

We have a new name! STFI-Packforsk is now INNVENTIA

On the orientation of the wood polymers in spruce wood fibres

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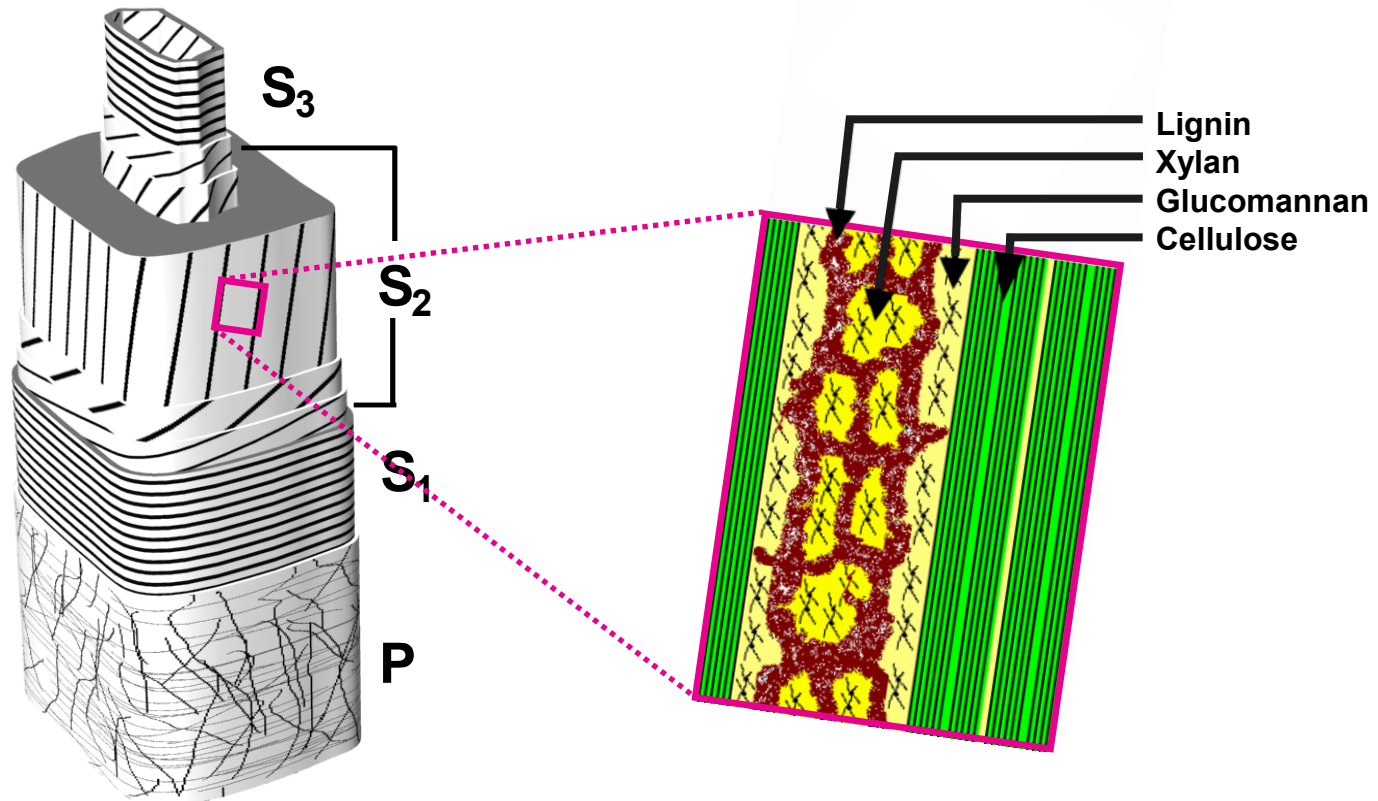


INNVENTIA

In S_2 :

- ✓ Cellulose and glucomannan oriented
- ✓ Xylan and lignin?

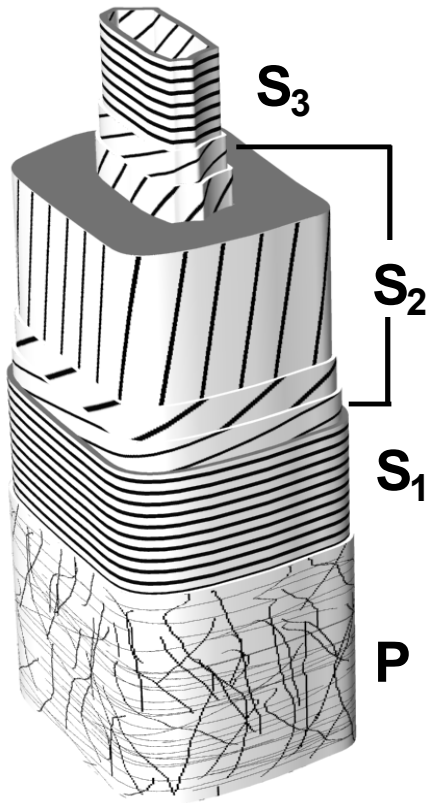
Imaging FTIR microscopy



(Brändström 2002)

