

Tree-rings have not disclosed all their secrets yet: an novel application of wood anatomy reveals additional environmental information

Patrick Fonti¹, Ignacio García-González², Dieter Eckstein³

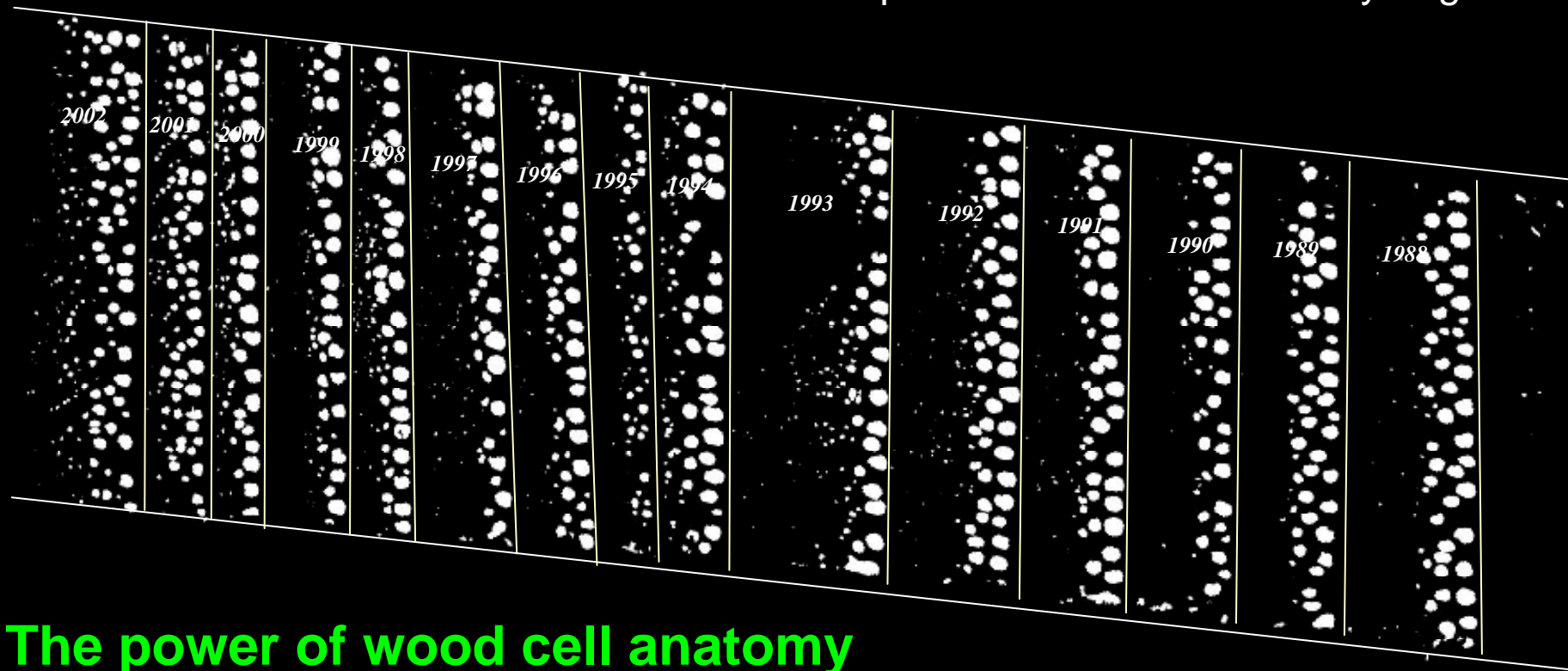
¹ WSL Swiss Federal Research Institute, Switzerland

² Department of Botany, University of Santiago de Compostela, Spain

³ Department of Wood Science, University of Hamburg, Germany

The power of tree rings

- Encode response to environment
- Annually datable
- Long and continuous time series
- Widespread distributed and "easy to get"



Castanea sativa Mill.

