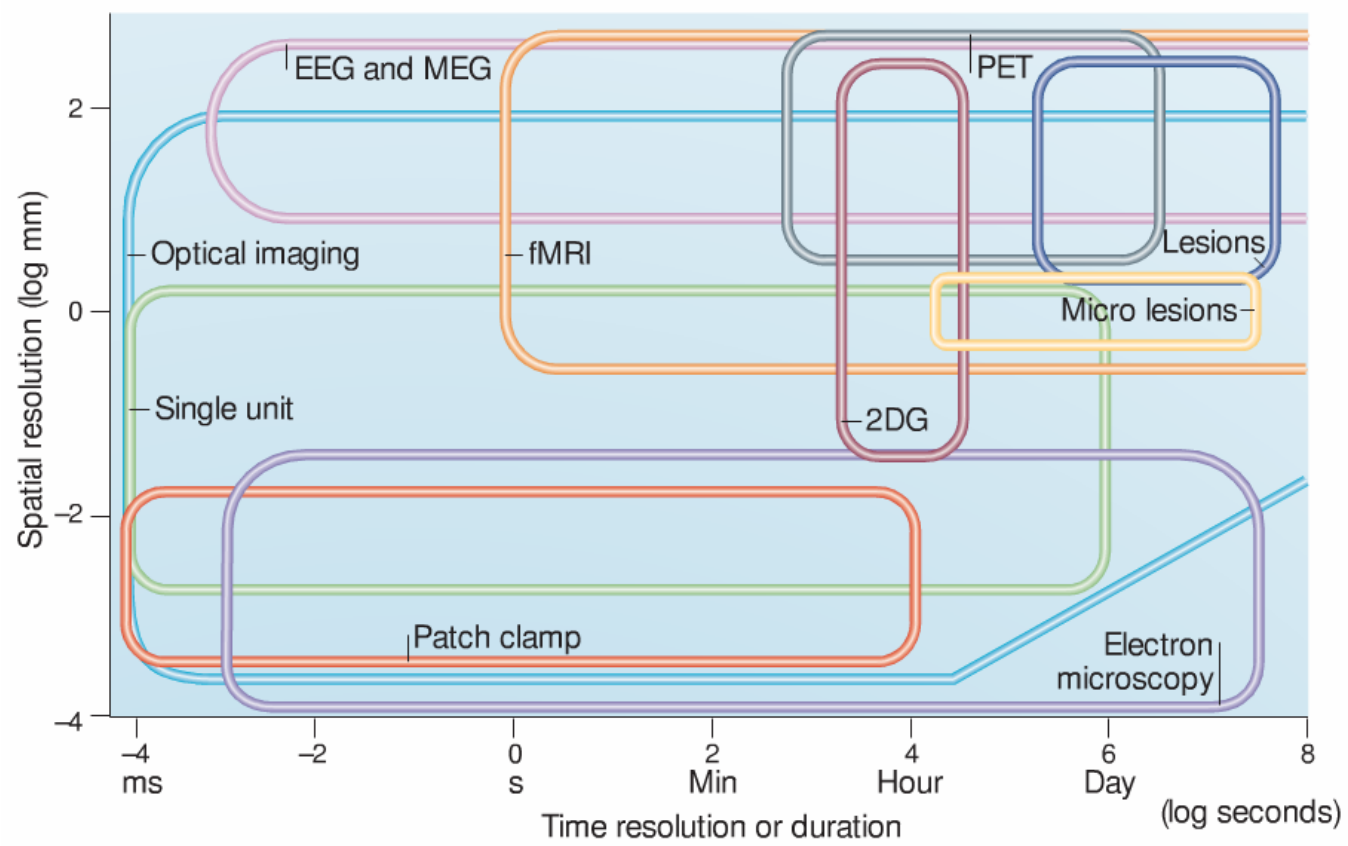
EEG: zeitlich hoch auflösend,
räumlich begrenzt