(Salmén and Olsson 1998)

Fibres studied



(Brändström 2002)

✓ Wood fibres (W):

Mechanically treated TMP spruce fibres

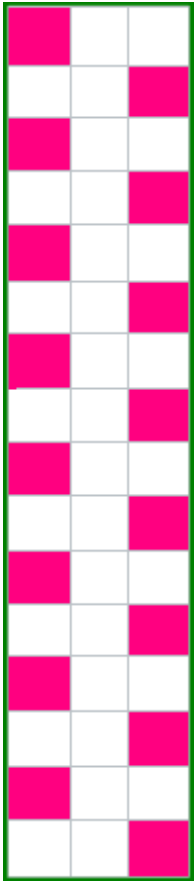
$S_2 + S_3$ layers remaining

✓ Holocellulose fibres (H):

Macerated ($H_2O_2 + CH_3COOH$) spruce fibres

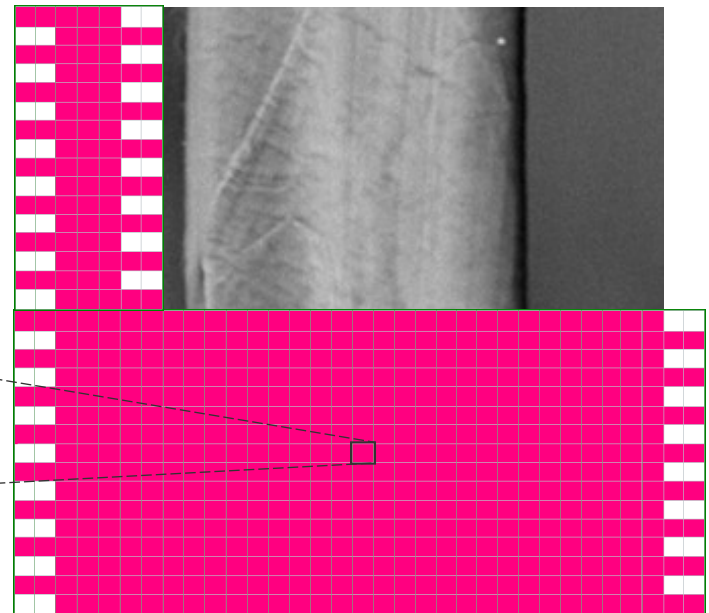
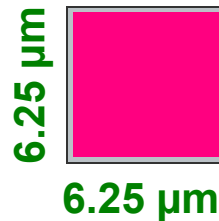
delignified, 45% hemicelluloses removed