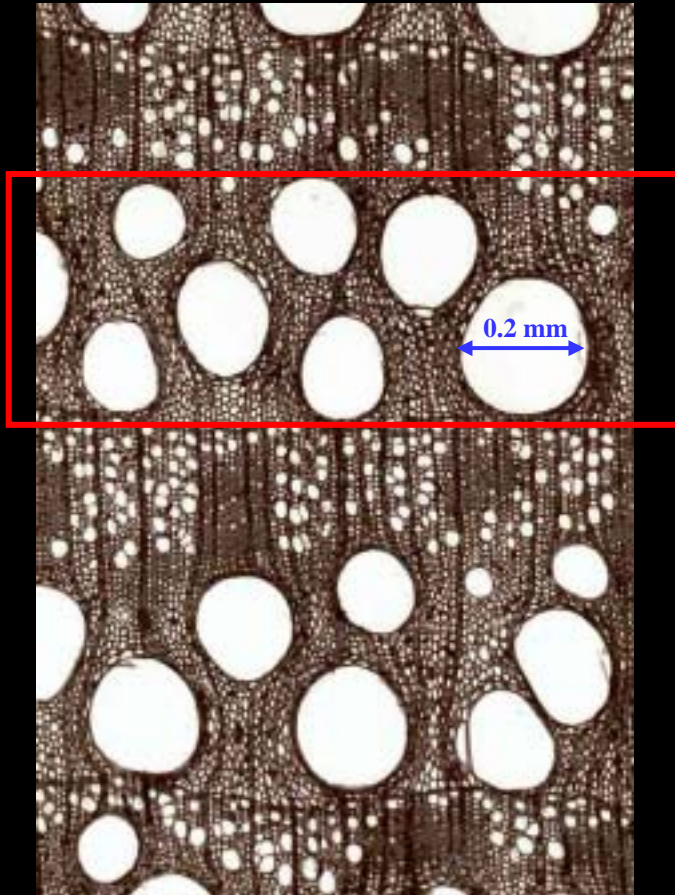
The power of wood cell anatomy

In addition to tree-ring

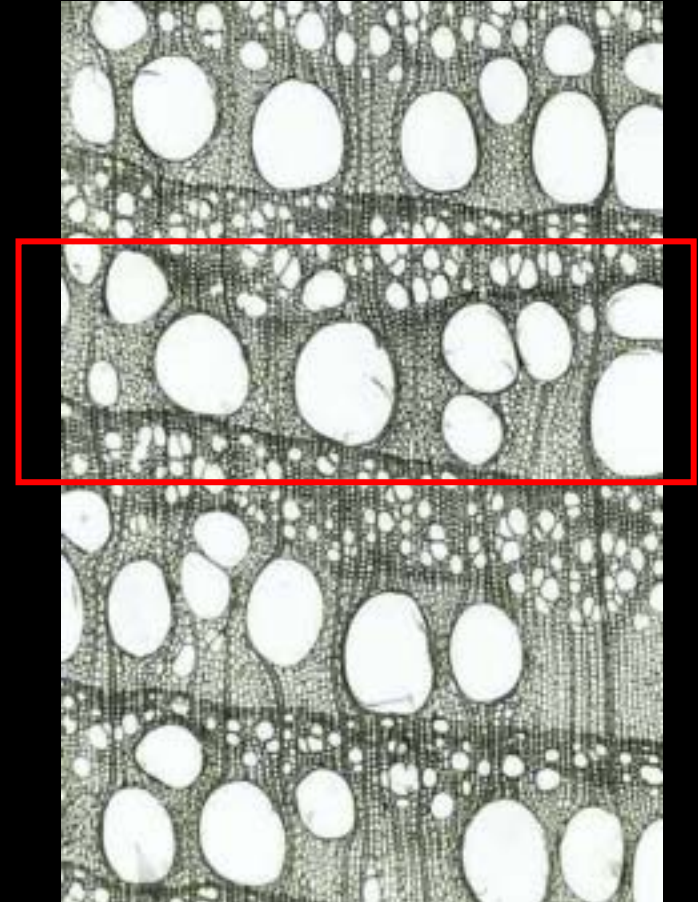
- Seasonal information
- Direct link to tree physiology

