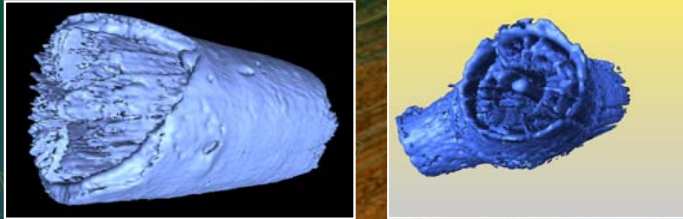


Wound response in beech investigated by 3D MRI



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Aim of our research:

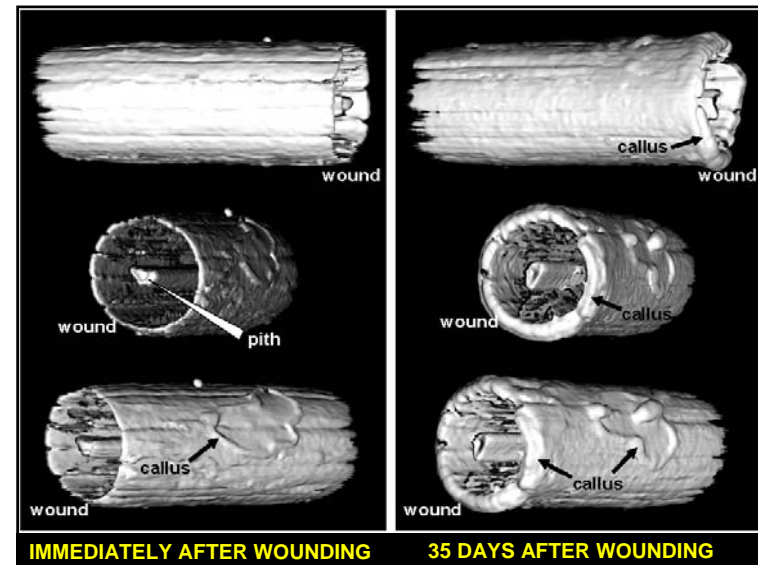
- to reveal structural and water changes in the tree tissues after wounding

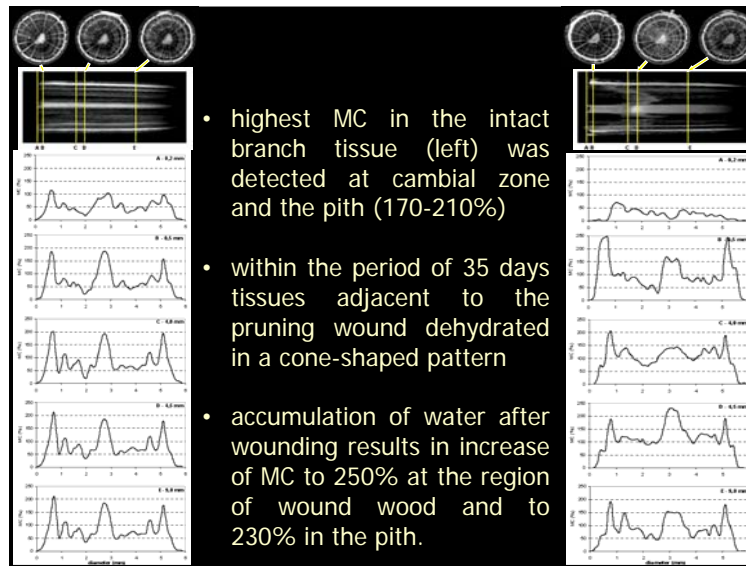
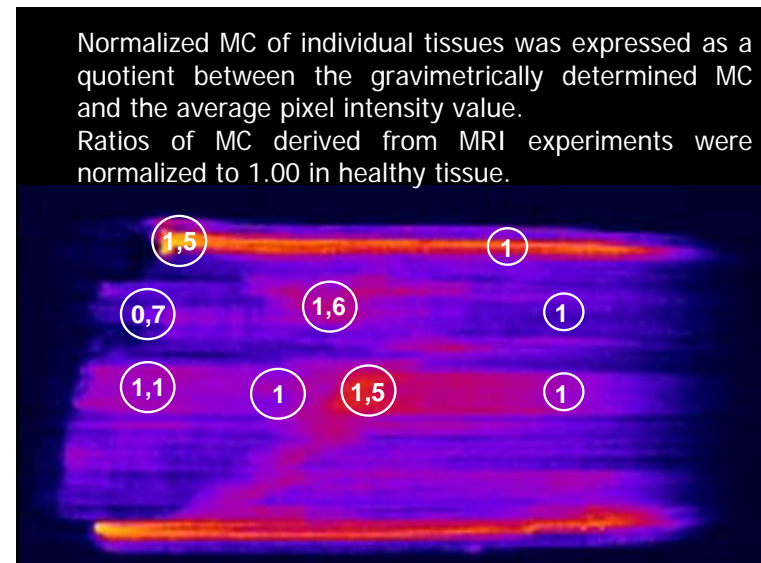
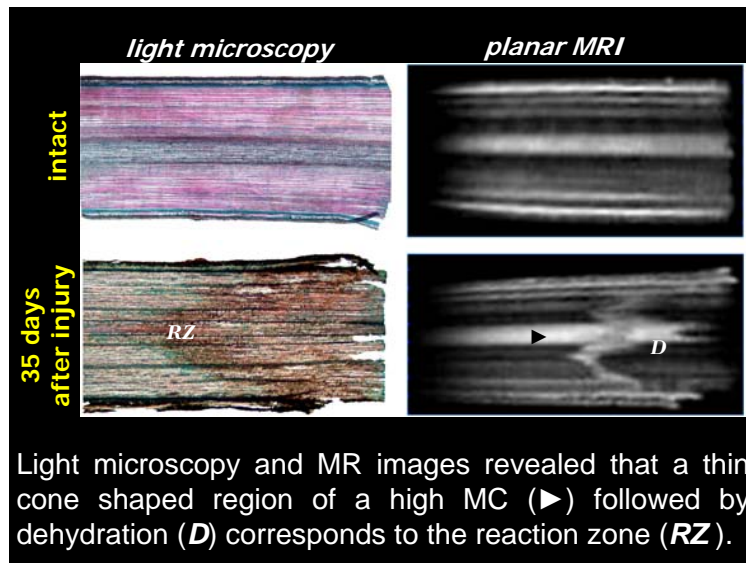
Methods:

- 3D spin-echo magnetic resonance imaging (MRI) and
- traditional light microscopy .

Investigated trees

- 3 m high beech (*Fagus sylvatica* L.) was transplanted into a portable pot
- branch of 5 mm in diameter was pruned and imaged immediately, as well as 35 days after wounding *in vivo*
- branch was inserted into a RF coil and positioned in the centre of a horizontal (2.35 T) superconductin magnet
- experiment was repeated at 3 excised branches





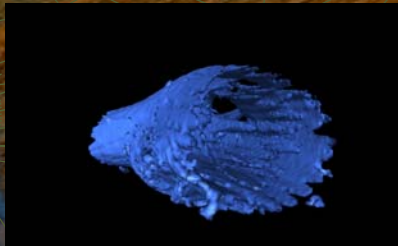
Conclusions:

- In the margins of wounded beech wood cell wall alterations as well as an intensive water accumulation probably represent integral part of the protective mechanism for the underlying sound wood.
- 3D MR microscopy is definitely capable of achieving sufficient resolution to distinguish topography, anatomy and water content in selected intact and mechanically wounded tree tissues.

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“Research of wood as material and tissue of living trees by MRI.”

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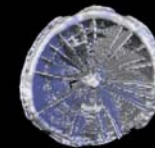
Special thanks for this work go to my:

supervisor prof. dr. Primož Oven

co-supervisor doc. dr. Igor Serša

co-workers Martin Zupančič (Department of Wood Science and Technology), Ana Sepe and dr. Urša Mikac

(MRI Laboratory at the Jožef Stefan Institute).



■ Average moisture content (av.MC) of imaged branches was determined gravimetrically from parallel samples:

$$\text{av.MC(\%)} = (m_{\text{green}} - m_0) / m_0$$

m_{green} = weight of green wood

m_0 = weight of absolutely dry wood

3D Magnetic Resonance Imaging

■ Branches were imaged by a 3D spin echo MR microscopy technique at:

- field of view (FOV): 25 x 12.5 x 12.5 mm³,
- imaging matrix: 256 x 128 x 128,
- echo time (TE): 2.4 ms,
- repetition time (TR): 600 ms and
- at 8 averages.

■ Spatial resolution of images was 100 μm isotropic and total imaging time was 22 hours.

■ MRI data were processed and analyzed by Image-J (NIH, USA) computer software.