fMRI: zeitlich begrenzt,
räumlich hoch auflösend

MRI

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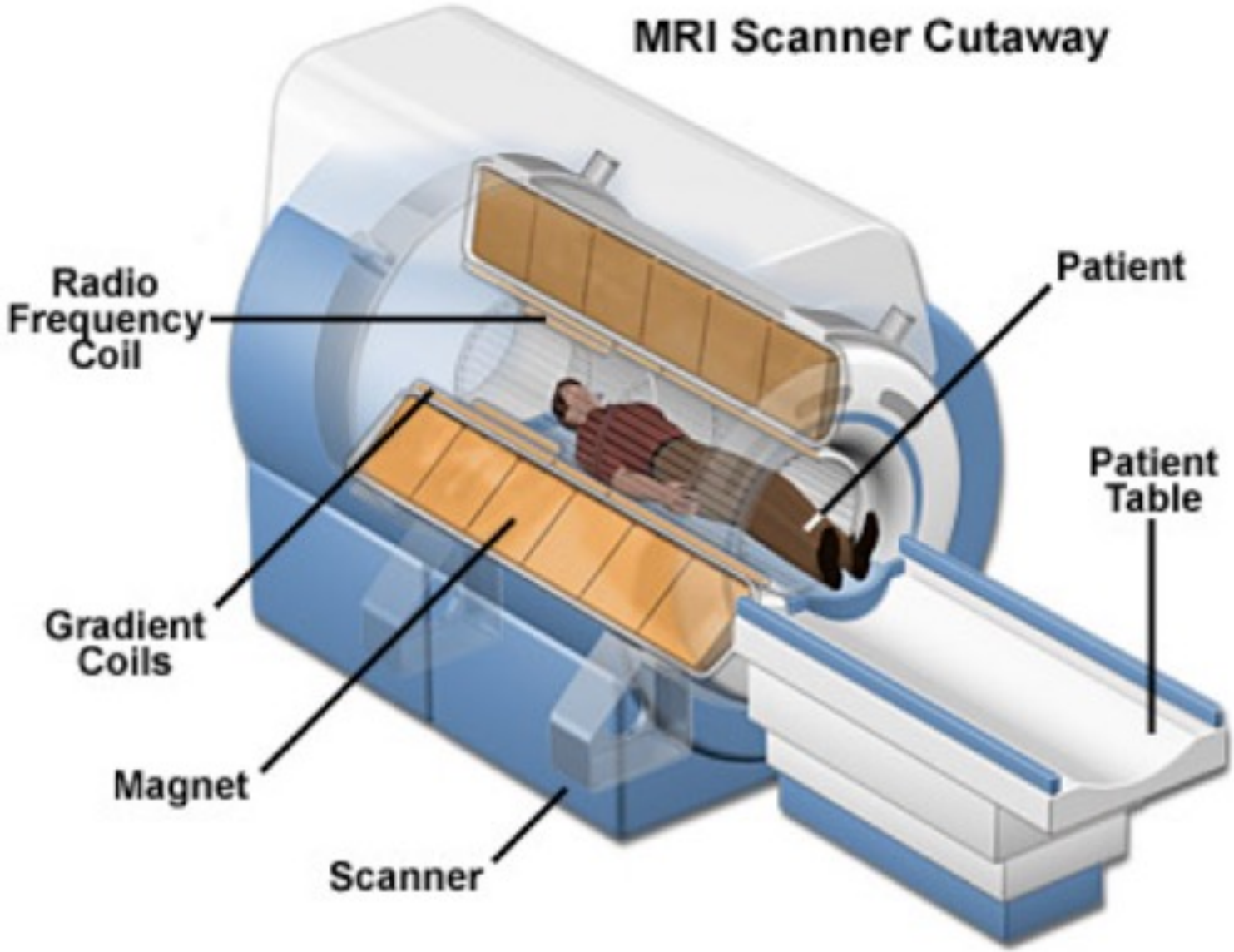
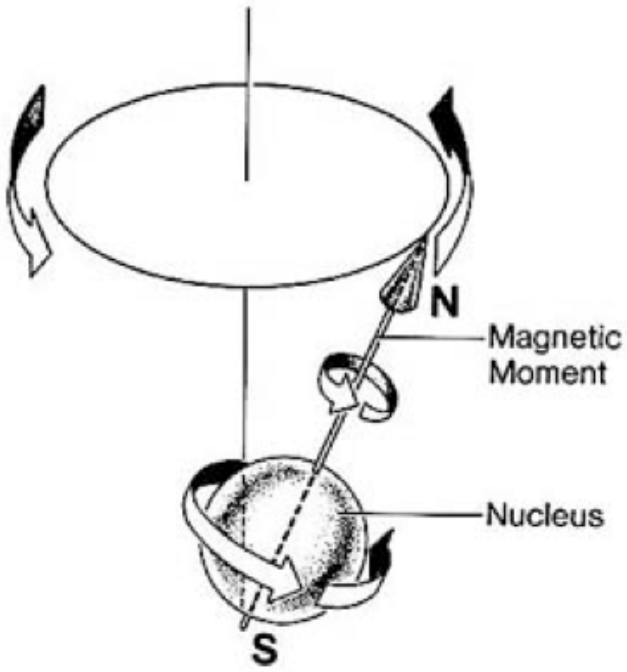
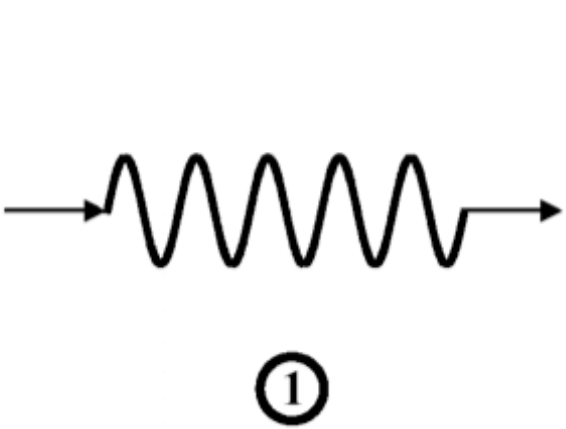
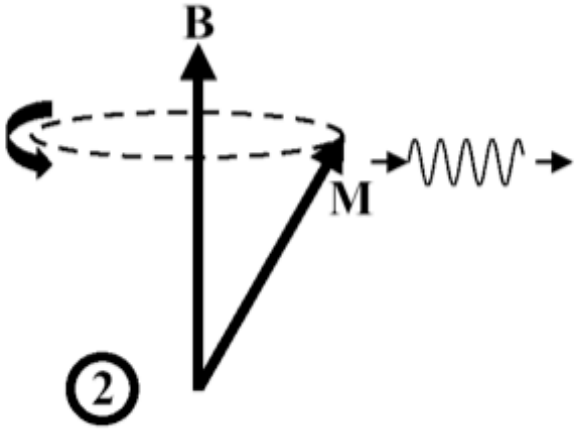