Explorative case studies

Oak



Chestnut

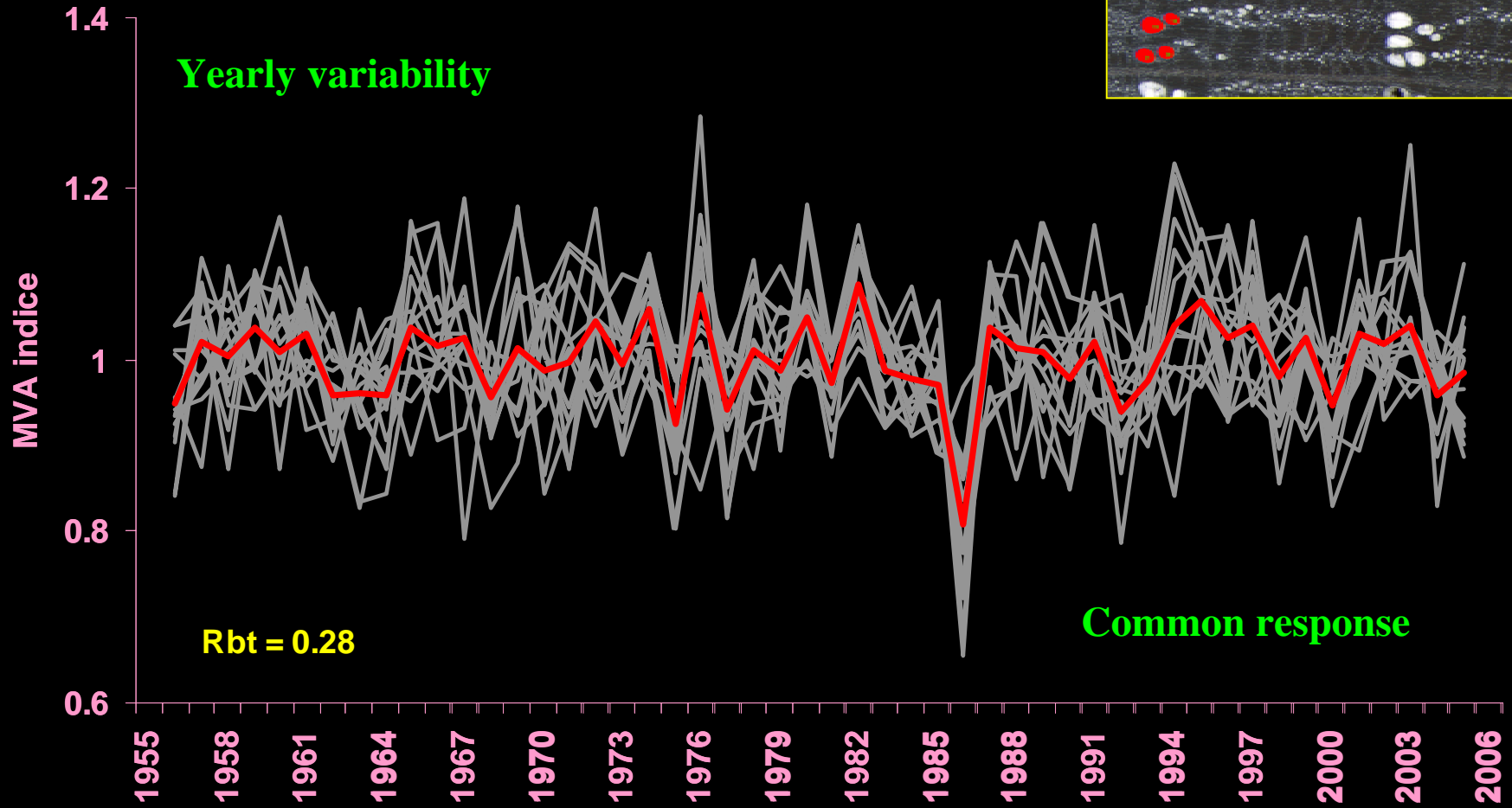
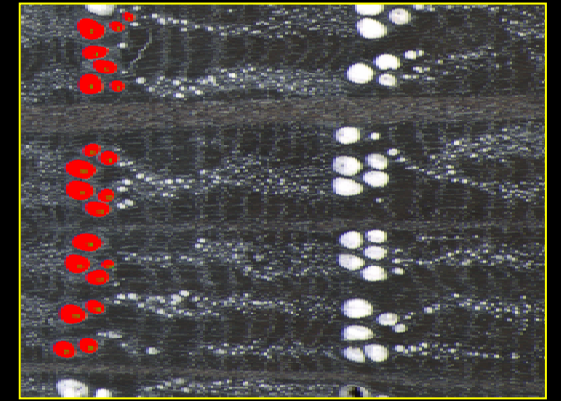


