ForSEAdiscovery

Application of ecological wood anatomy for provenancing of oak and pine wood from Atlantic Iberia

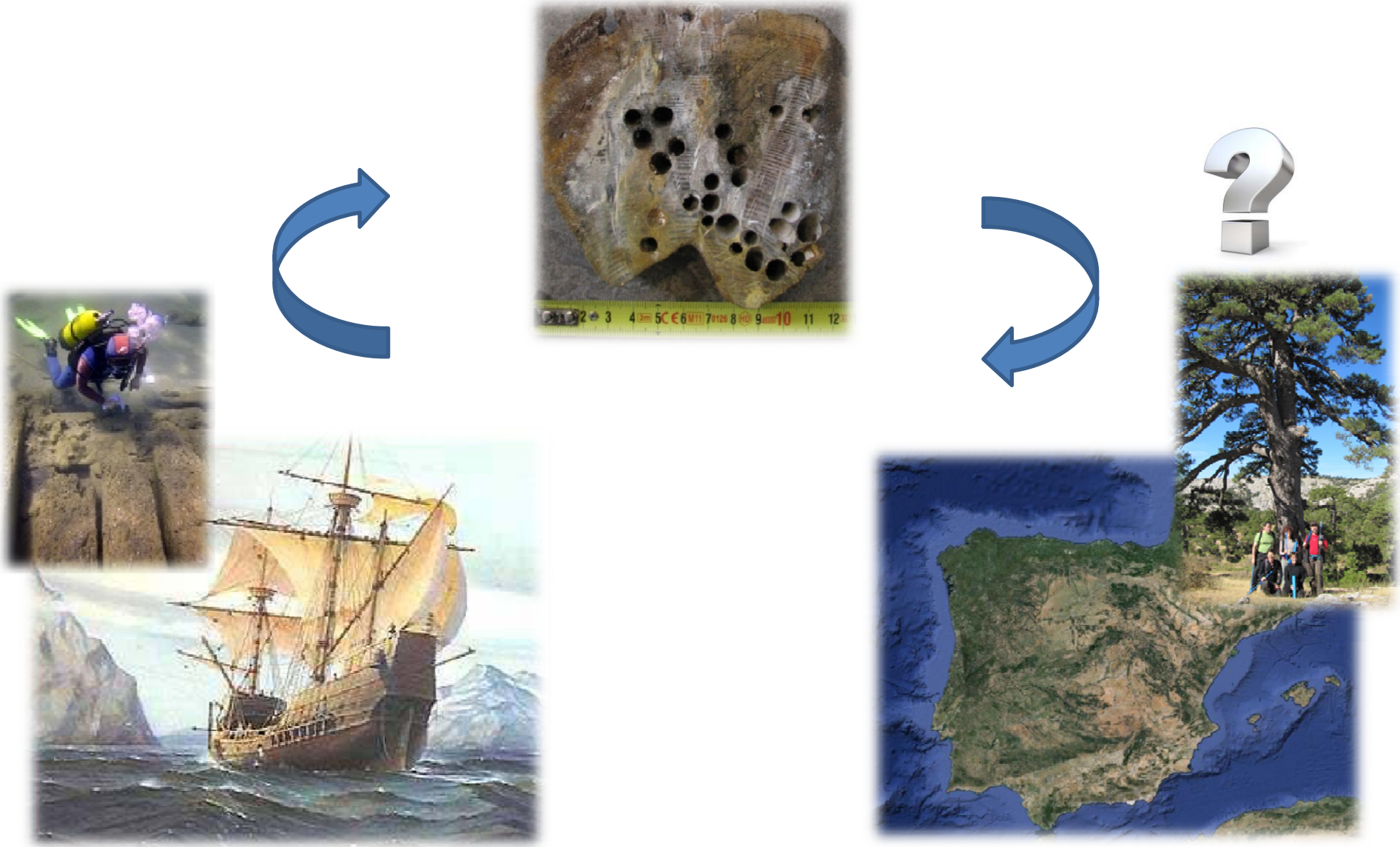
WAGENINGEN UR

ForSEAdiscovery

MARIE CURIE ACTIONS

MARIE SKŁODOWSKA-CURIE ACTIONS

Wood-anatomical analyses within the ForSEAdiscovery project

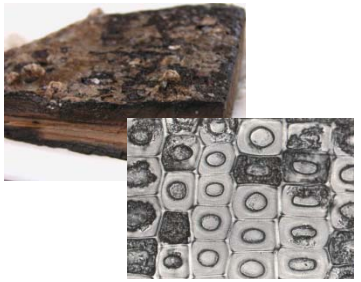


Wood-anatomical analyses within the ForSEAdiscovery project

WP 1

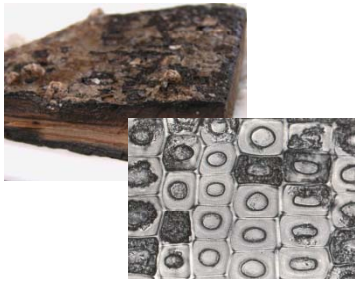
WP 2

WP 3

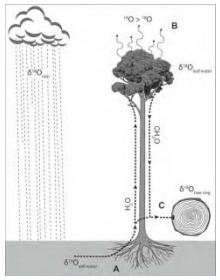


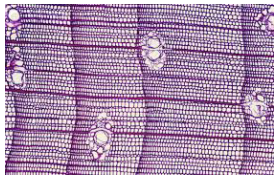
Wood-anatomical analyses within the ForSEAdiscovery project