Imaging mode



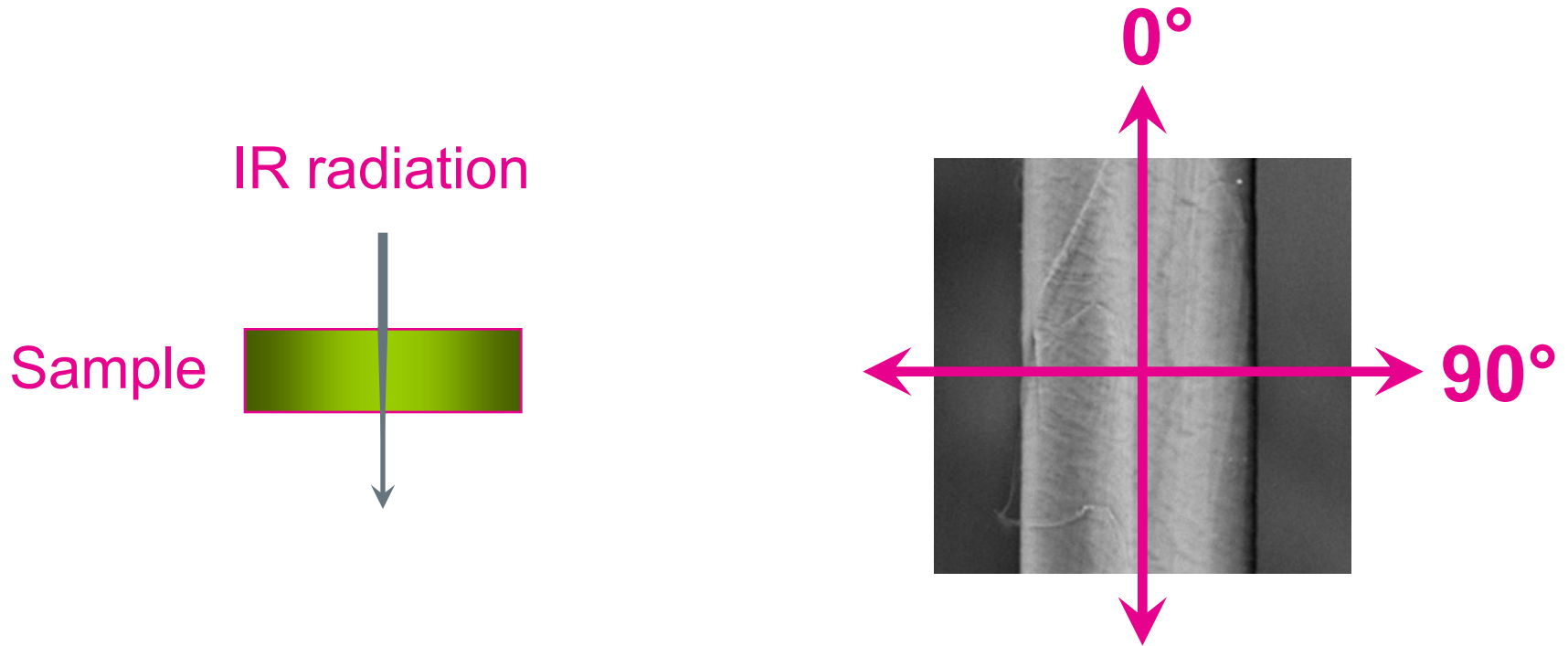
Linear Array 6.25 μm (NB)MCT

- ✓ 16 elements
- ✓ stepping precision 0.1 μm
- ✓ pixel resolution:



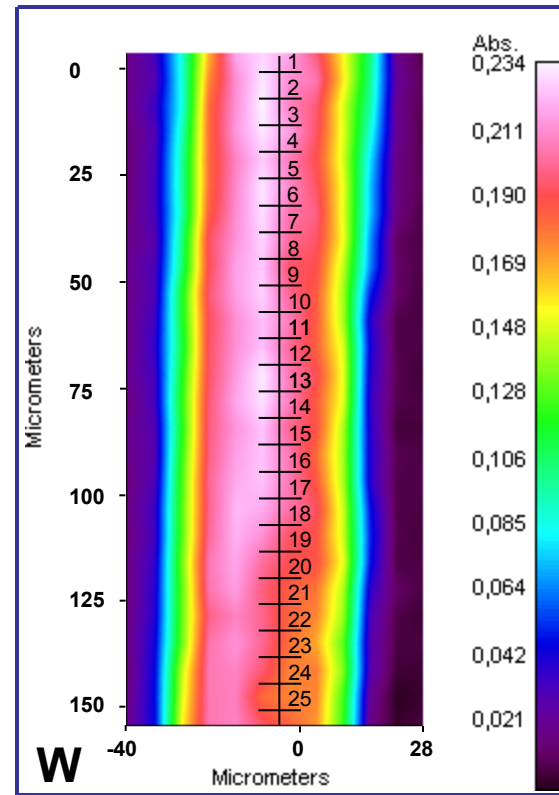
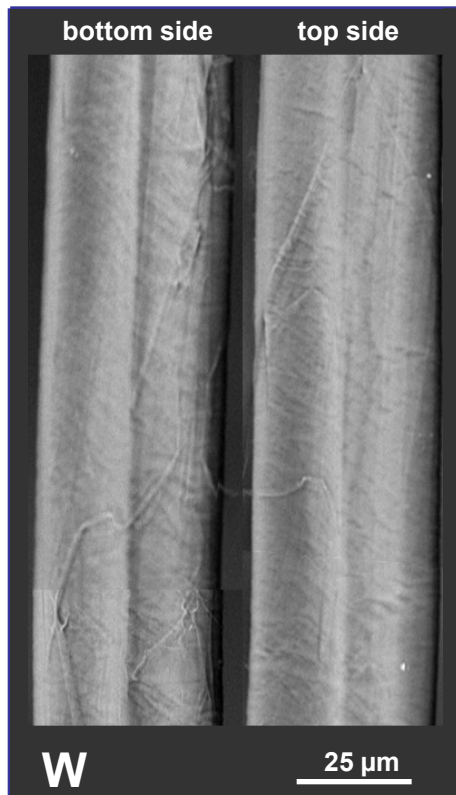
- ✓ 1 pixel = 1 spectrum