Earlywood vessels

Common signal

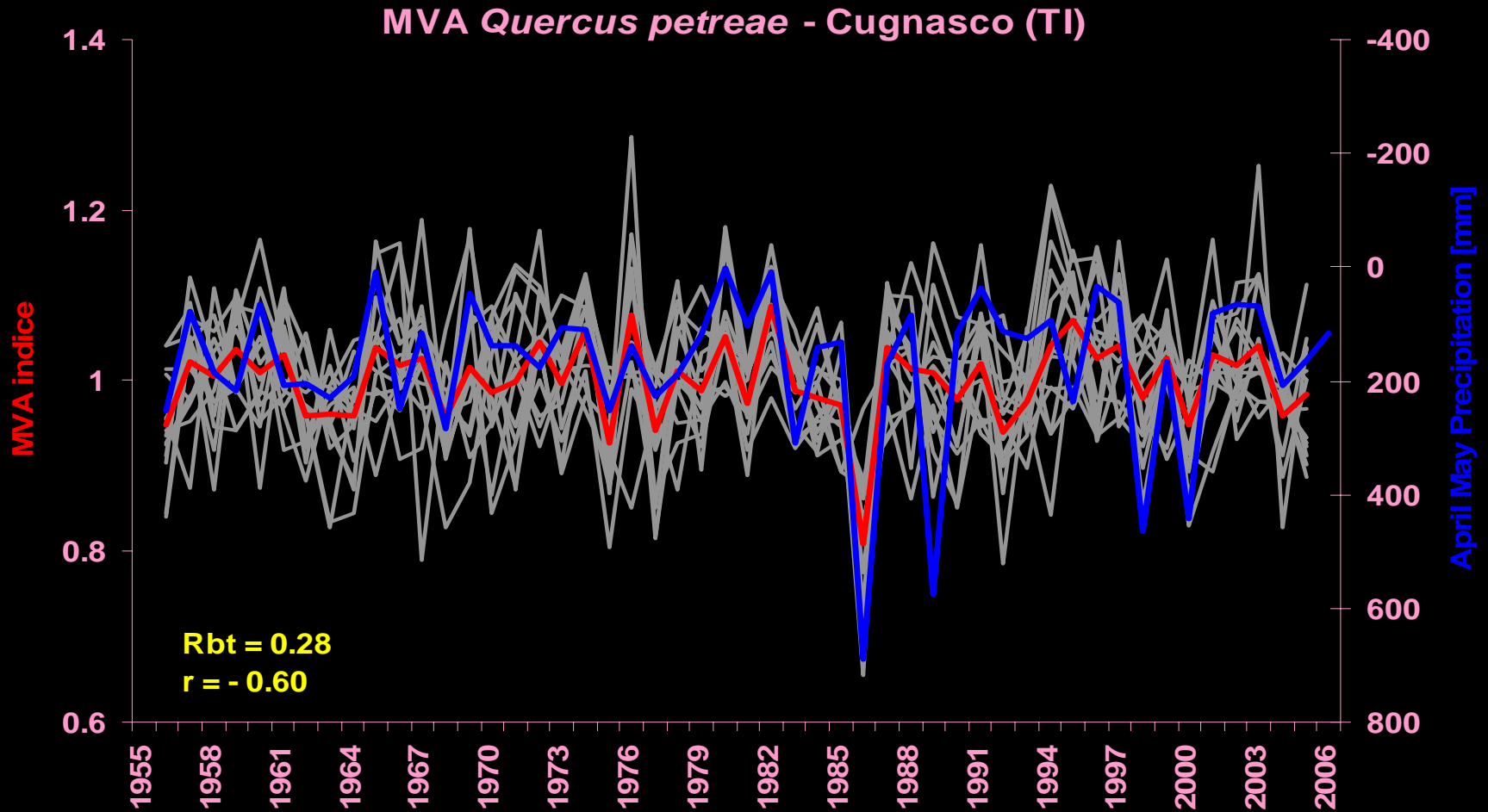
MVA: Mean Vessel Area

MVA Quercus - Cugnasco (TI)