MRI





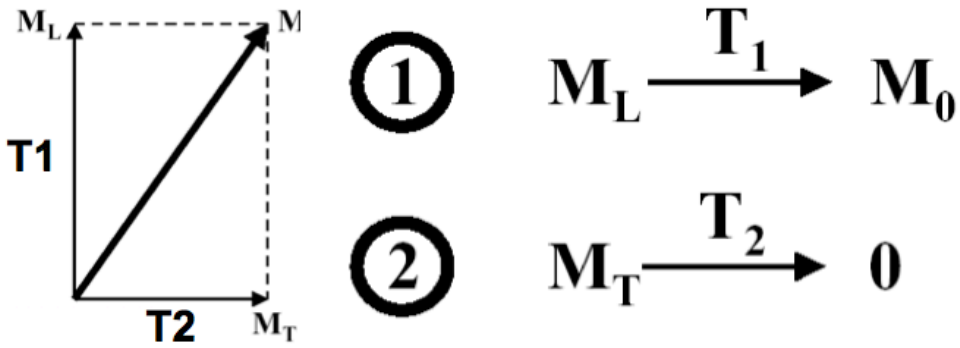
① Send an *external radio signal*, *exactly* with the „Larmor frequency“

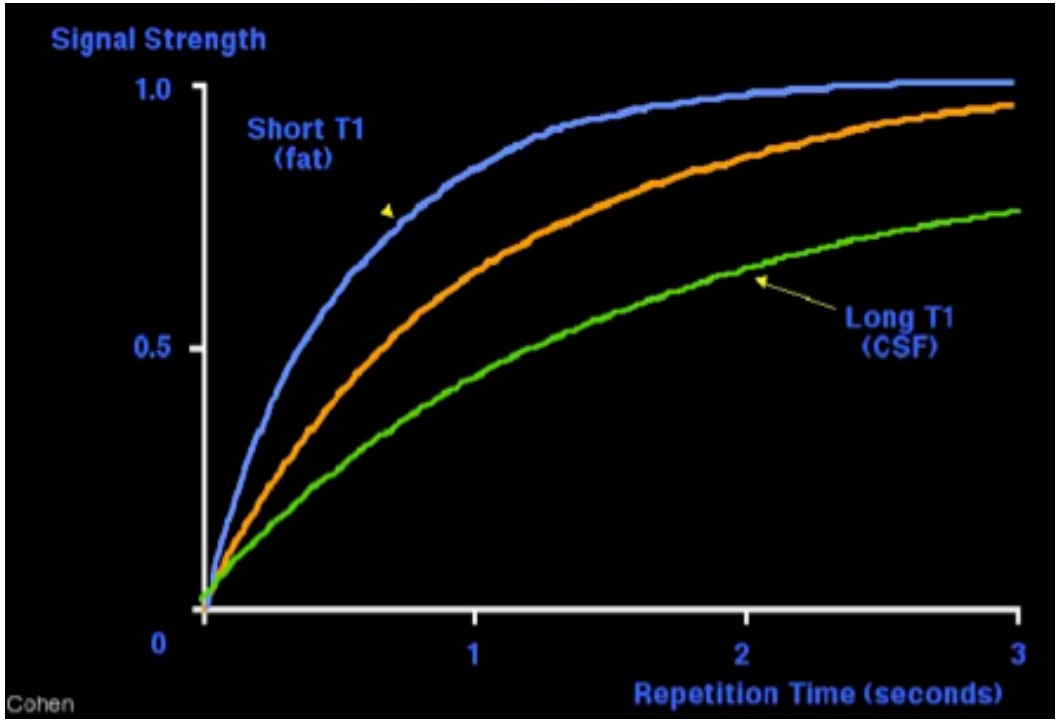


②
- Magnetization is tilted by signal
- Precesses around the magnetic field
- Emits a secondary radio signal

1. Protonen am Magnetfeld ausrichten