Transmission – Polarised radiation

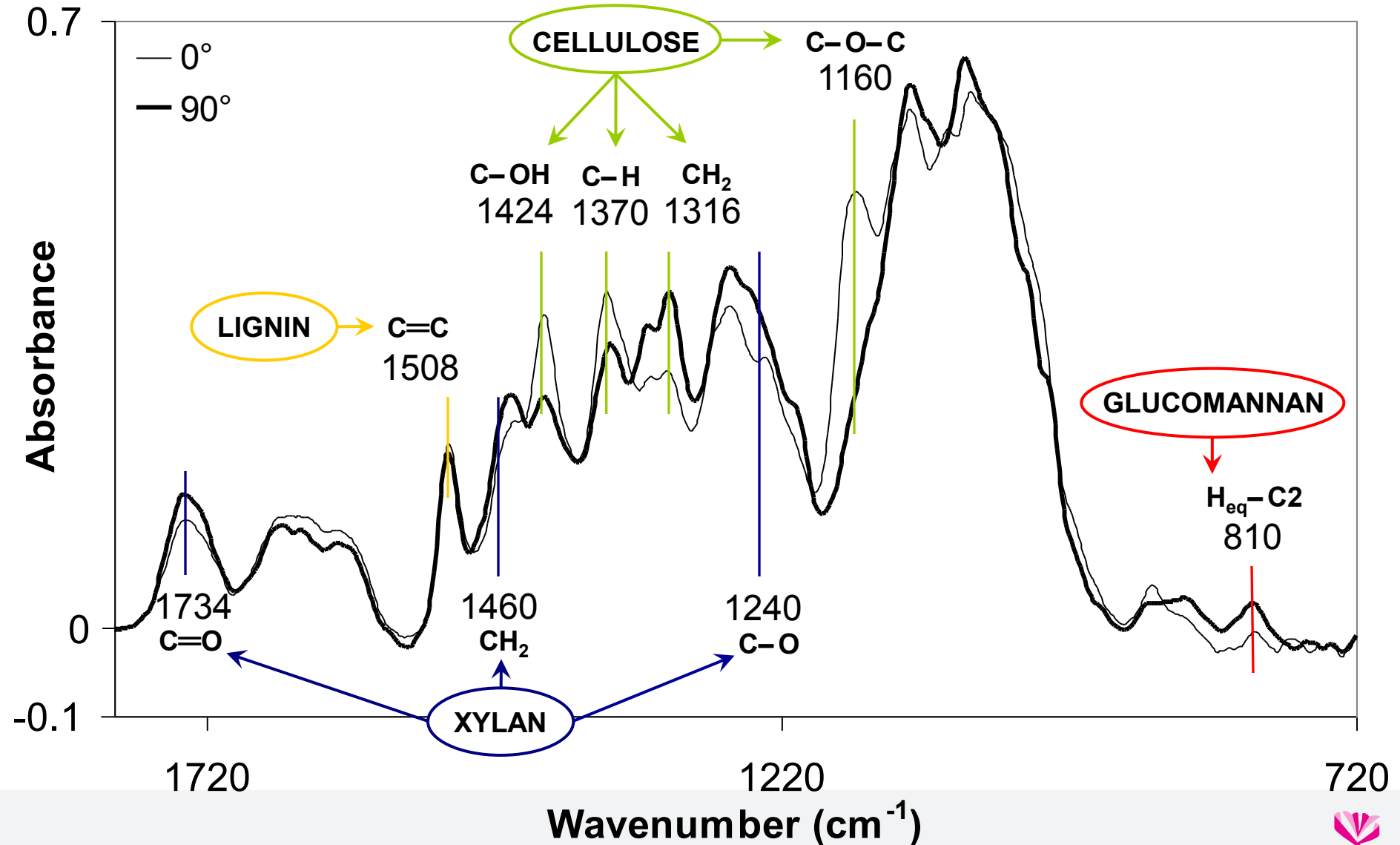


$$\text{Ratio} = \frac{\text{Transmittance spectra at } 0^\circ}{\text{Transmittance spectra at } 90^\circ}$$