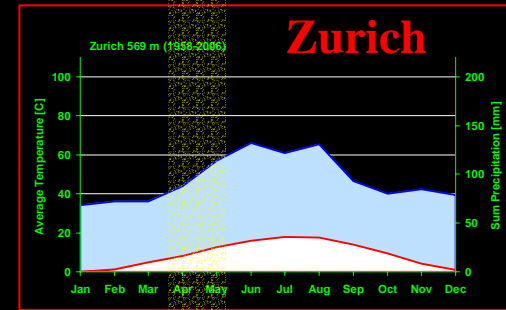
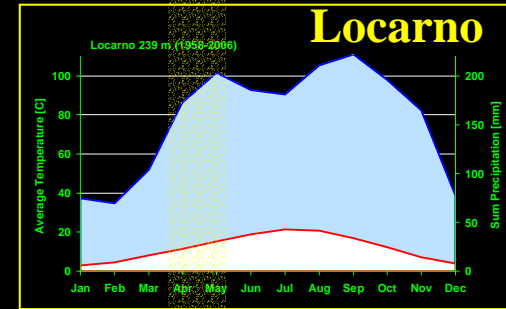
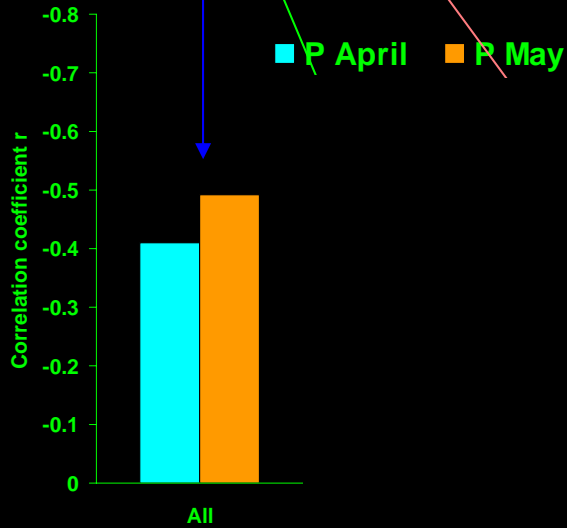
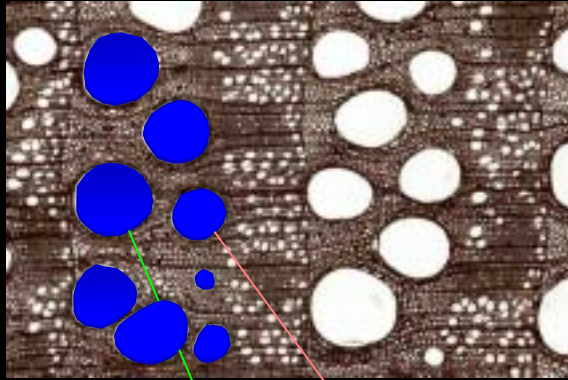
New environmental information

IAWA meeting
 San Luis Potosi, Mexico, 16-20 July 2007



High time resolution

Outside limiting factors

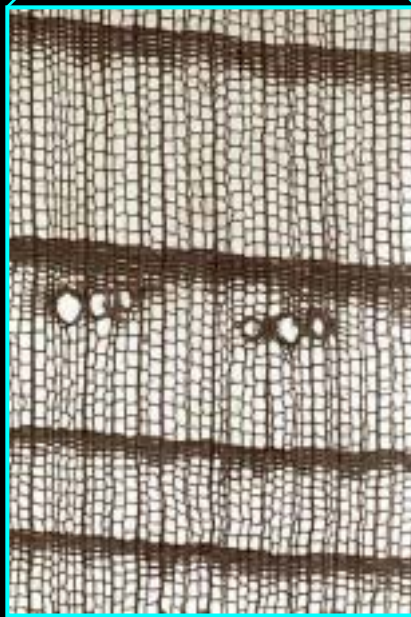
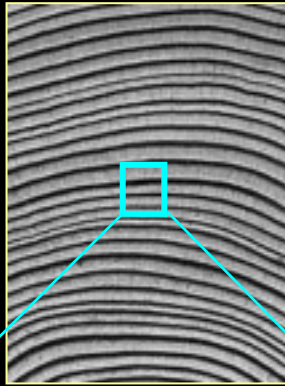


These examples on MVA shows that:

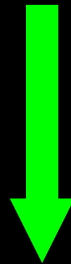
- Time series of wood cell anatomical features can encode valuable environmental information
 - Common signal
 - Climatic information
 - High time resolution
 - Valid outside zones with factor limiting growth

