



**MIAAC**  
Medical Image Analysis Center

 Universitätsspital  
Basel

# **WOZU IST DIE MODERNE BILDAUSWERTUNG GUT UND WAS MACHT EIGENTLICH DAS MIAAC?**

Dr. med. Tim Sinnecker  
**MS Infotag 2017, Basel, Schweiz**

18.03.2017

# INHALT

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1. MRI – was ist das?
2. Was ist das MIAC?
3. Neue Methoden der Bildauswertung

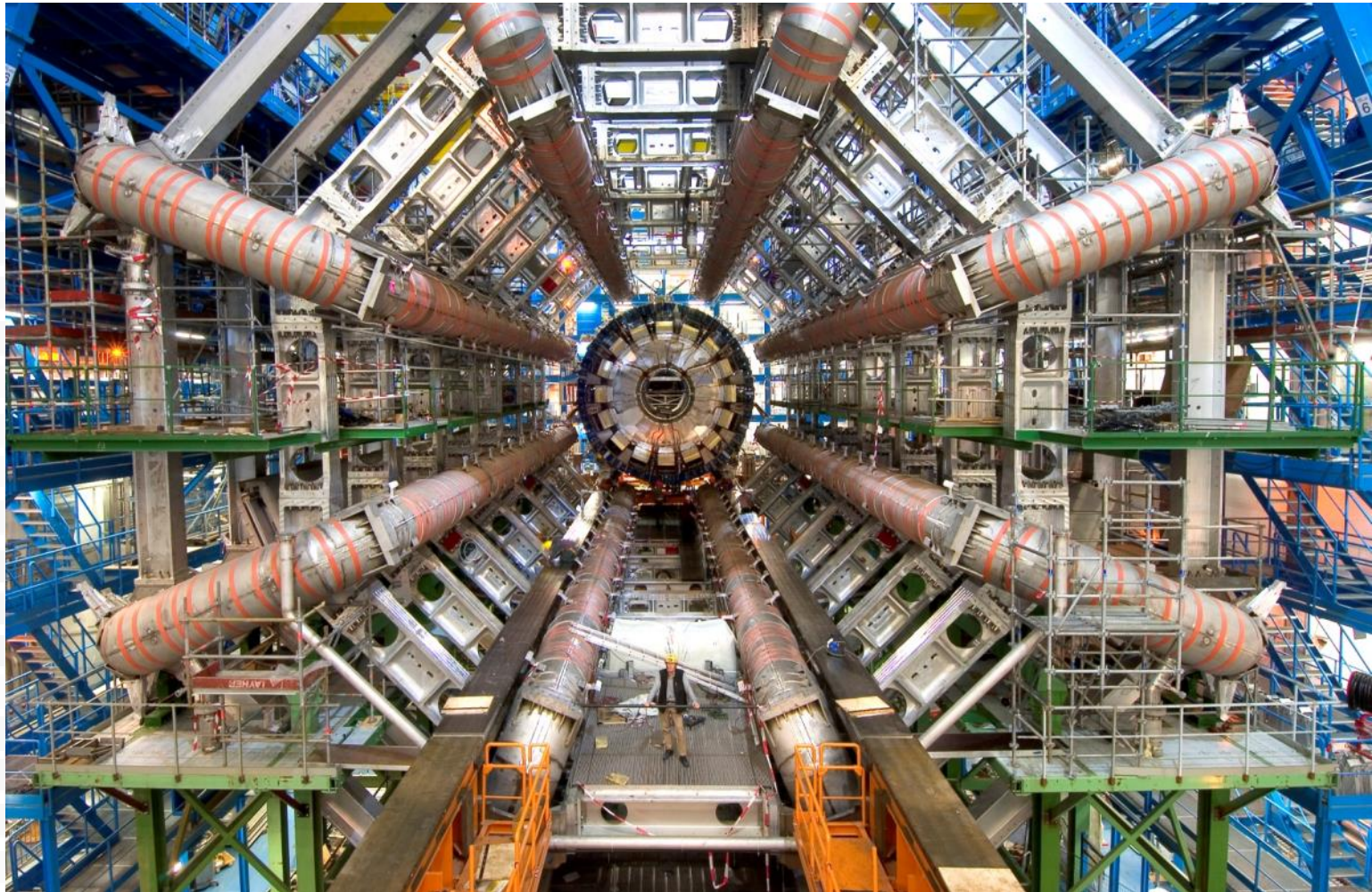
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# MRI – WAS IST DAS?

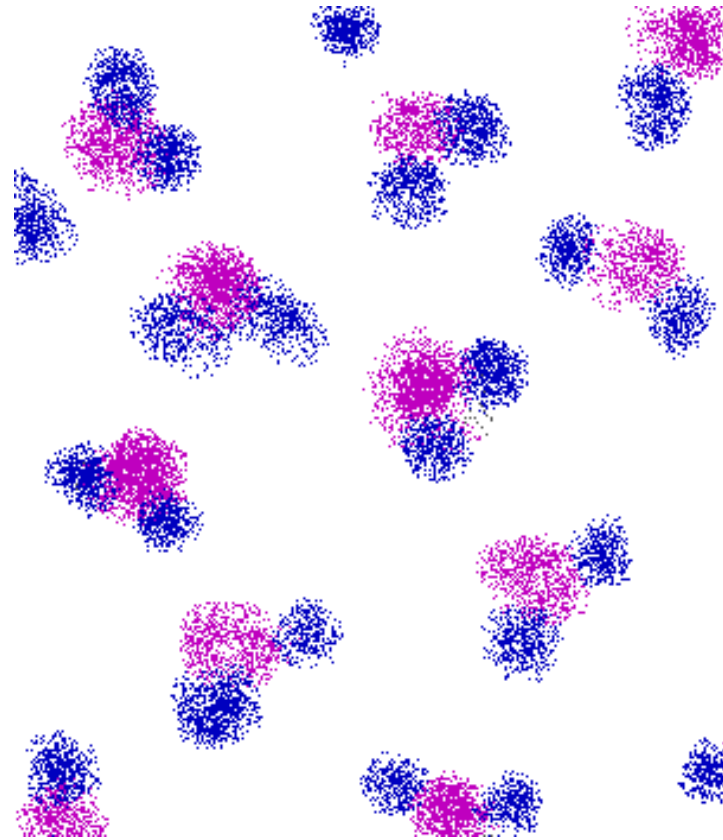
# MRI = ANWENDUNG DER QUANTENMECHANIK

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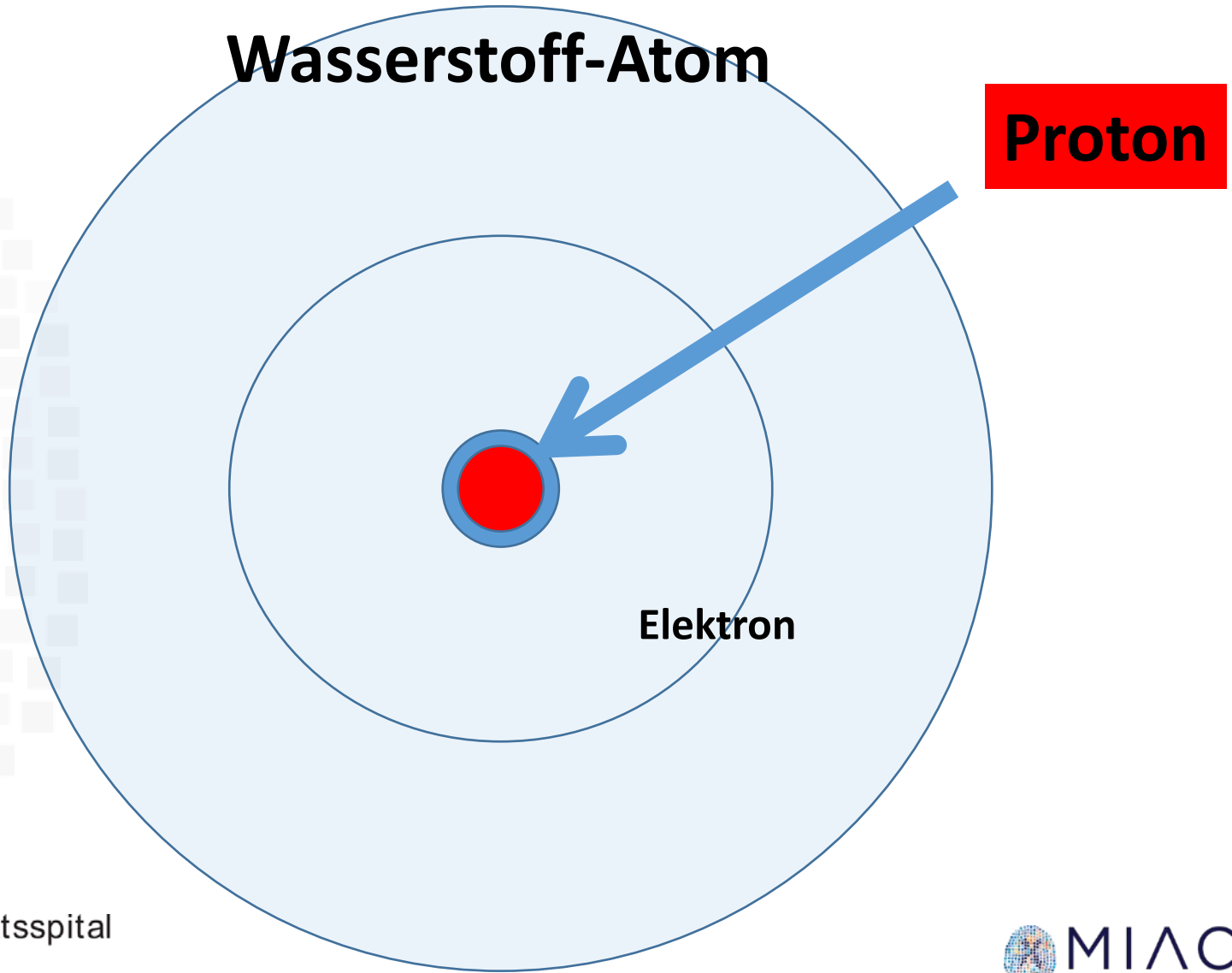
# MRI STELLT WASSER DAR!