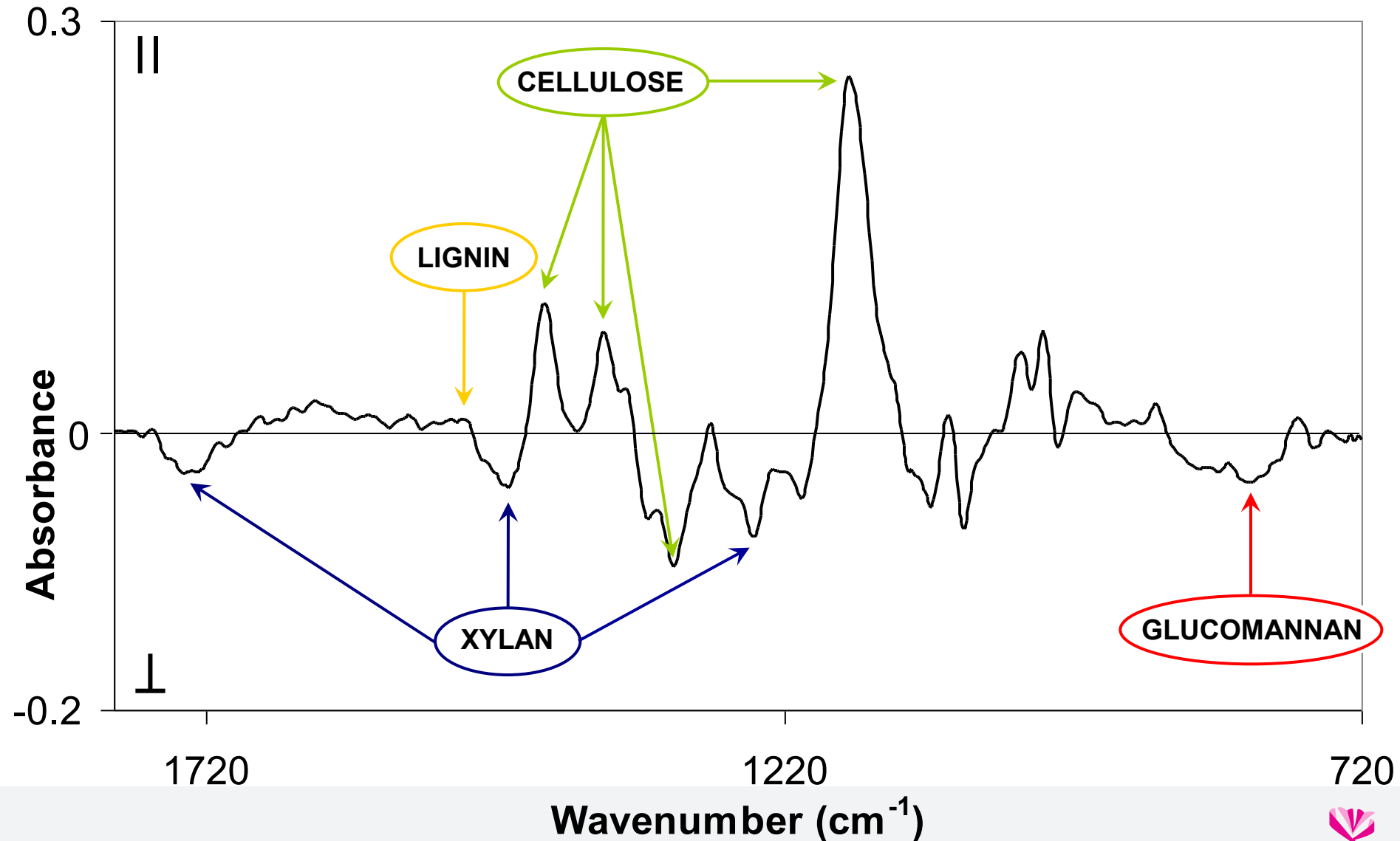
ESEM – Full spectral image



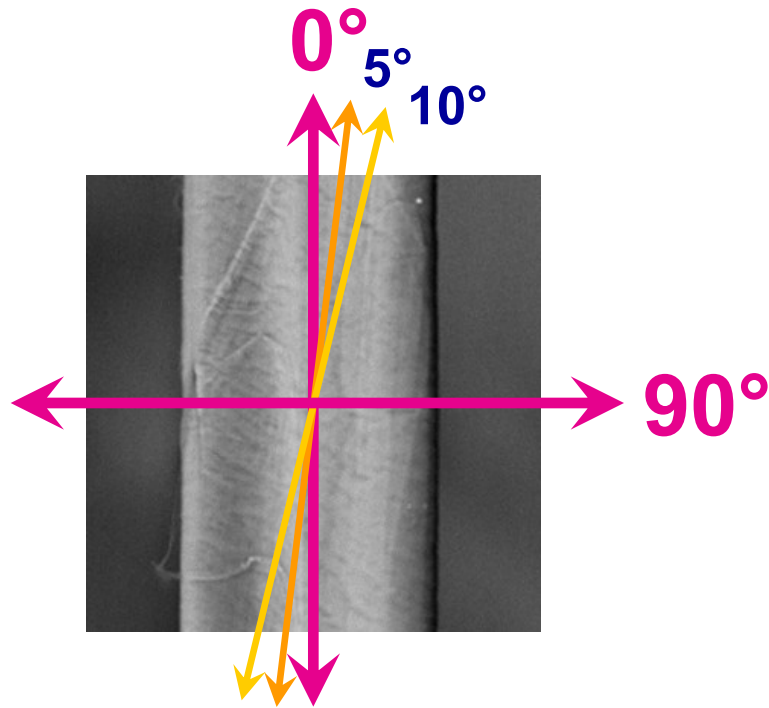
W fibre – 0° and 90° absorbance spectra