The upgrade: an old challenge

Coniferous wood

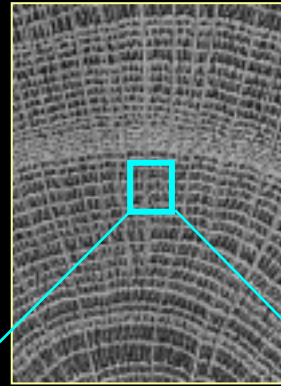


mm

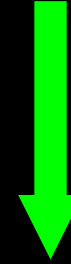


μm

Ring porous wood

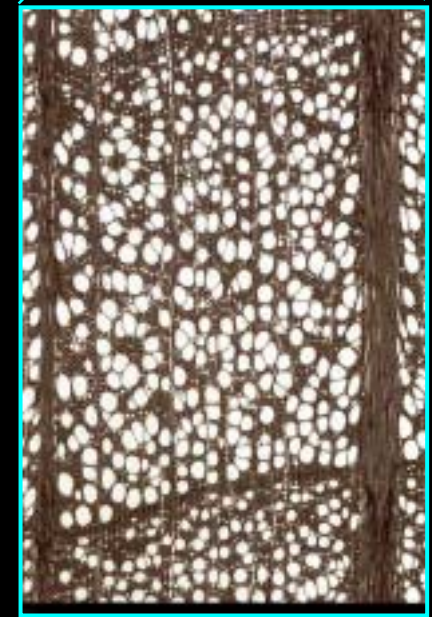
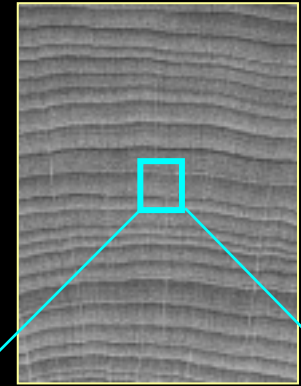


1



n

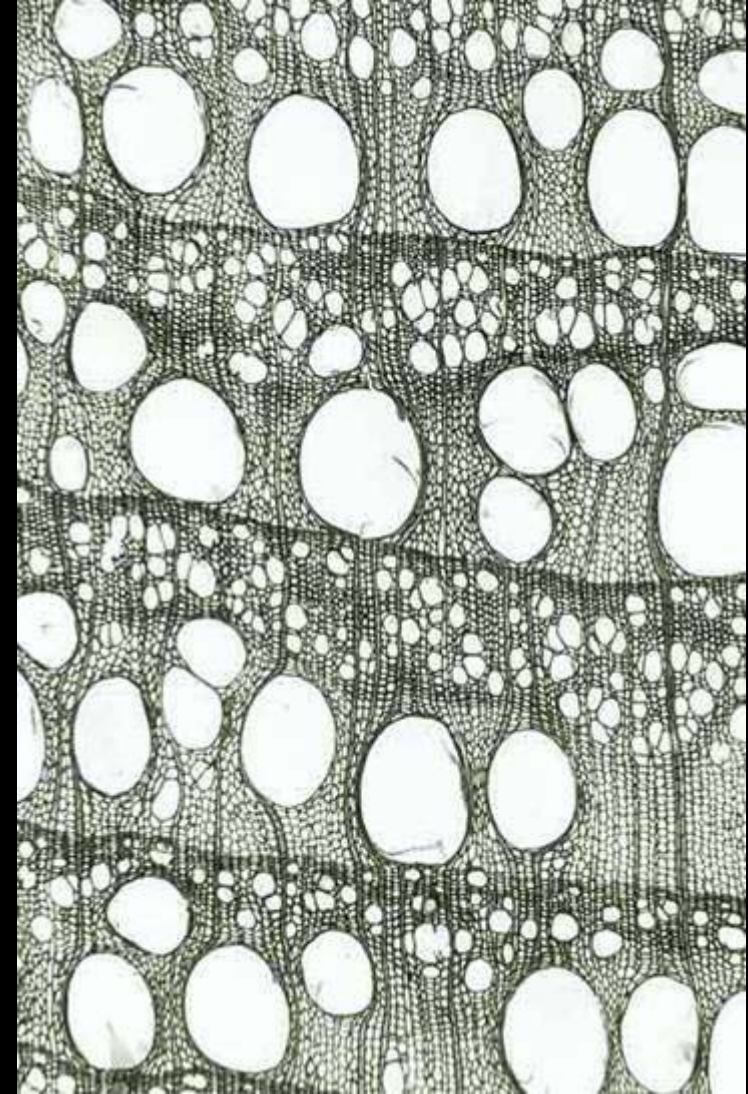
Semi-ring to diffuse porous wood



Nowadays we have the tools

- Technological development
 - Digital camera
 - Computer
 - Image analysis software