2. Kalibrieren über Gradient Coil
3. Anregen über Radio Coil

Strukturelles MRI





Energie wird frei, wenn Protonen wieder am Magnetfeld ausgerichtet werden

-> Detektion der emittierten Radiowellen

-> Messung der „Relaxationszeit“

T1 vs. T2 MRI

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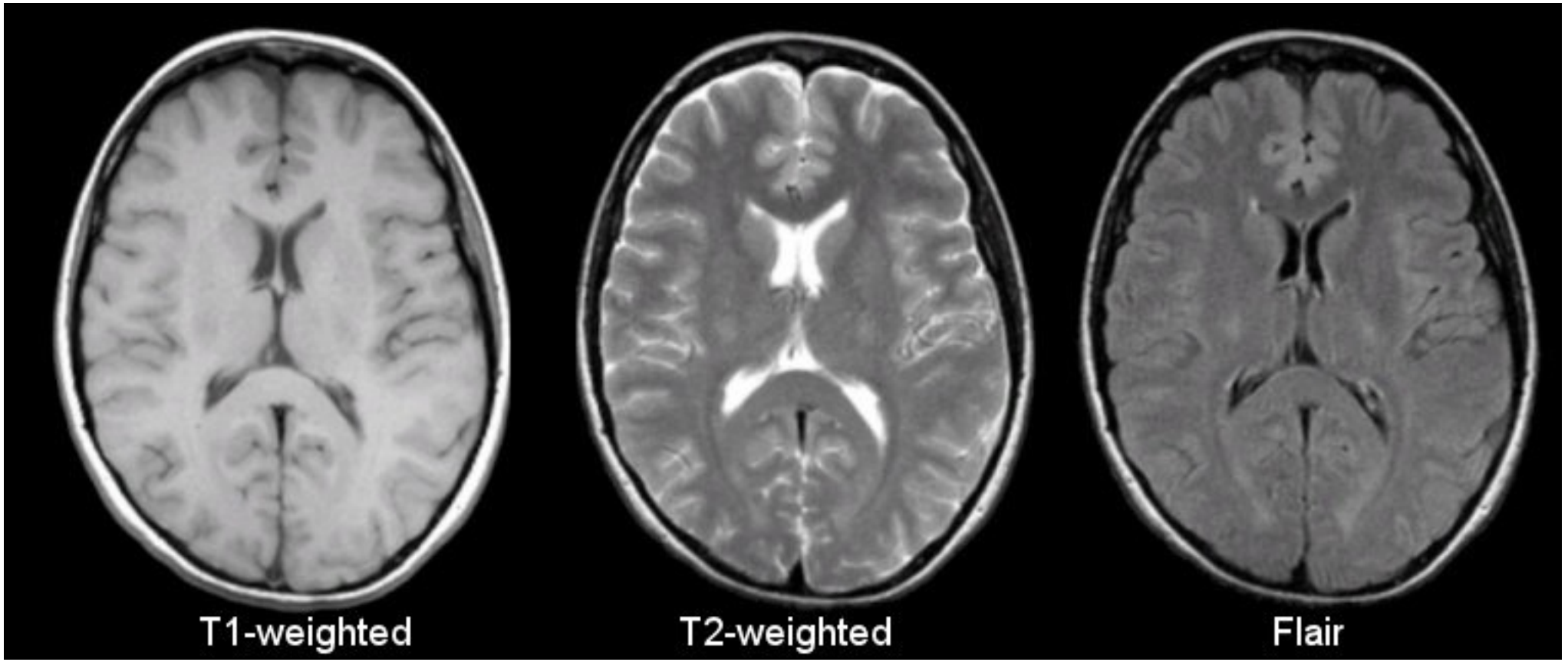