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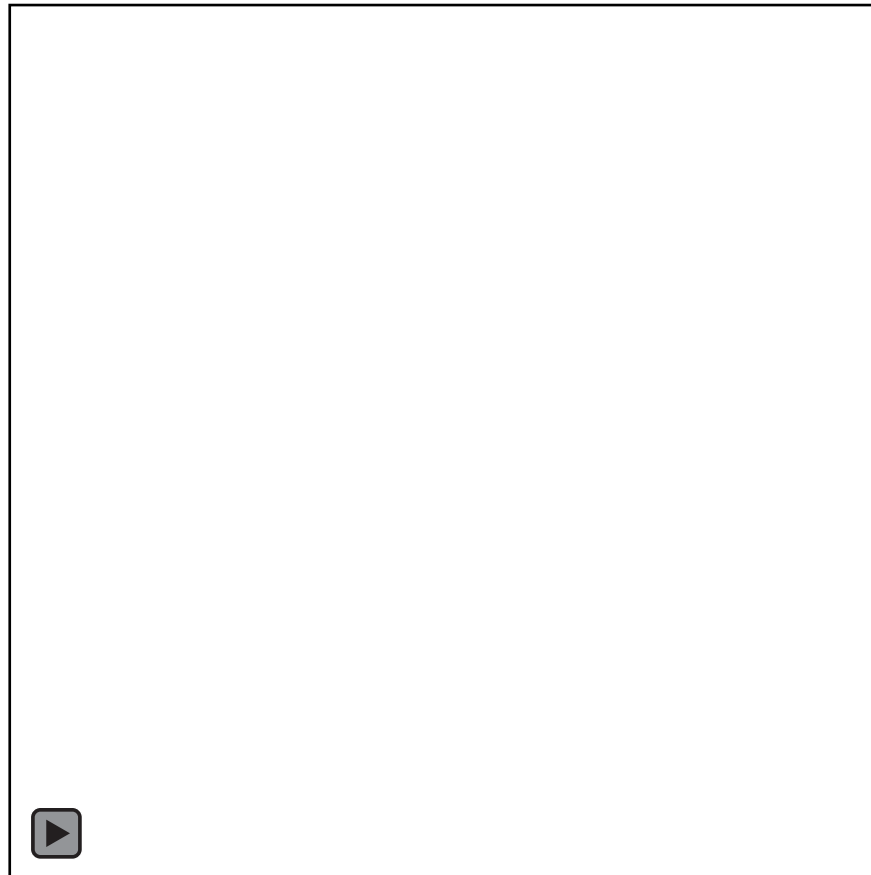
# MRI STELLT WASSER DAR!

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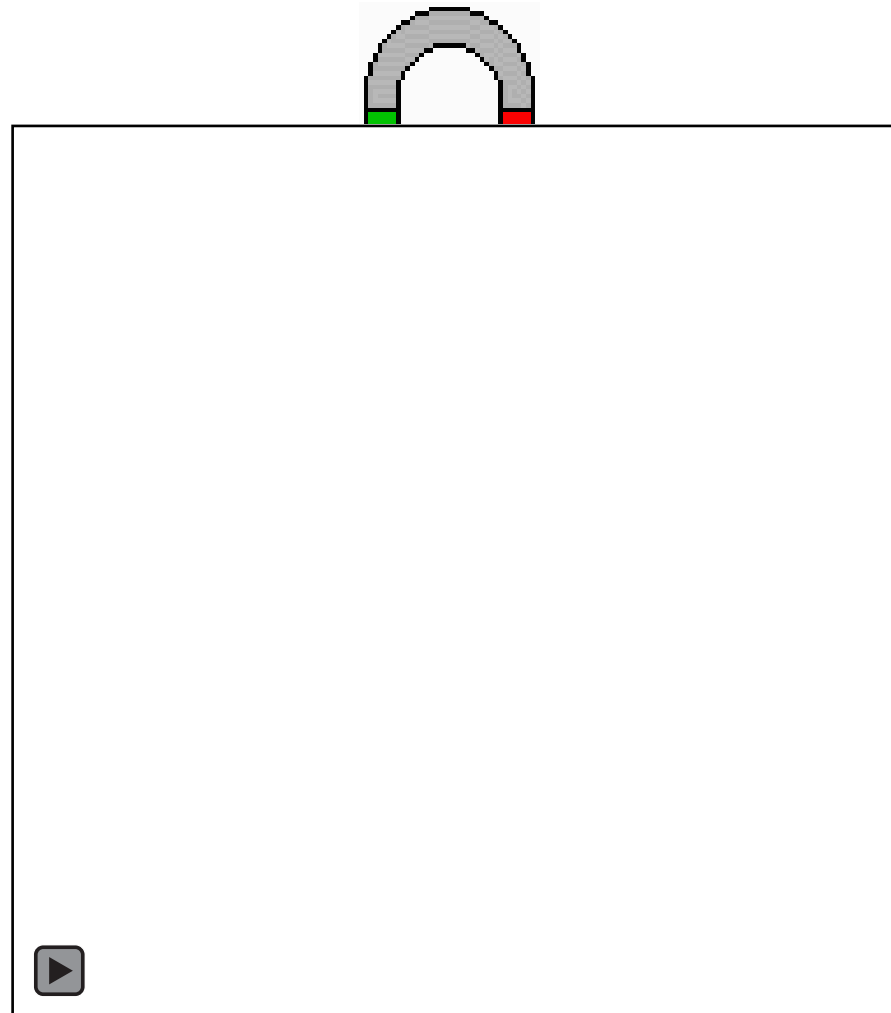
# MRI STELLT WASSER DAR!

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# MRI STELLT WASSER DAR!

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# MRI STELLT WASSER DAR!

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# WAS IST DAS MIAC?

# WAS IST DAS MIAC?

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A hand is shown pointing towards a digital world map. The map is composed of numerous small white dots connected by thin, light blue lines, creating a network-like structure. The background is a soft, out-of-focus blue.

Seit der Gründung im Jahr 1995 ist das “Medical Image Analysis Center” auf die Bildanalyse im Rahmen akademischer und pharmazeutischer Forschungsprojekte spezialisiert.

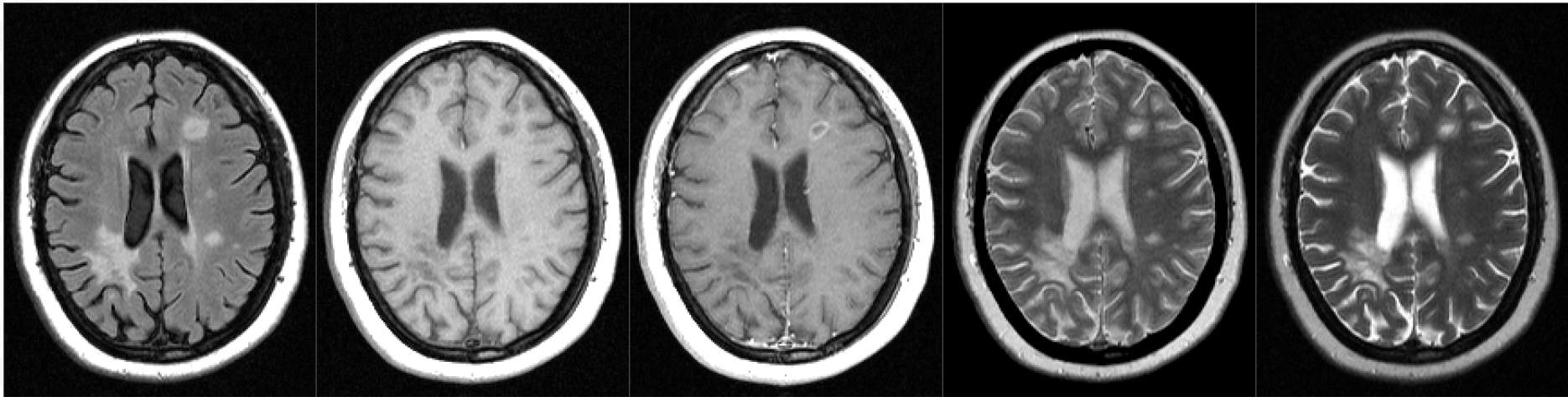
# WAS IST DAS MIAC?

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# UNTERSCHIEDLICHE SEQUENZENZEN