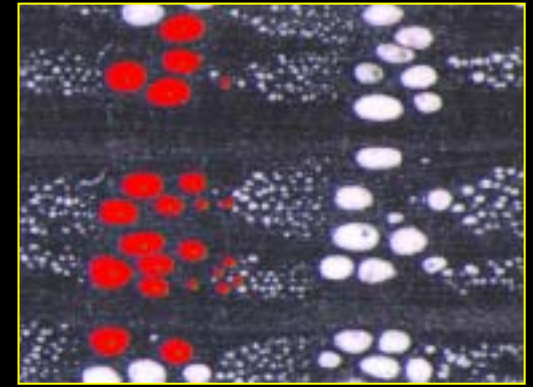
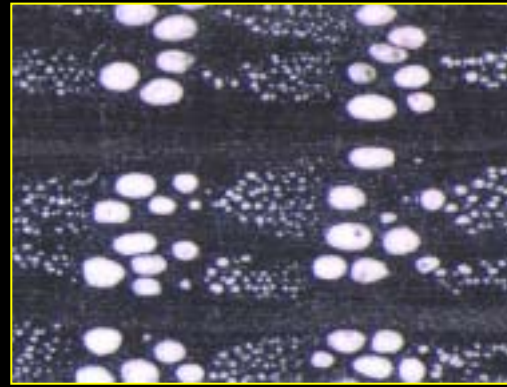
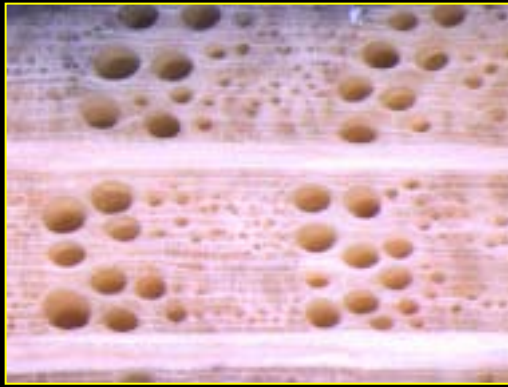
→ Automatic survey



Automatic survey need contrast

4.5 cm

Ring porous wood

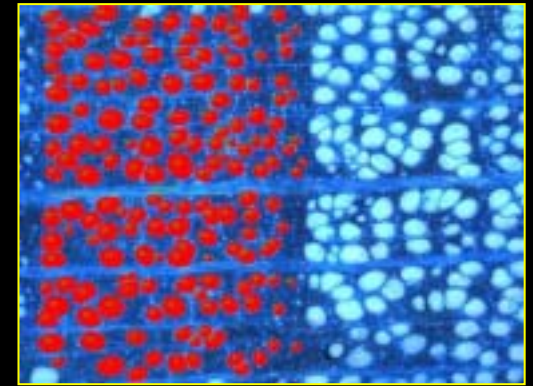
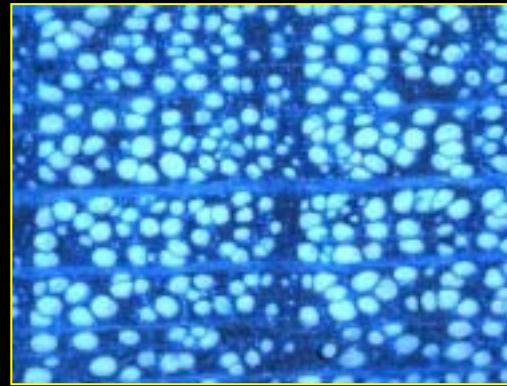