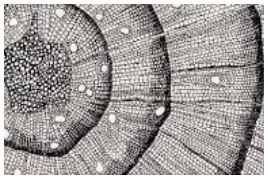
WP 3



Provenancing of ship timber







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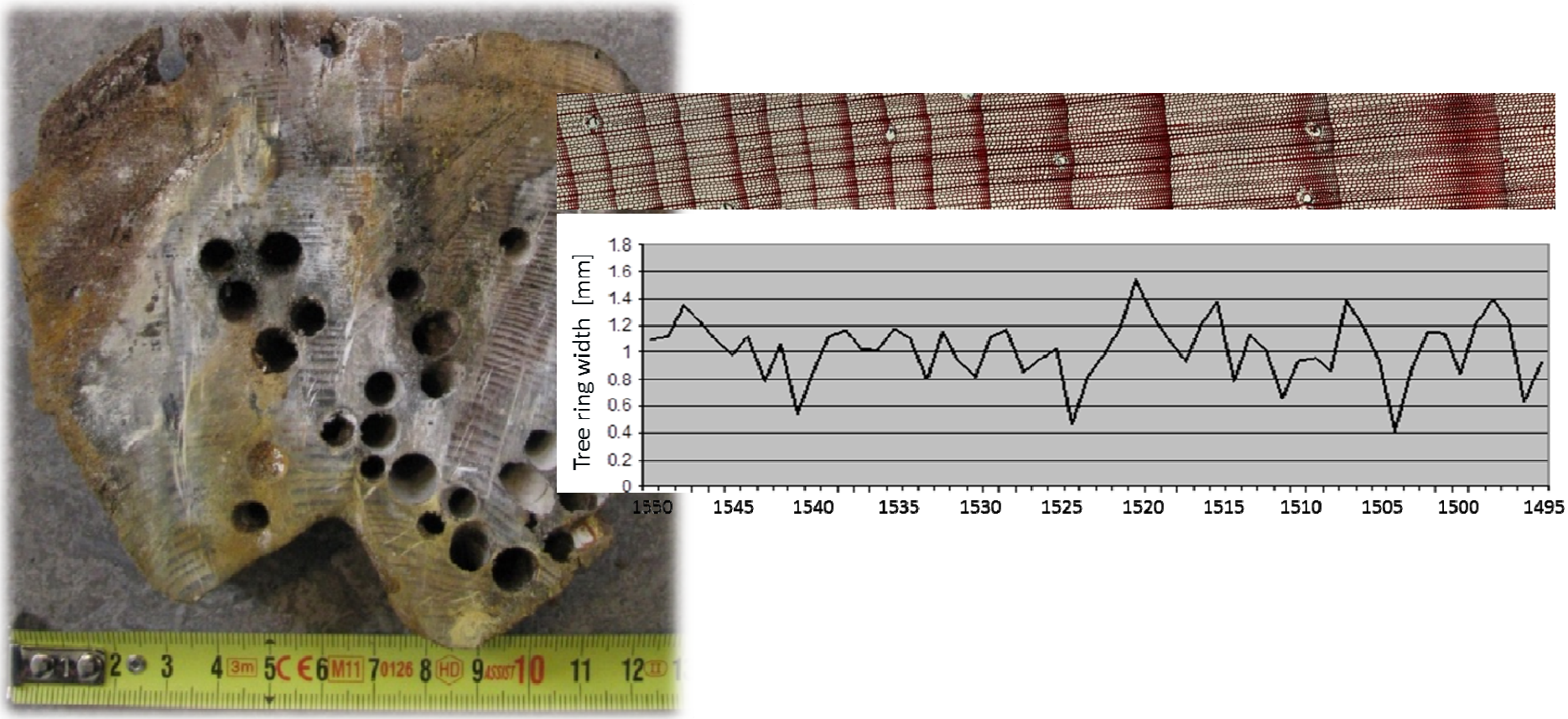