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FLAIR

T1w

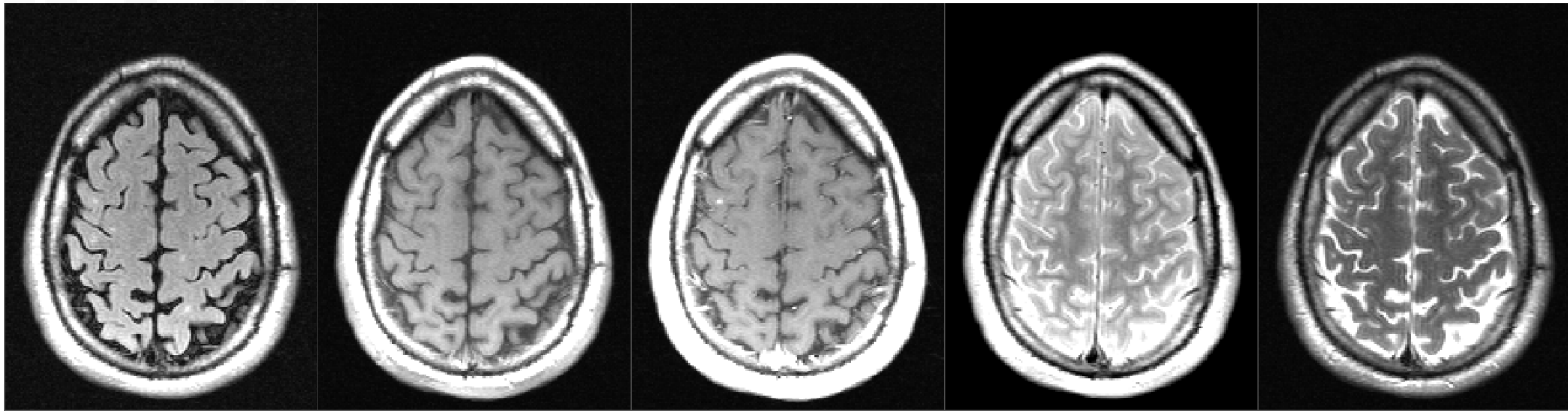
T1w - KM

PDw

T2w

# UNTERSCHIEDLICHE SEQUENZEN

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FLAIR

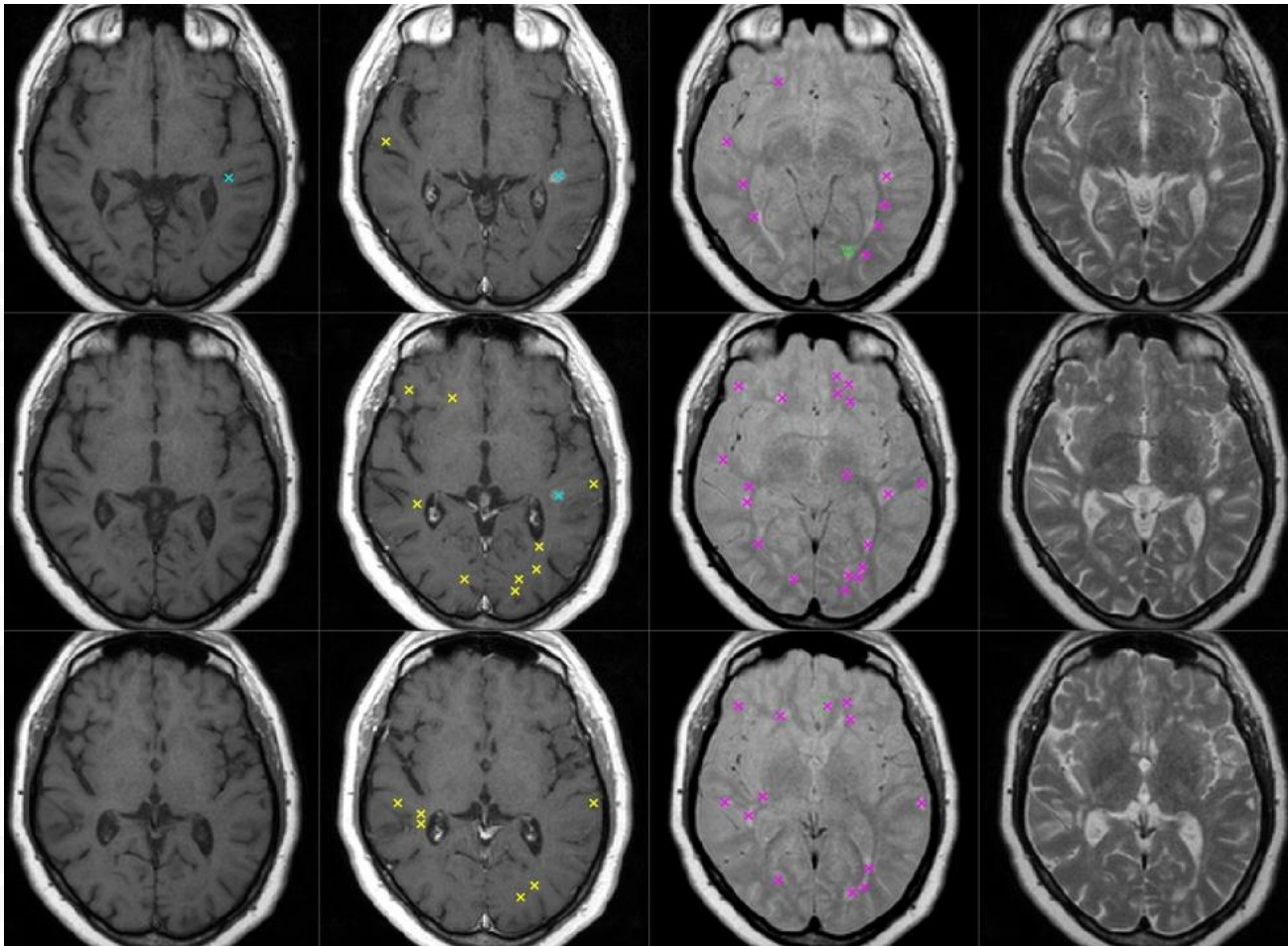
T1w

T1w - KM

PDw

T2w

# MARKIEREN UND SEGMENTIEREN VON LÄSIONEN



T1w

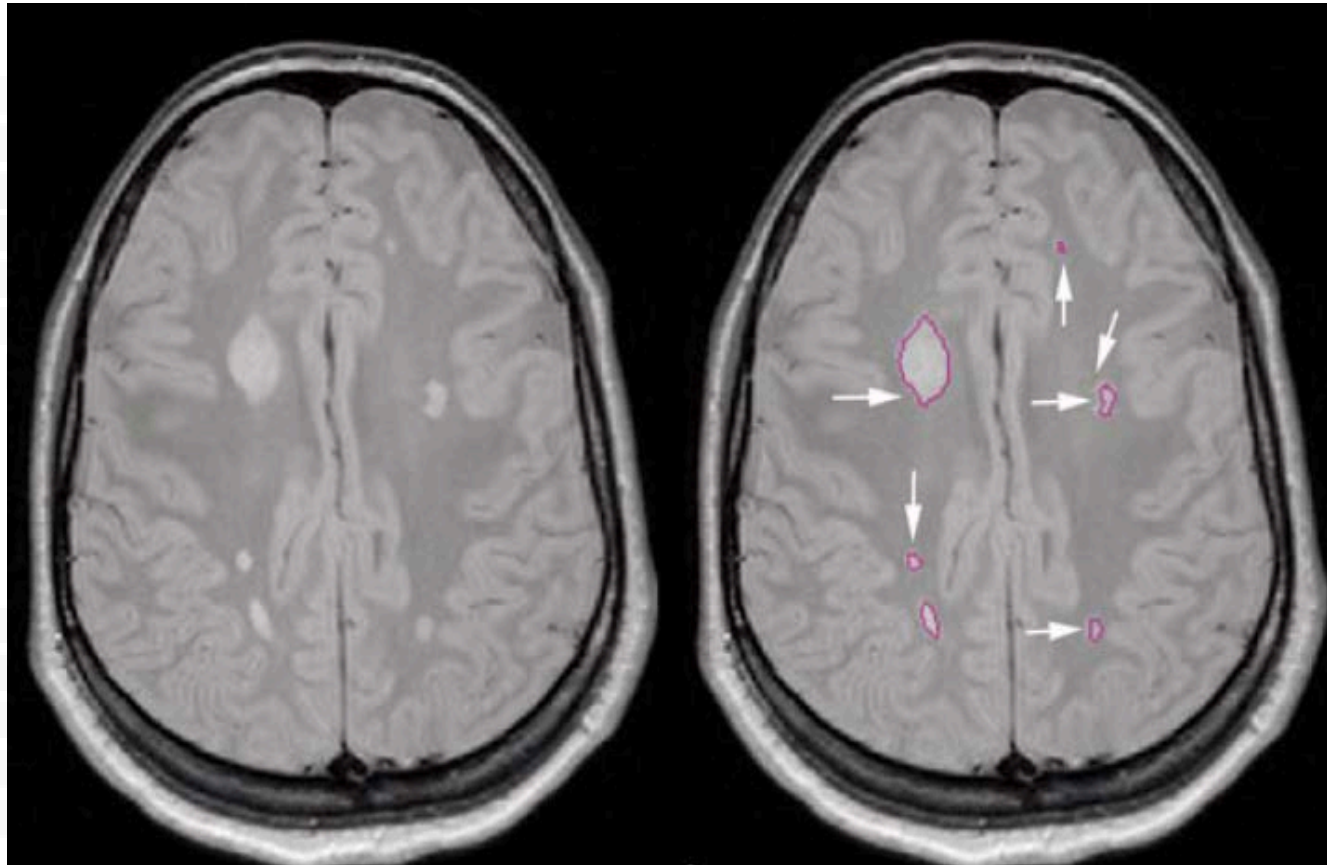
T1w

PDw

T2w

# MARKIEREN UND SEGMENTIEREN VON LÄSIONEN

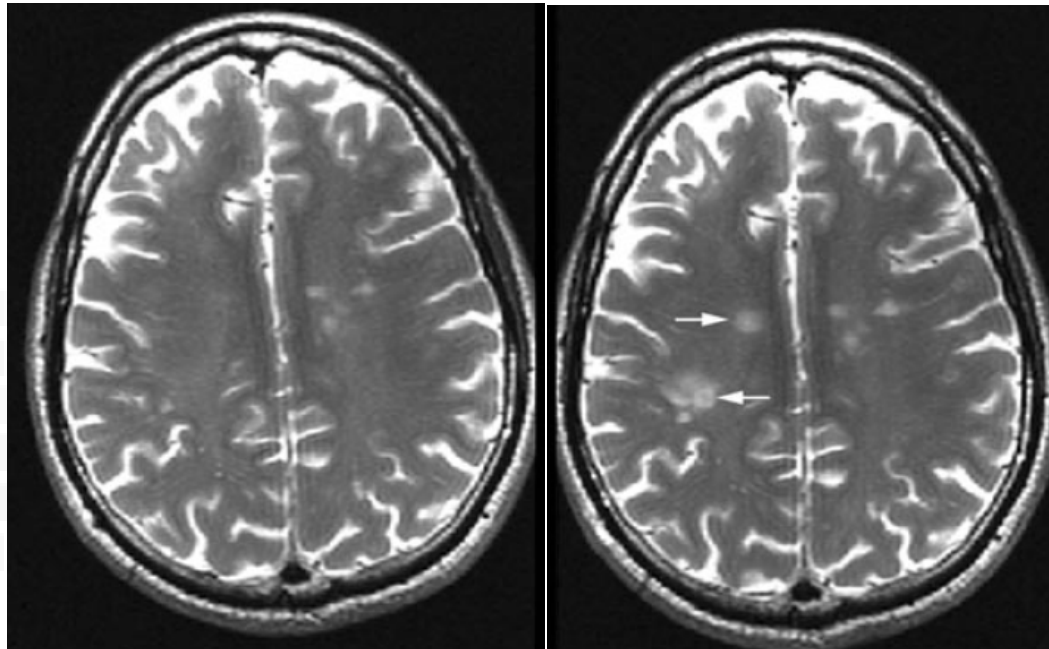
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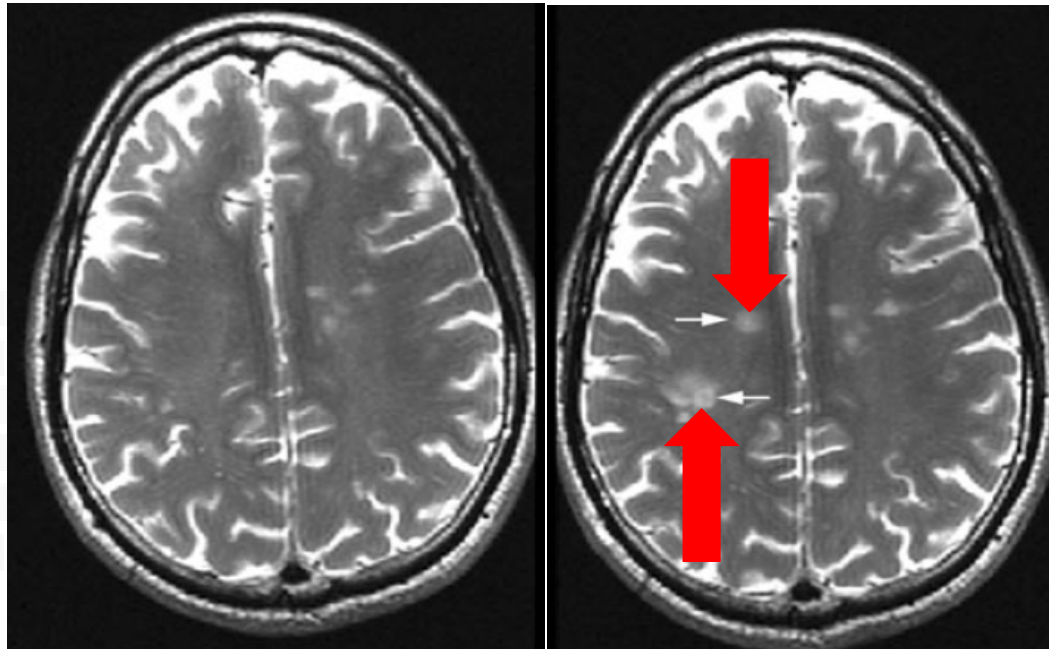
# ZEITLICHER VERLAUF