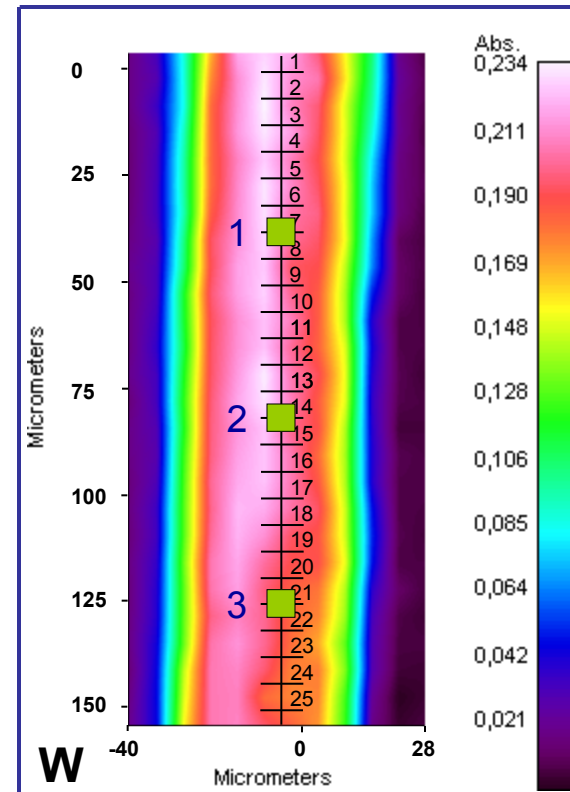
W fibre – Average ratio spectrum



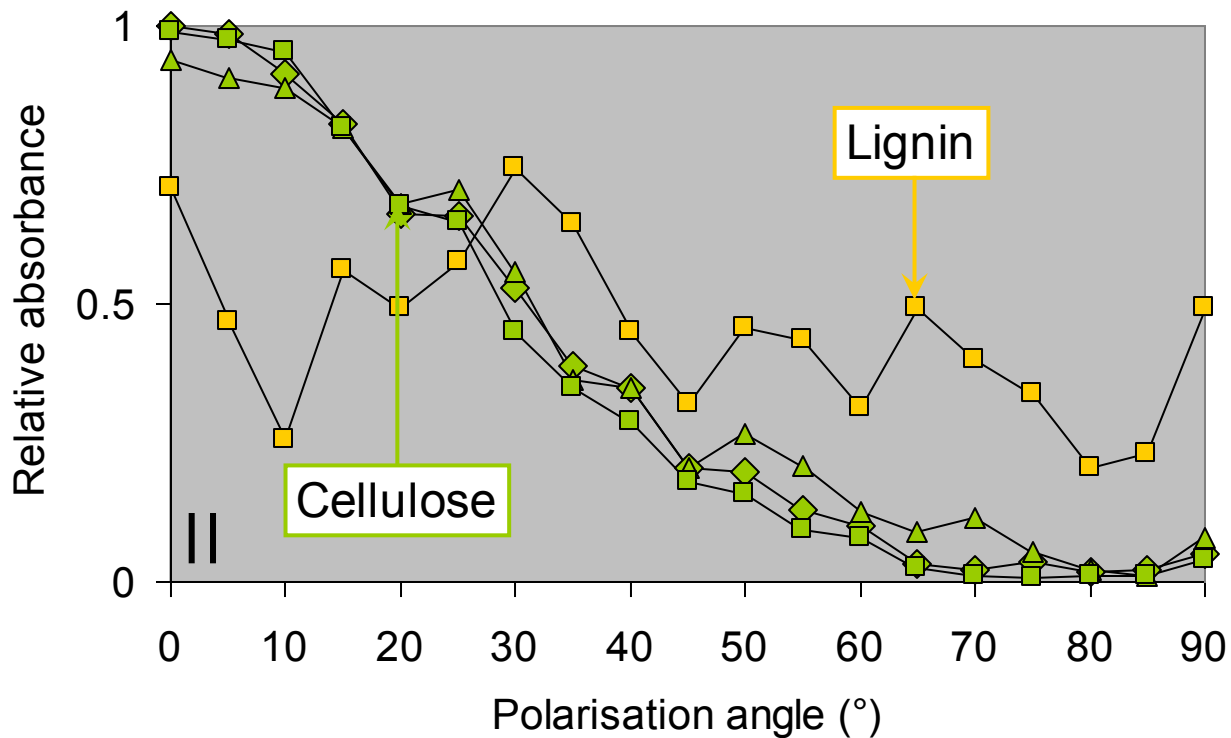
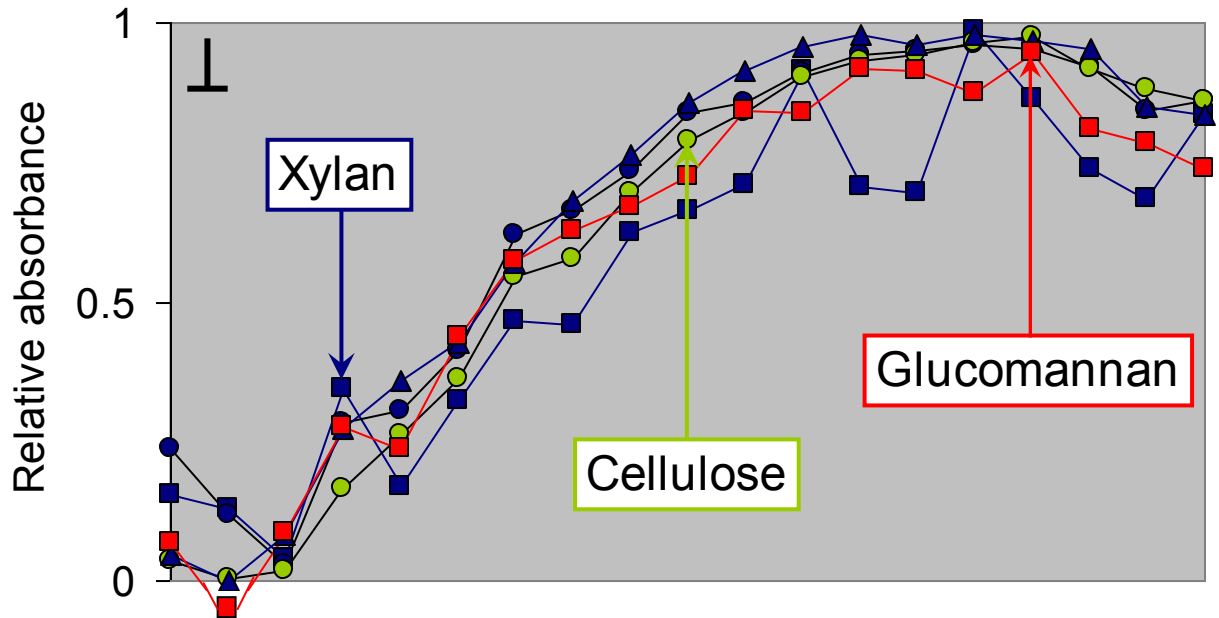
Polarised radiation