Hohe Räumliche Auflösung, niedrige zeitliche Auflösung

- Kompromiss zwischen Größe des Messbereiches und Mess-Dauer

fMRI

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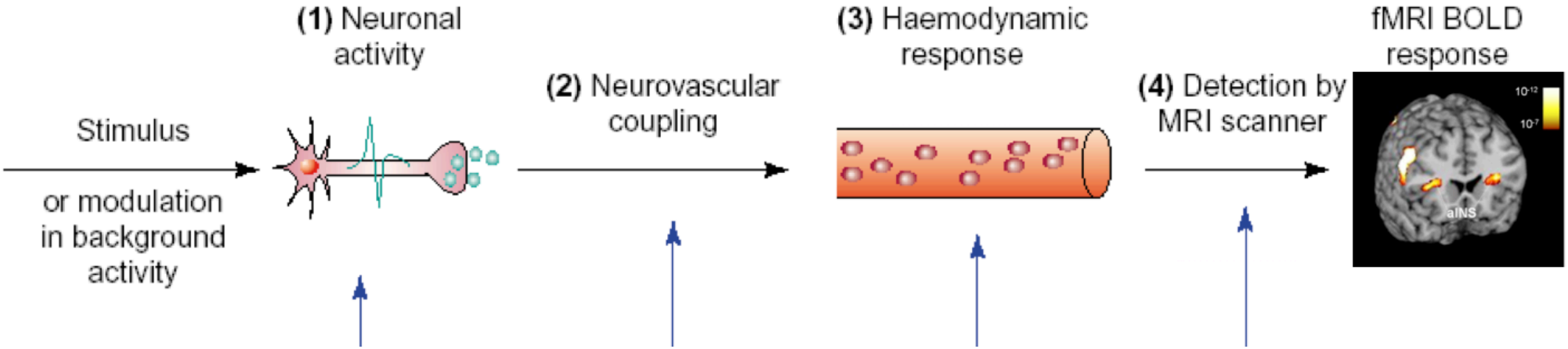