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# ZEITLICHER VERLAUF

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# ZEITLICHER VERLAUF – EIN BEISPIEL – 5 JAHRE

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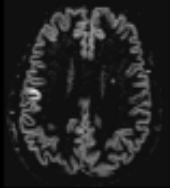


# NEUE METHODEN DER BILDAUSWERTUNG

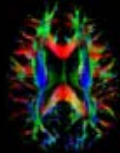
# NEUE METHODEN DER BILDAUSWERTUNG

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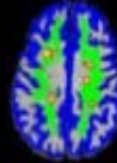
**Double inversion recovery**



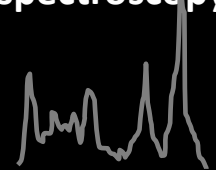
**Diffusion tensor imaging**



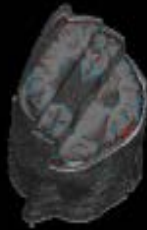
**Magnetization transfer imaging**



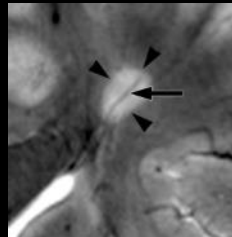
**Magnetic resonance spectroscopy**



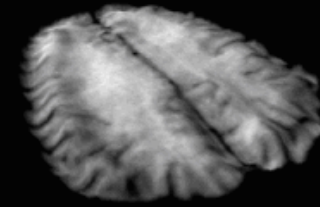
**Volumetry**



**Ultrahigh-field MRI**



**MR-Elastography**

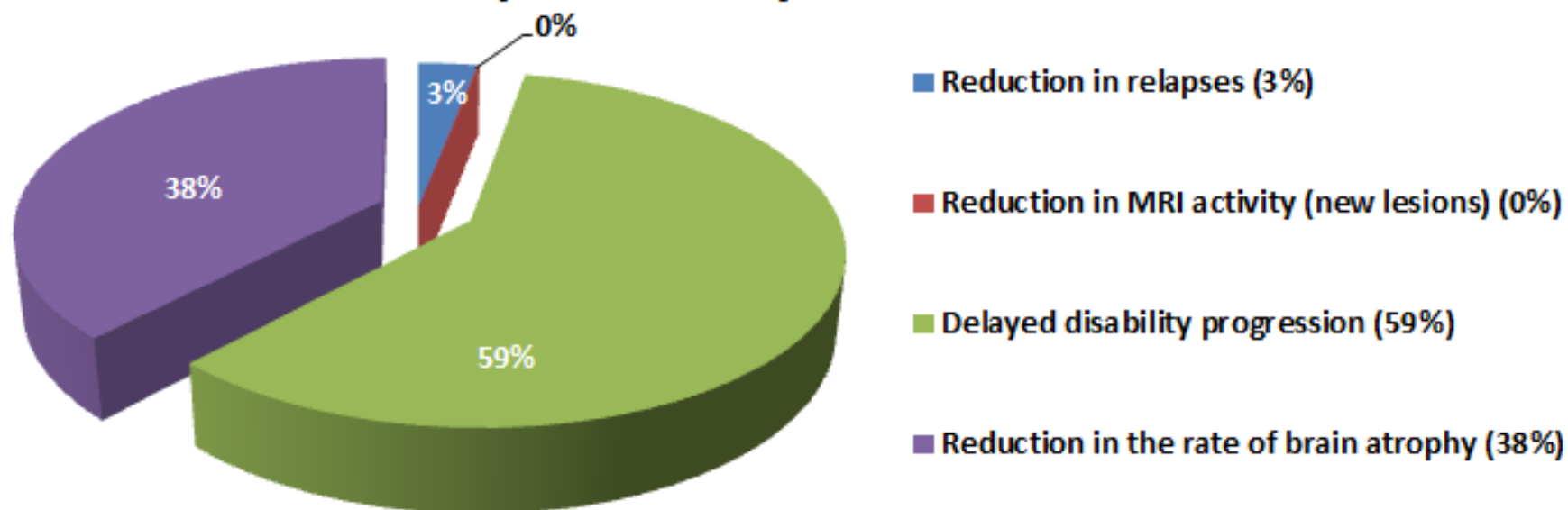


© Mayo Foundation

# ATROPHIE – EINE PATIENTENUMFRAGE

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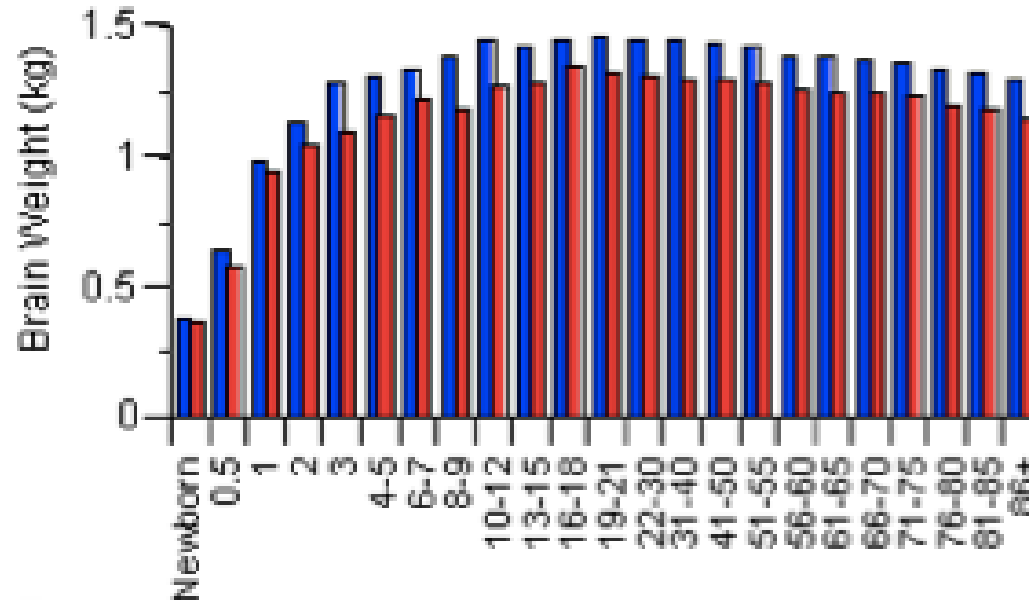
**In relation to DMTs, which outcome measure is the most important to you?**



G. Giovannoni 26.11.2012: (<http://multiple-sclerosis-research.blogspot.com/2012/11/poll-results-outcome-measures-and-brain.html>)

# ATROPHIE

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Dekaban et al. Ann Neurol 1978.

# ATROPHIE

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# ATROPHIE – EIN BEISPIEL – 5 JAHRE

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# ATROPHIE

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1. Jahr

5. Jahr

Vergrößerung der  
Ventrikel in 5 Jahren

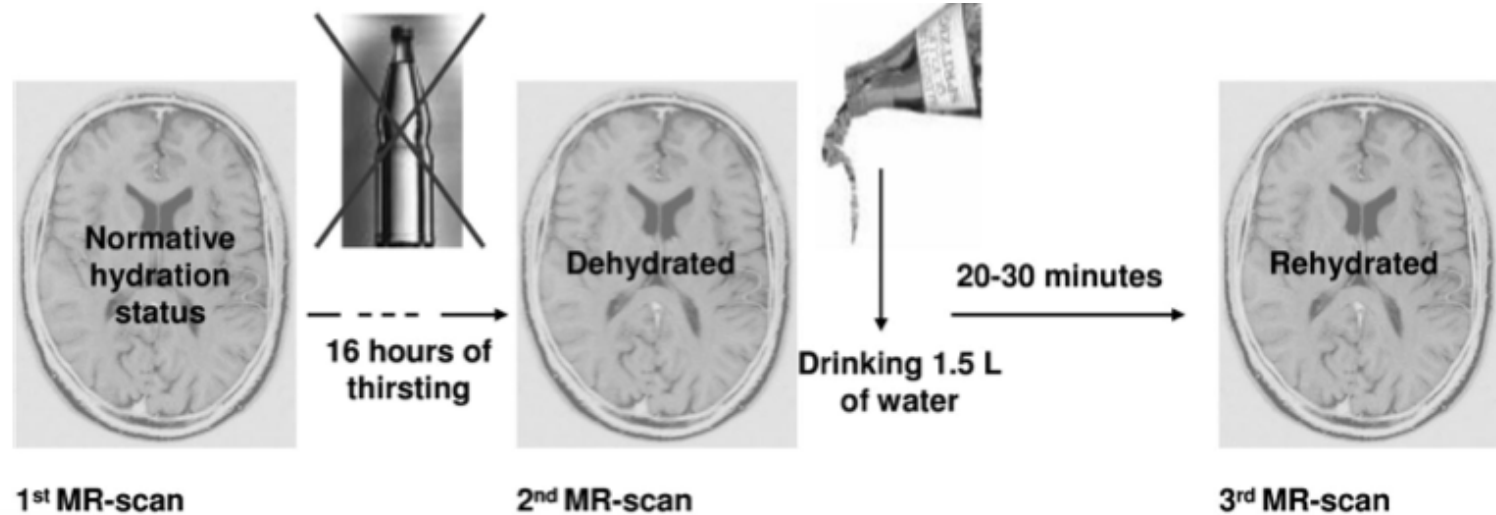


# WIE MISST MAN ATROPHIE?

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# WIE MISST MAN ATROPHIE?