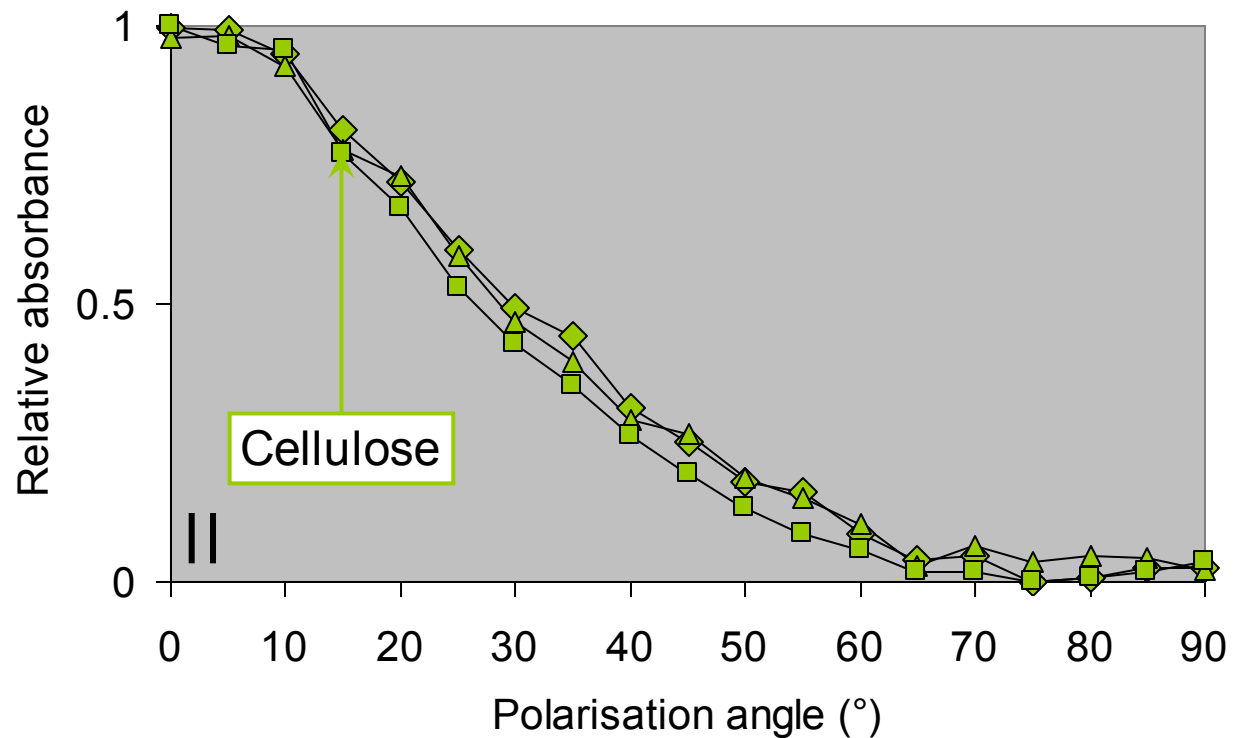
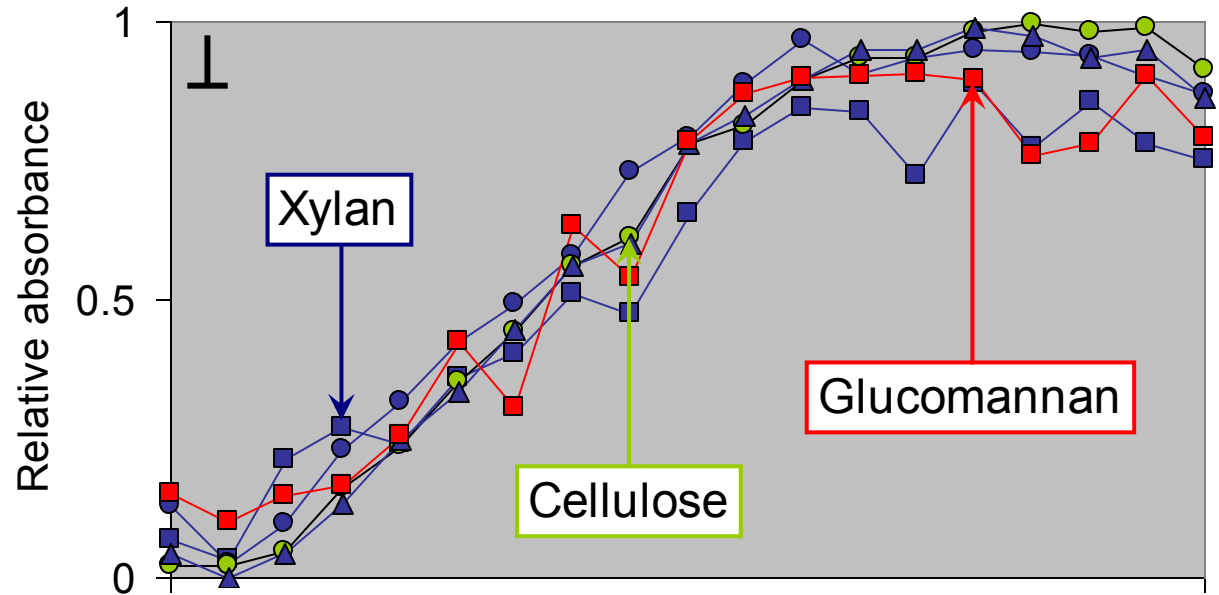
$$RA = \left(\frac{I_P - I_{\min}}{I_{\max} - I_{\min}} \right)$$