■ Surface quality

■ Contrast

■ Automatic survey

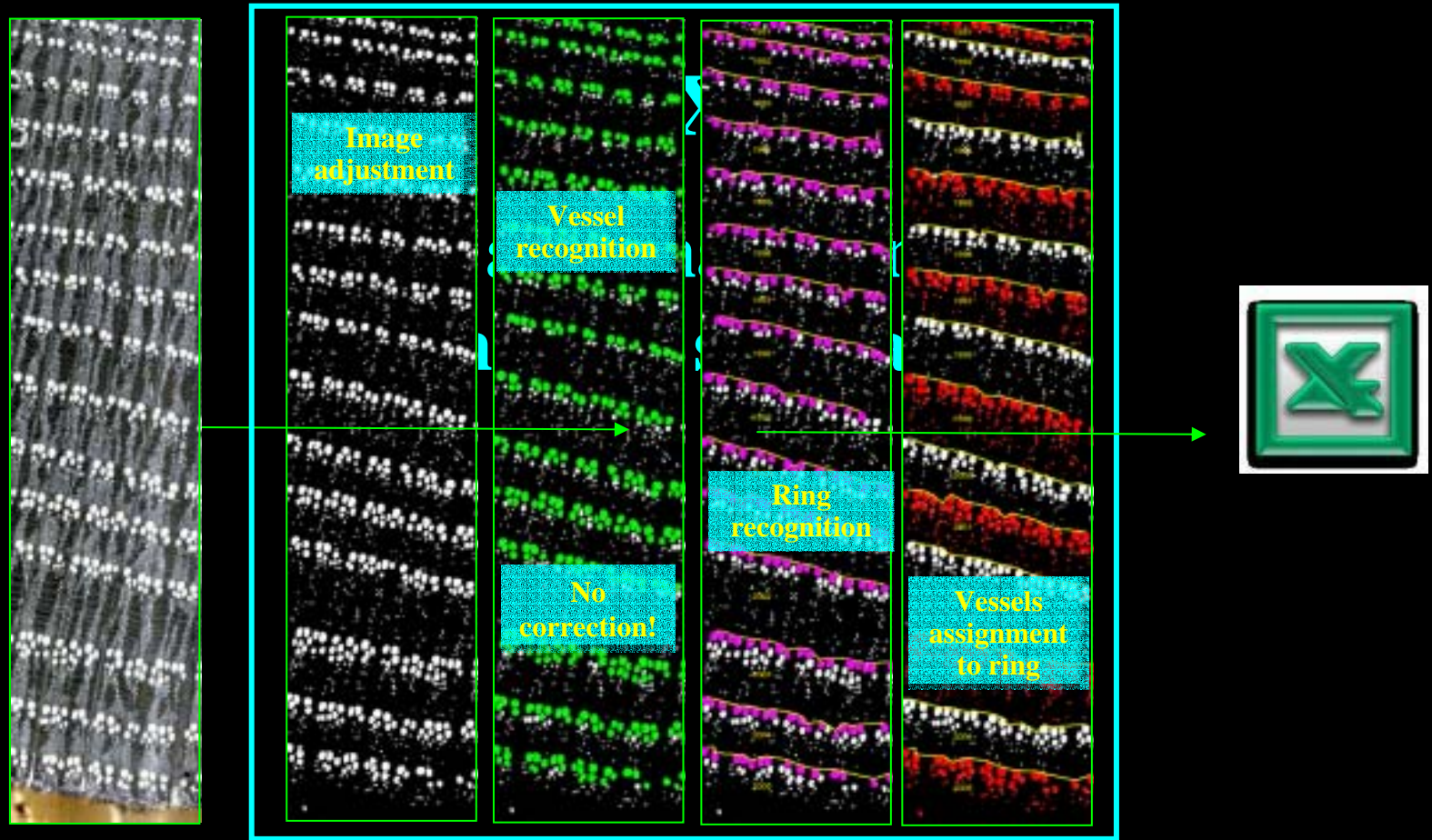
Semi-ring to diffuse porous wood



1.5 cm

Full Automatisation

IAWA meeting
San Luis Potosi, Mexico, 16-20 July 2007



Capturing Image
(Scanner 1500 dpi, 30 MB)

**Automatic
ring and vessel recognition**

**Automatic
Data export**

Conclusions

Time-series of wood cell anatomical features

- New information with interesting properties
 - Tools to explore
- ➔ new opportunity for a novel development of wood anatomy !!!!

Thanks for your attention!!!

For more info or details

www.wsl.ch/personal_homepages/fonti

patrick.fonti@wsl.ch