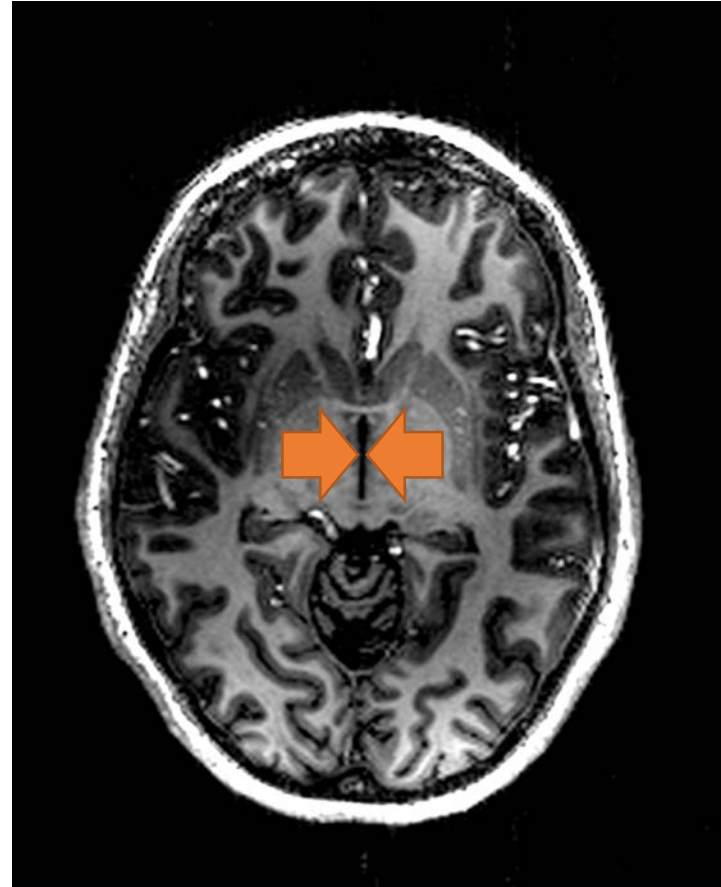
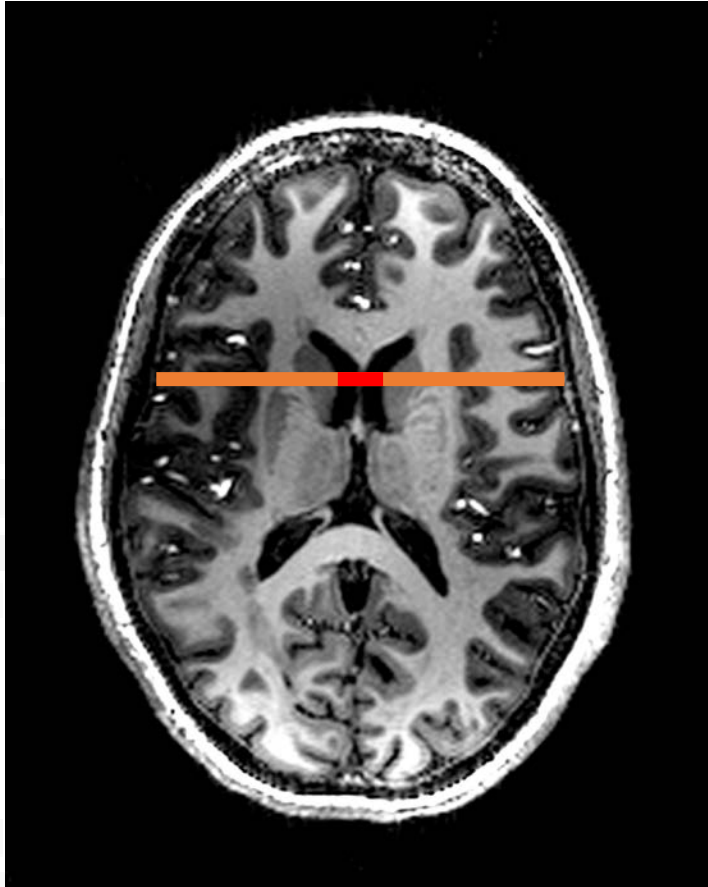


Die Atrophiemessung ist beeinflusst von:

- Alter
- Wasserhaushalt (bis zu 0.7% Veränderung)

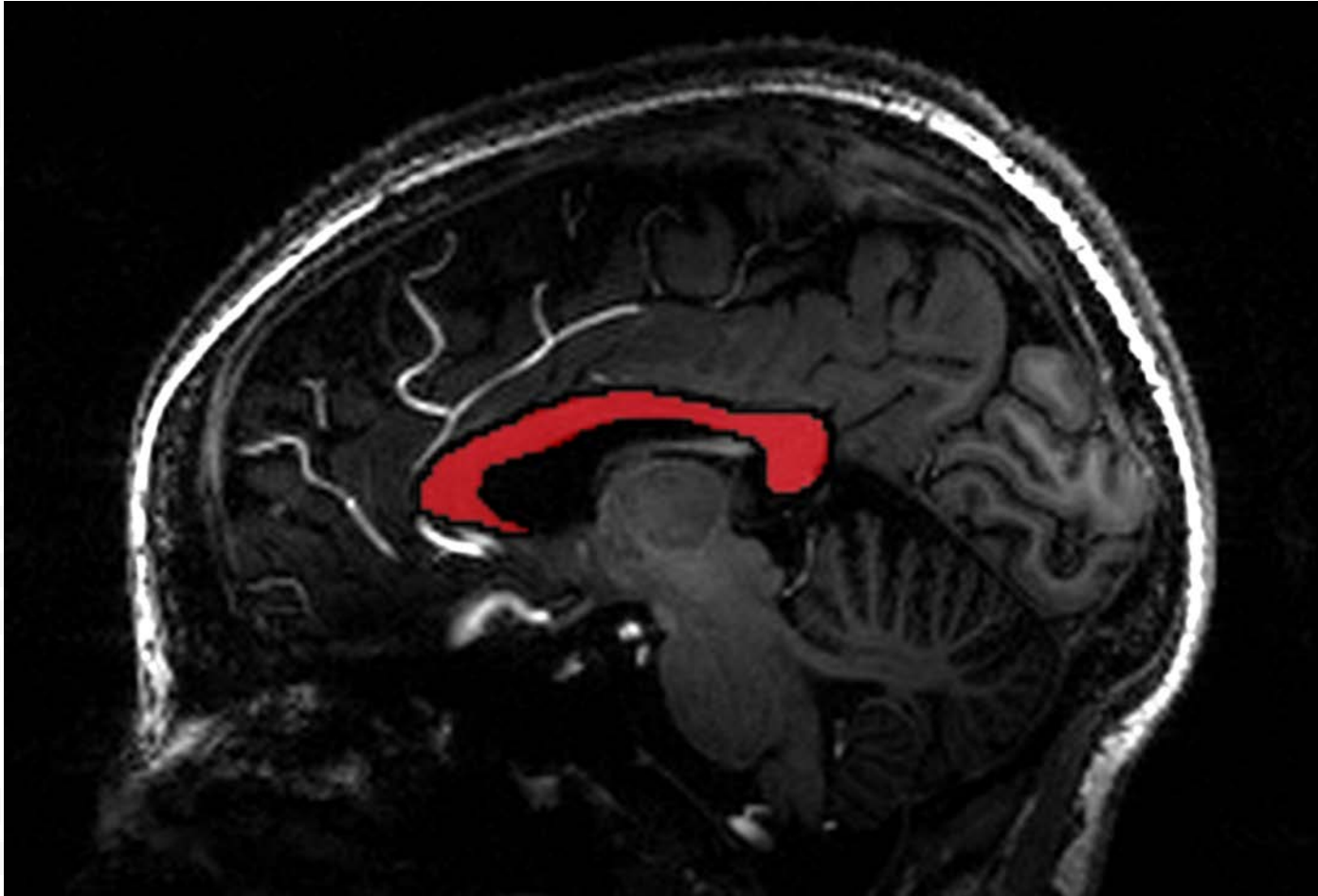
# MANUELLE TECHNIKEN

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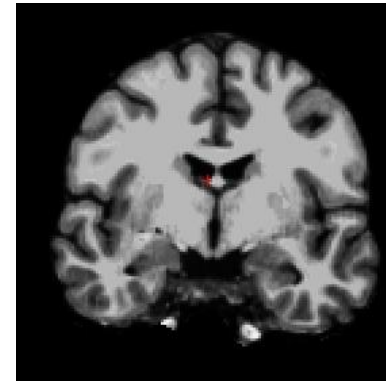
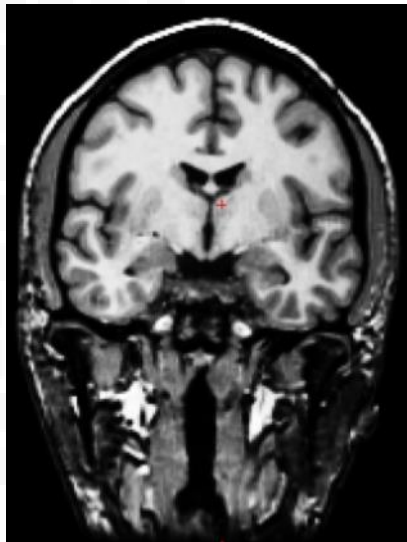
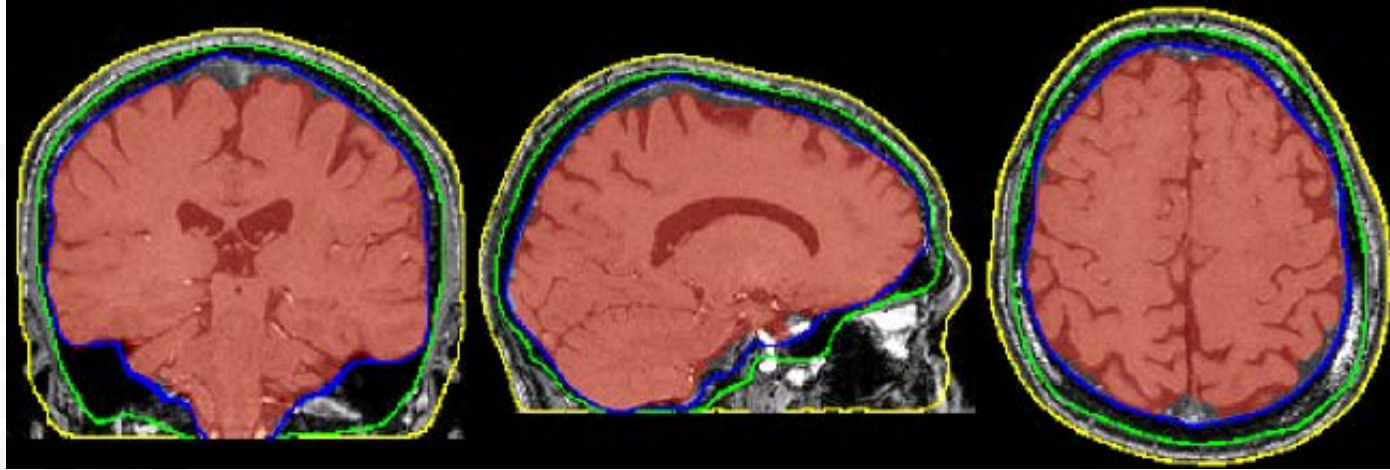