W fibre Relative absorbance vs. polarisation angle

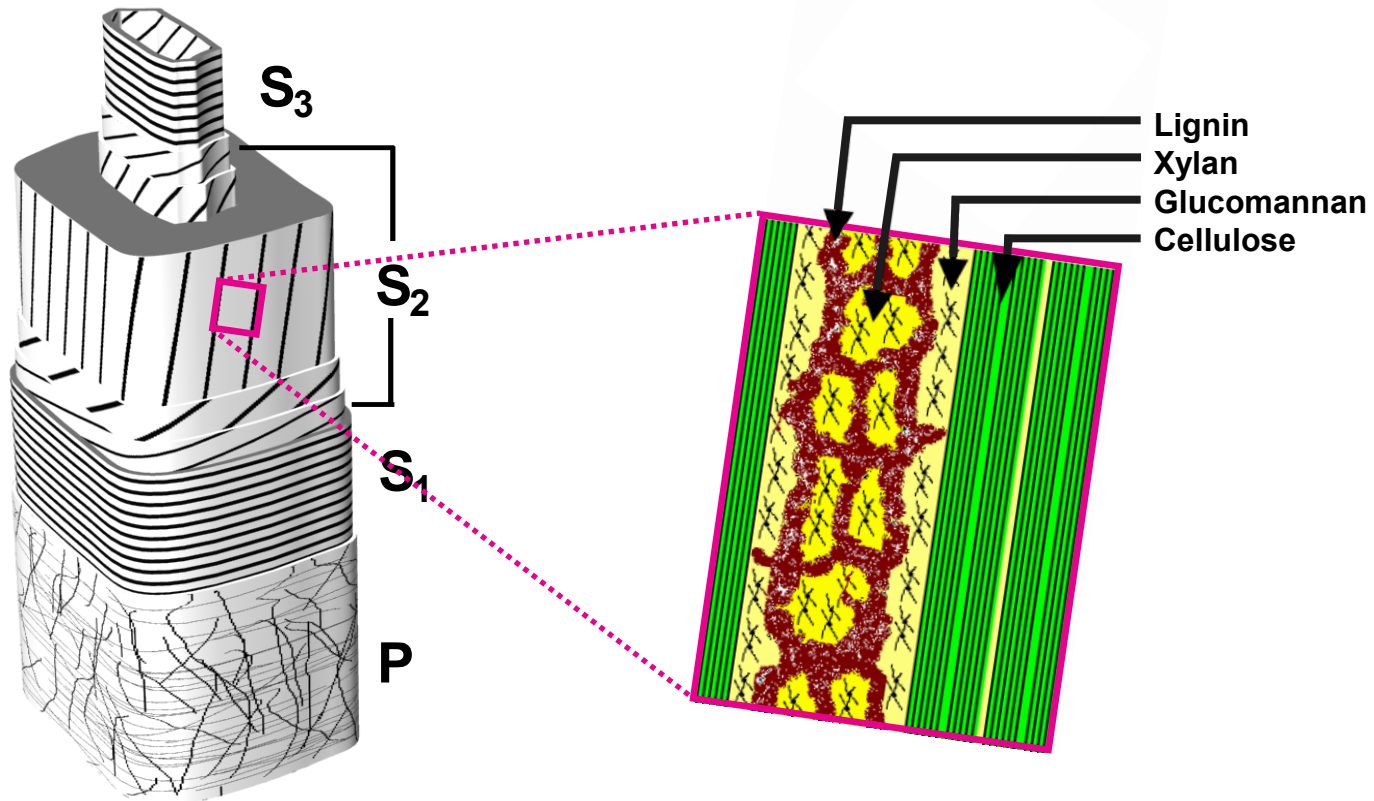


H fibre Relative absorbance vs. polarisation angle



In S_2 :

- ✓ Carbohydrates oriented
- ✓ Lignin not fully isotropic
- ✓ No significant orientational variations



(Brändström 2002)

(Salmén and Olsson 1998)

Thank you for your attention!

“Orientation of the wood polymers in the cell wall of spruce wood fibres”

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