Aktionspotential: Na+ und K+ Austausch

Erhöhter Energieverbrauch

Erweiterung der Blutgefäße
Deoxy./Oxy-Verhältnis nimmt ab

Veränderung des Paramagnetismus

Optical Imaging

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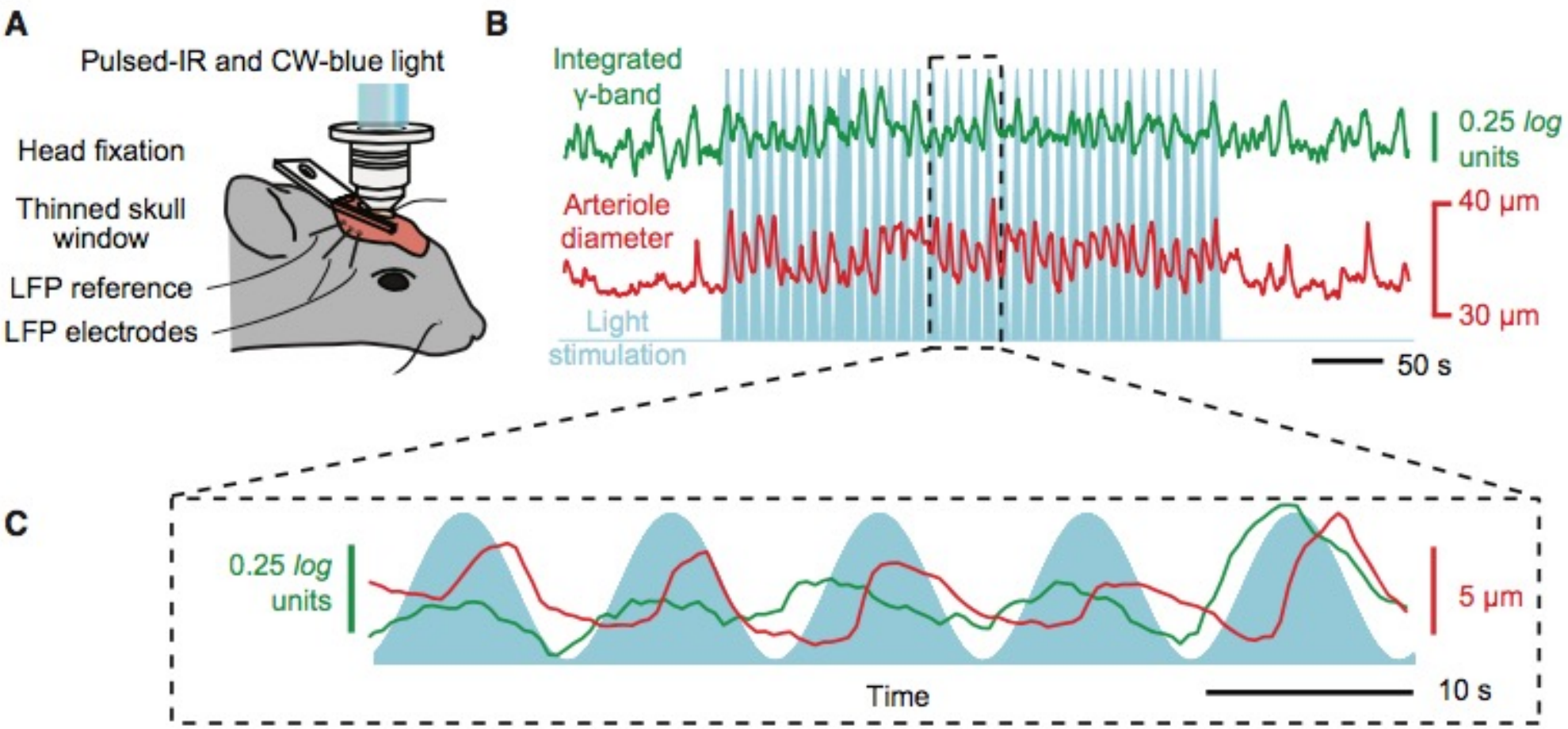

Diese Woche: Gedankenlesen?

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Recent advances in human neuroimaging have shown that it is possible to accurately **decode a person's conscious experience** based only on non-invasive measurements of their brain activity. [...] Such applications raise important **ethical issues** concerning the privacy of personal thought.

- Review: What is the idea of "decoding"?
- What current **technical challenges** exist?
- What **ethical issues** arise from this?

Nächste Woche:
Gedankenlesen im Schlaf?

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Neural Decoding of Visual Imagery During Sleep

T. Horikawa,[1,2] M. Tamaki,[1]* Y. Miyawaki,[3,1]† Y. Kamitani[1,2]‡

Visual imagery during sleep has long been a topic of persistent speculation, but its **private nature** has hampered objective analysis. [...] Our findings demonstrate that specific visual experience during sleep is represented by brain activity patterns shared by stimulus perception, **providing a means to uncover subjective contents of dreaming** using objective neural measurement.

- How is neural activity related to **subjective experience** here?
- How is subjective experience **decoded**?
- Is **perception and imagery** the same?

Literatur

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- Haynes, J.-D., & Rees, G. (2006). Decoding mental states from brain activity in humans. Nature Reviews Neuroscience, 7(7), 523–534. http://doi.org/10.1038/nrn1931
- Horikawa, T., Tamaki, M., Miyawaki, Y., & Kamitani, Y. (2013). Neural decoding of visual imagery during sleep. Science (New York, NY), 340(6132), 639–642. http://doi.org/10.1126/science.1234330