# MANUELLE TECHNIKEN

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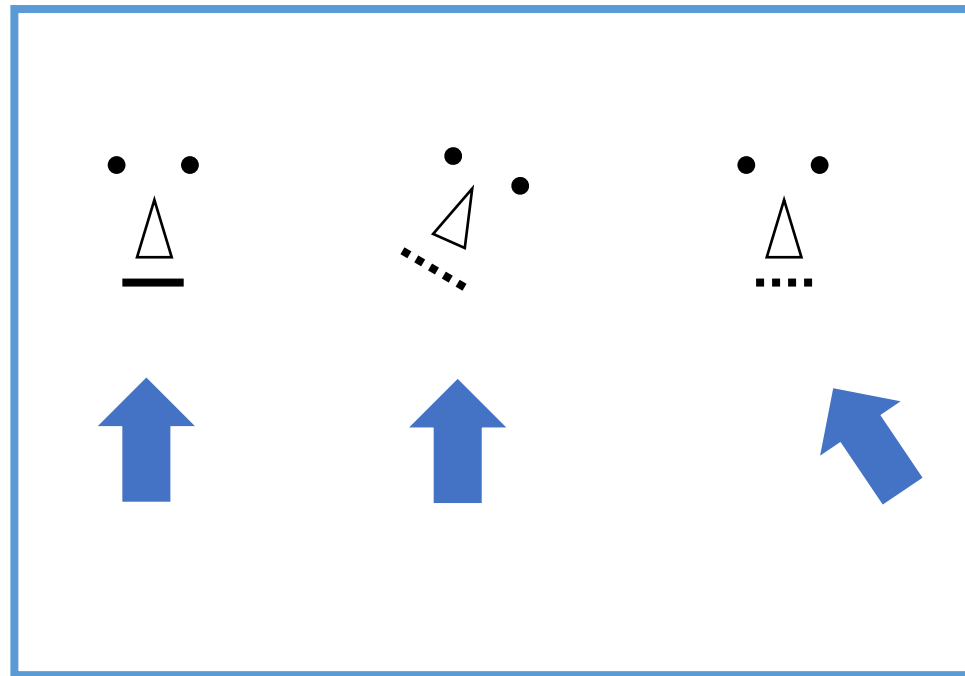


# AUTOMATISCHE BESTIMMUNG VON ÄNDERUNGEN DES HIRNVOLUMENS – SIENA (BET)



Smith SM et al. Neuroimage 2002;  
Smith SM et al. Neuroimage 2004;  
Zhang Y et al. IEEE Trans Med Imaging 2001.

# AUTOMATISCHE BESTIMMUNG VON ÄNDERUNGEN DES HIRNVOLUMENS – SIENA (REGISTRIERUNG)

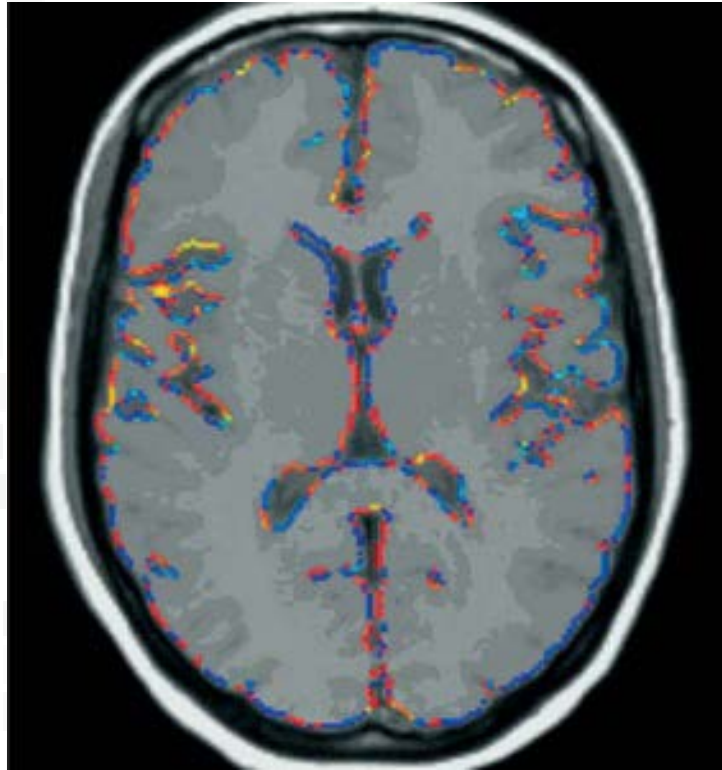


<http://www0.cs.ucl.ac.uk/research>

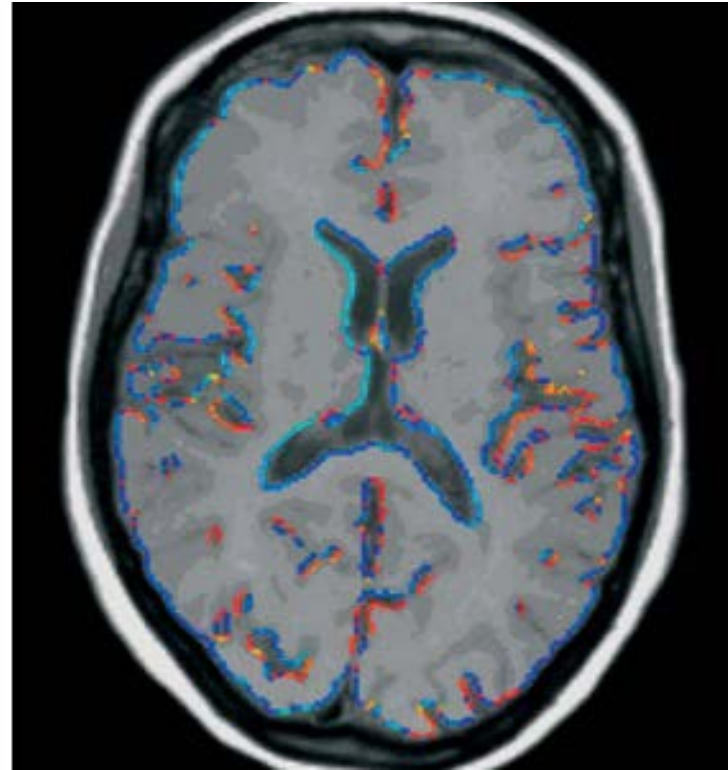


# AUTOMATISCHE BESTIMMUNG VON ÄNDERUNGEN DES HIRNVOLUMENS – SIENA

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Patient 1

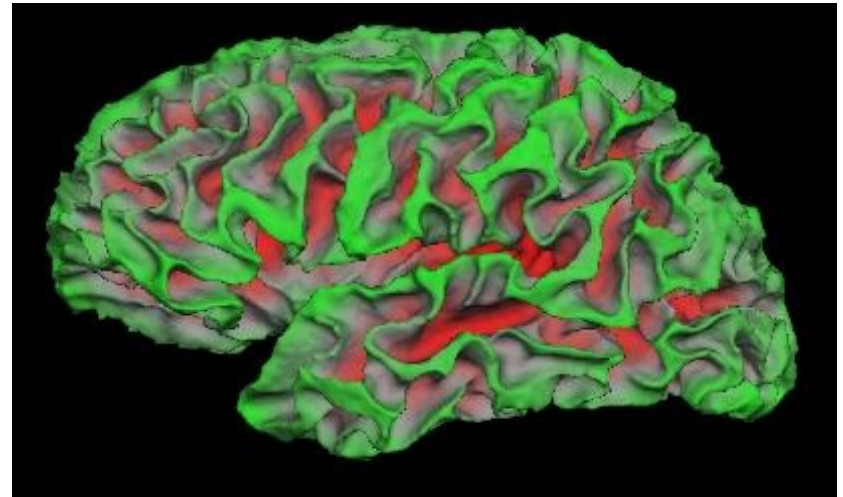
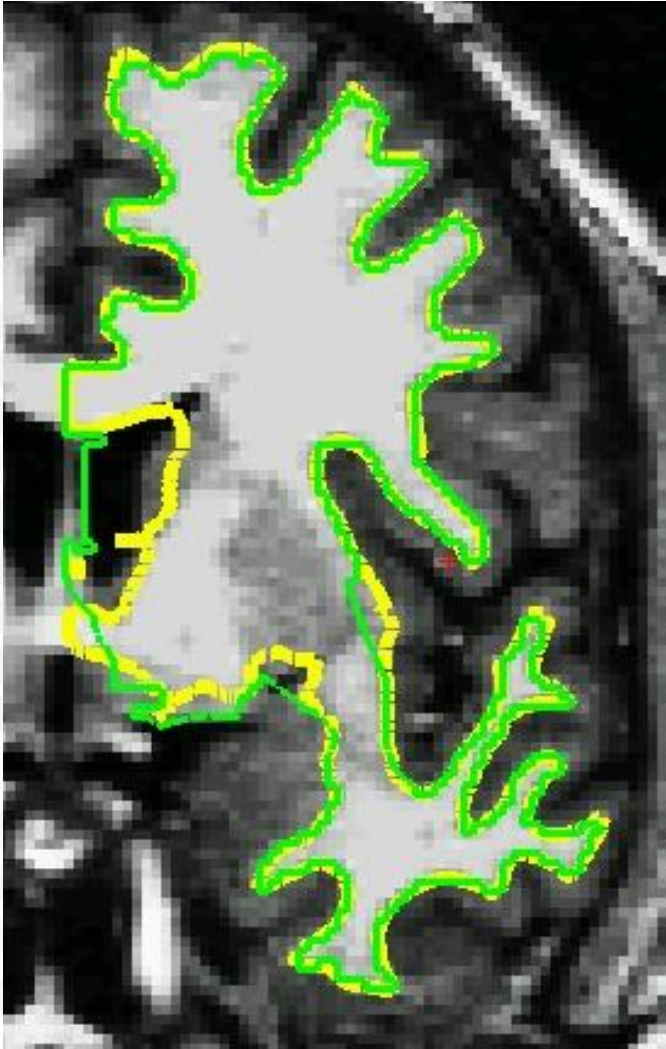


Patient 2

Bakshi, et al. *Lancet Neurol* 2008.

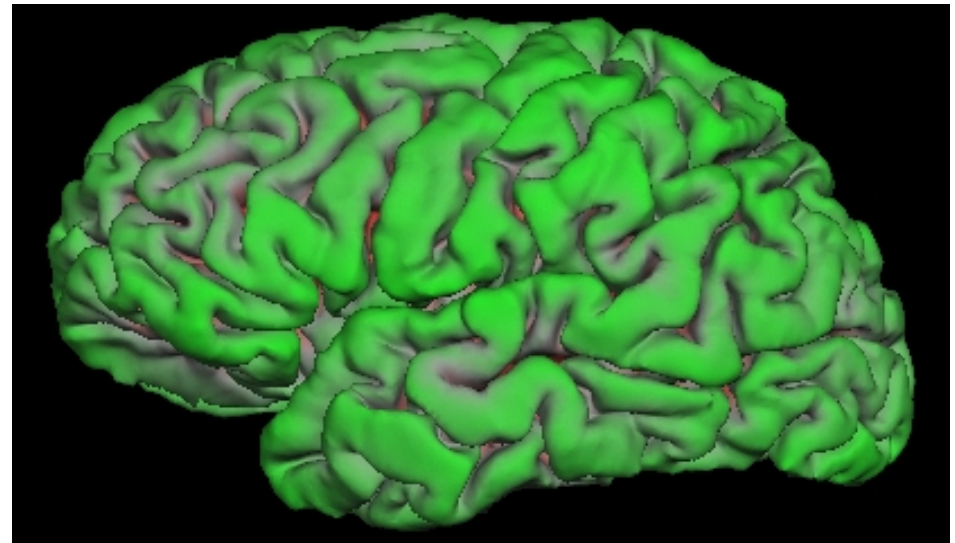
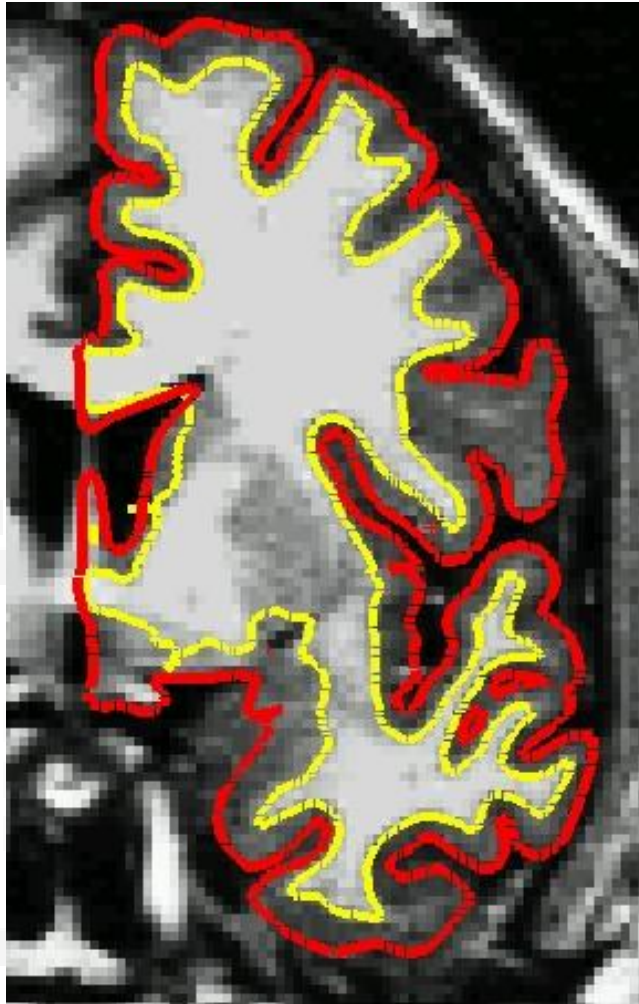
# AUTOMATISCHE BESTIMMUNG DES HIRNVOLUMENS - FREESURFER

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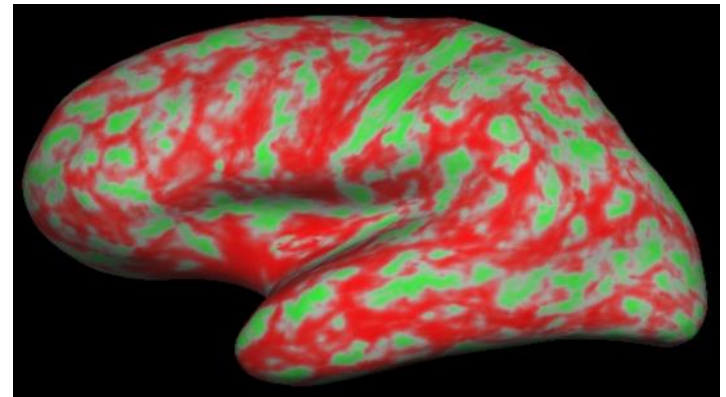
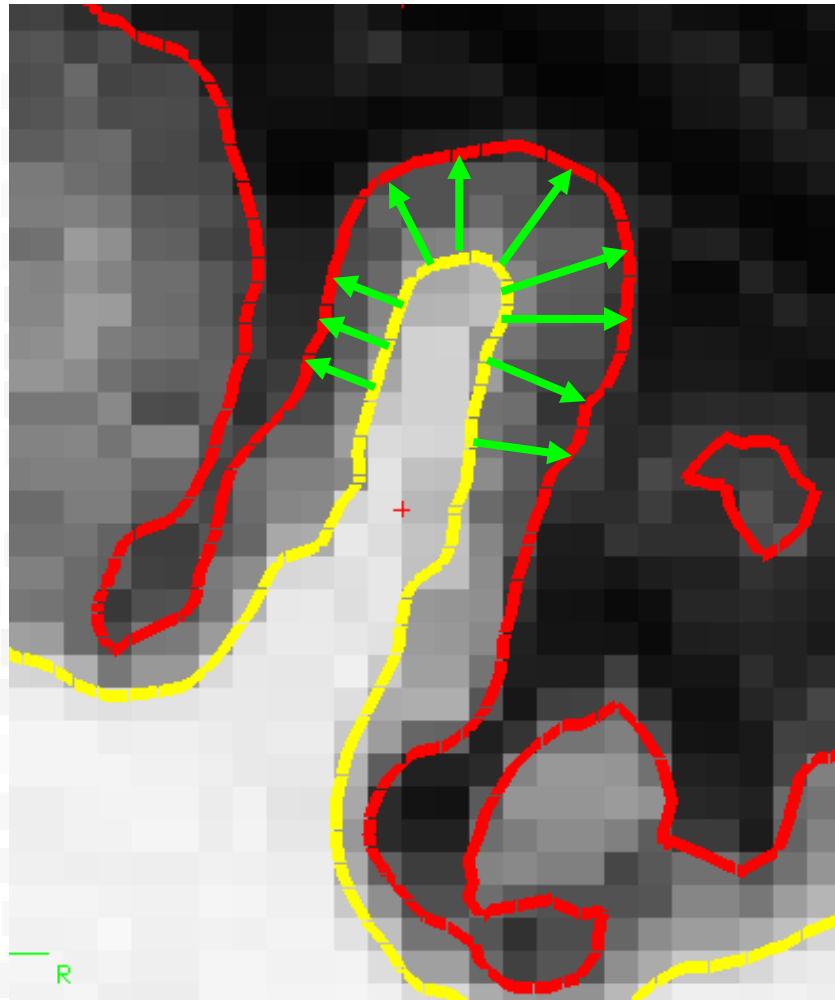
# AUTOMATISCHE BESTIMMUNG DES HIRNVOLUMENS - FREESURFER

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# AUTOMATISCHE BESTIMMUNG DES HIRNVOLUMENS - FREESURFER

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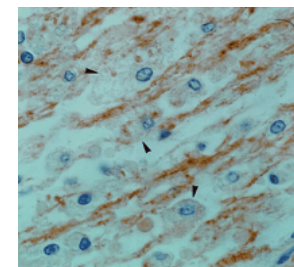
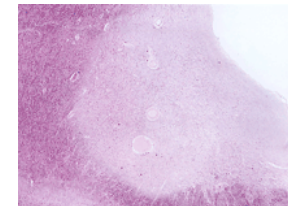
# WARUM NEUE SEQUENZENZEN?



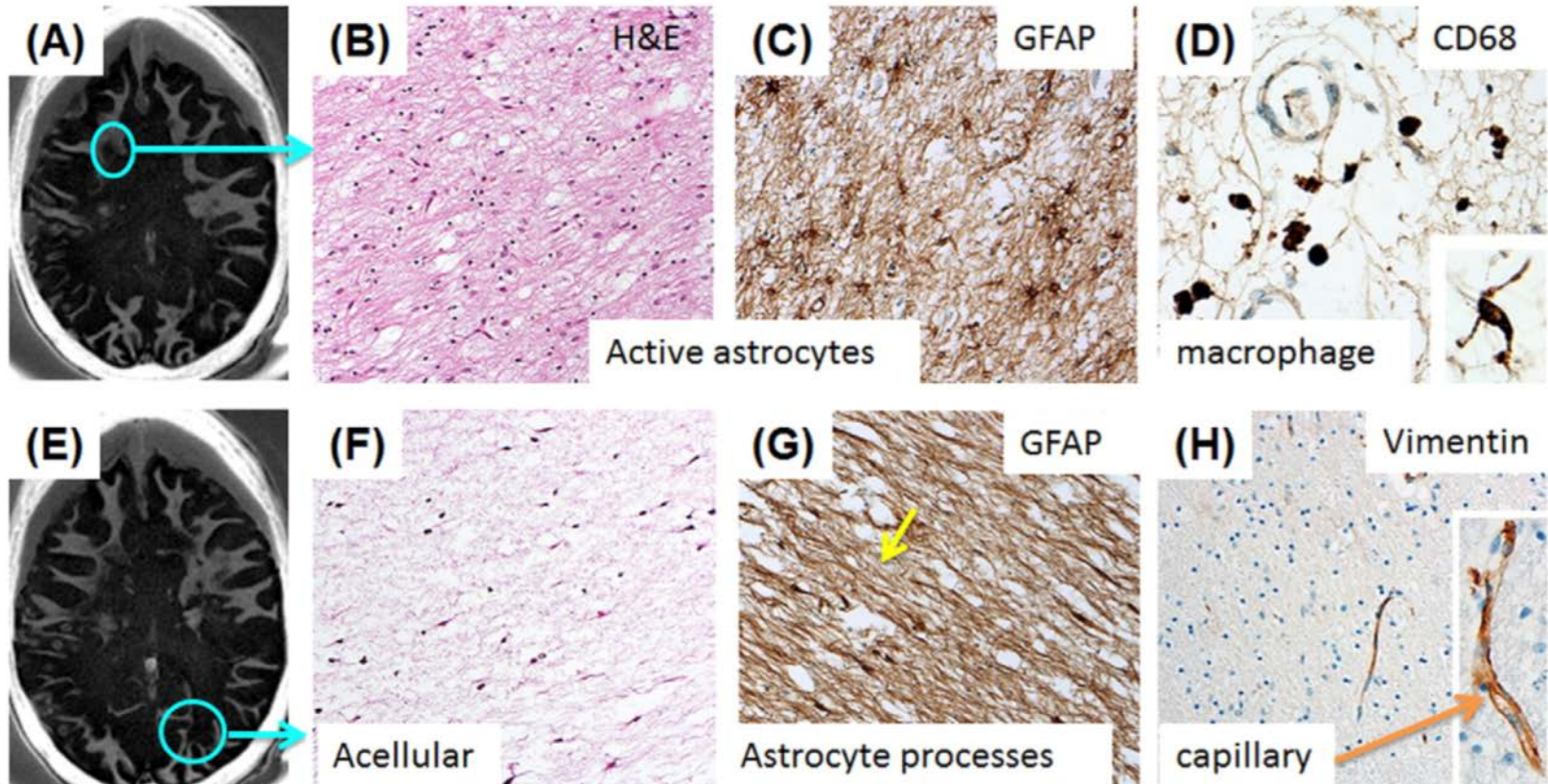
Oedem

Demyelinisierung

Strukturelle  
Schädigung

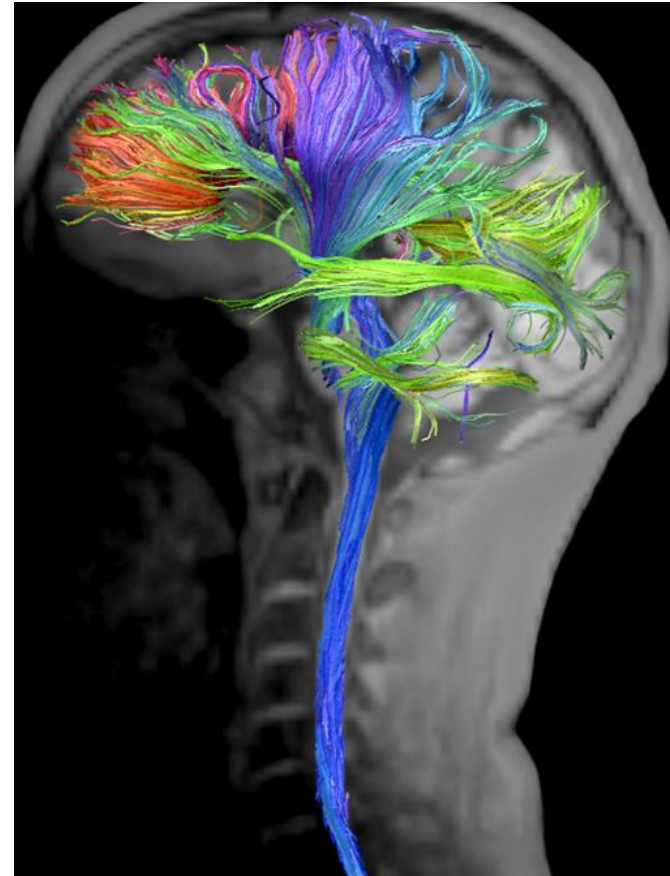
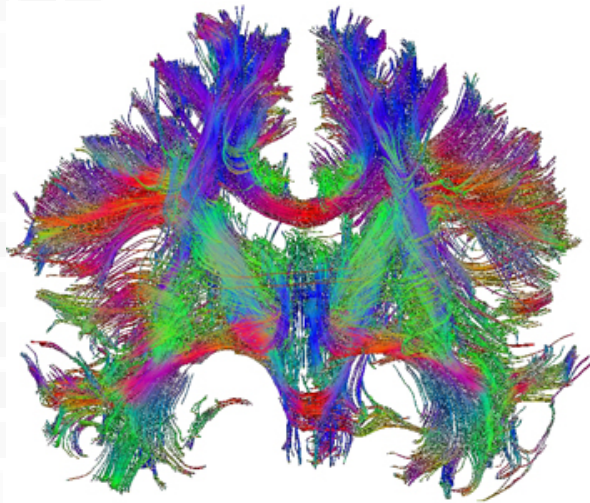


# NEUE TECHNIKEN: SELEKTIVE DARSTELLUNG DES MYELINS?

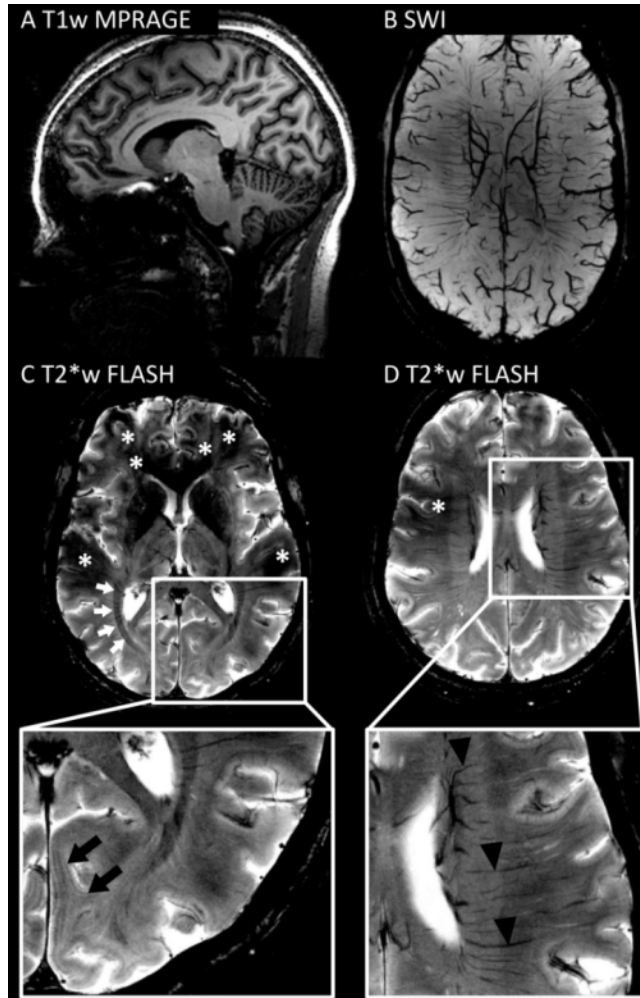


# NEUE TECHNIKEN: DARSTELLUNG DER FASERVERLÄUFE IM GEHIRN

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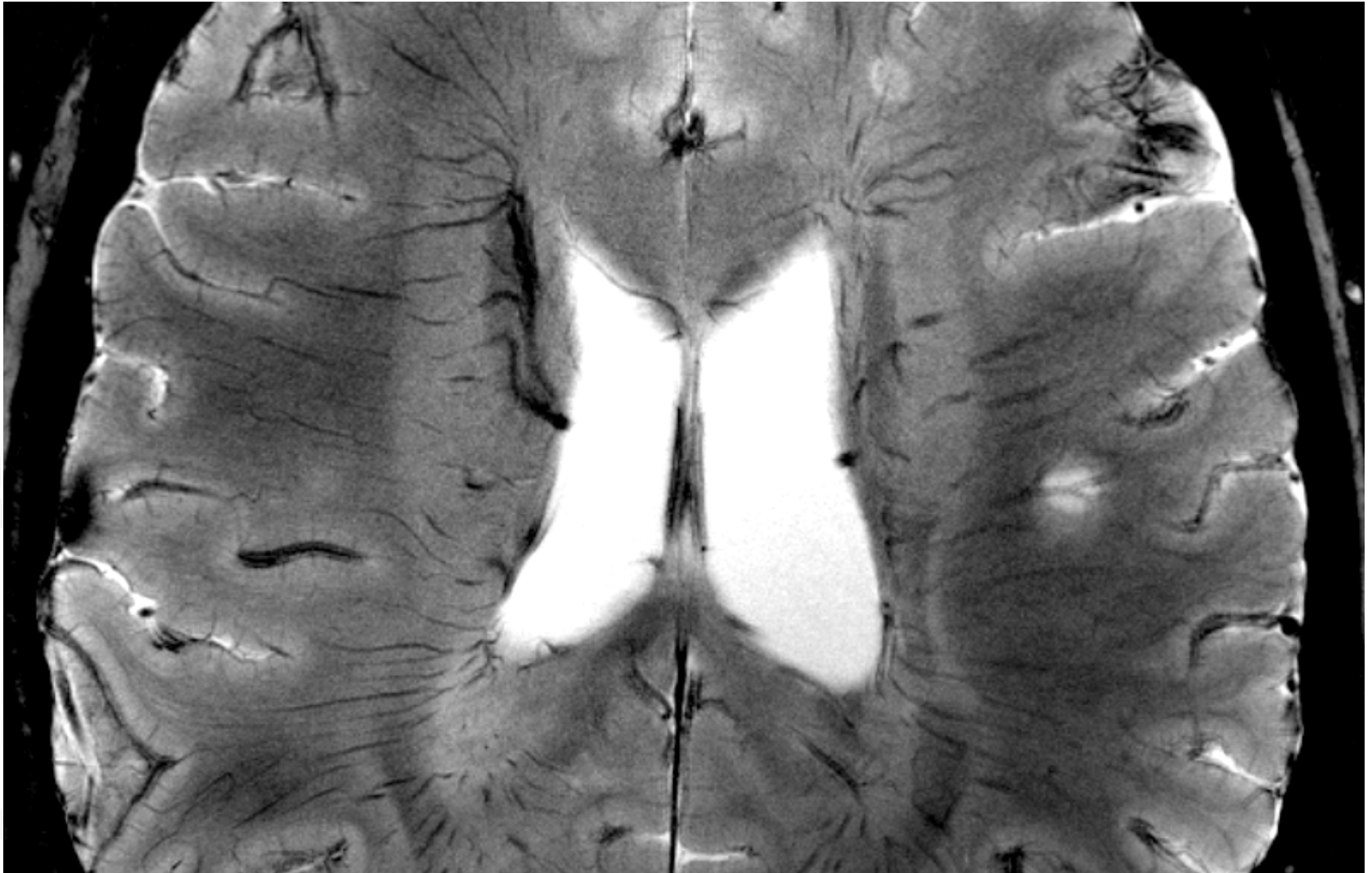
# NEUE TECHNIKEN: ULTRAHOCH-FELD-MRI



Sinnecker et al. EPMA 2015.



# NEUE TECHNIKEN: ULTRAHOCH-FELD-MRI



# VIELEN DANK FÜR IHRE AUFMERKSAMKEIT