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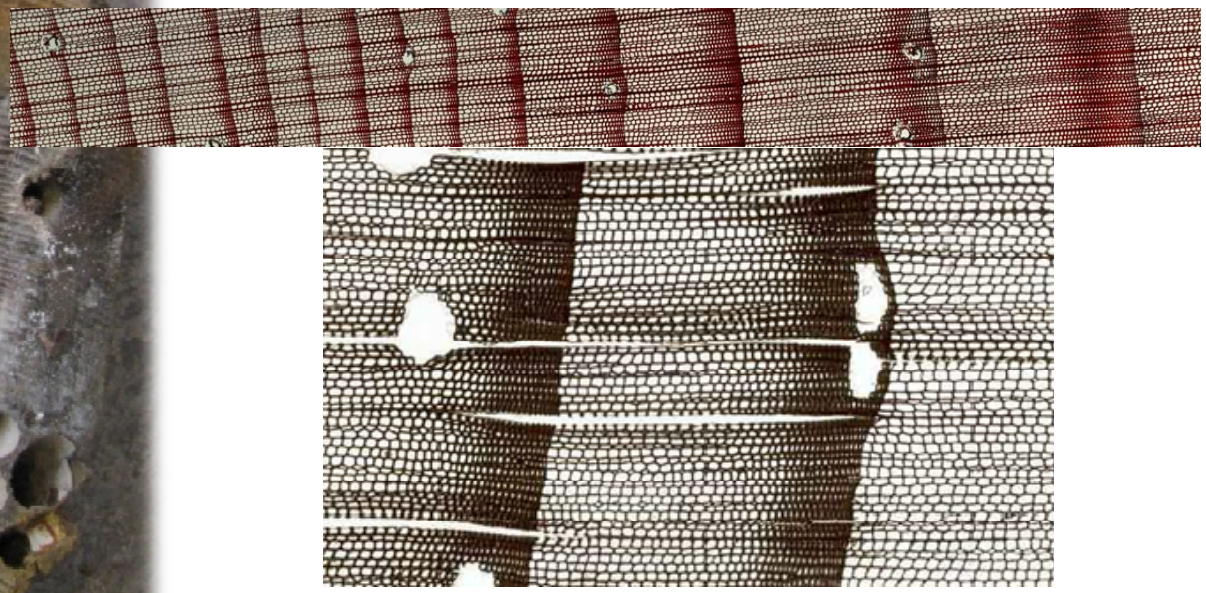

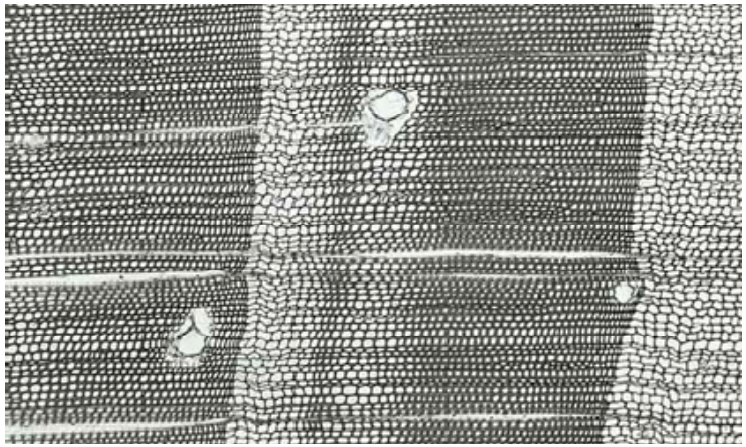

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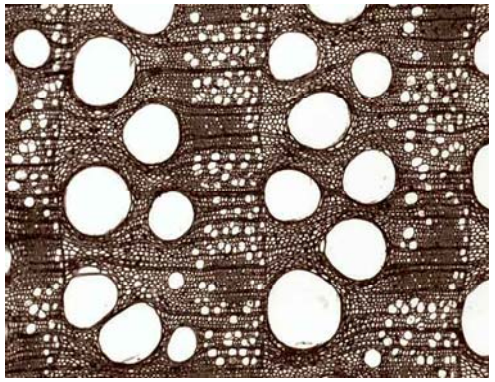
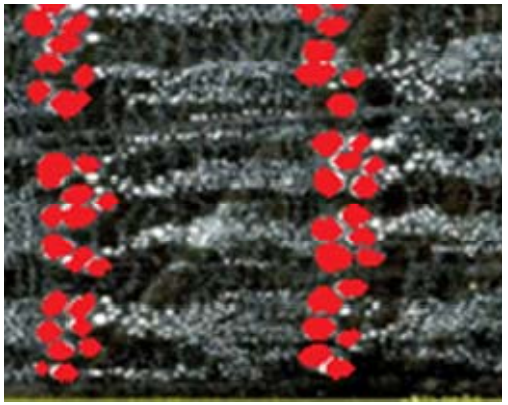
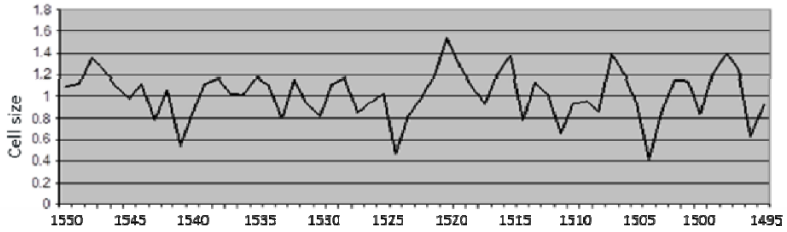
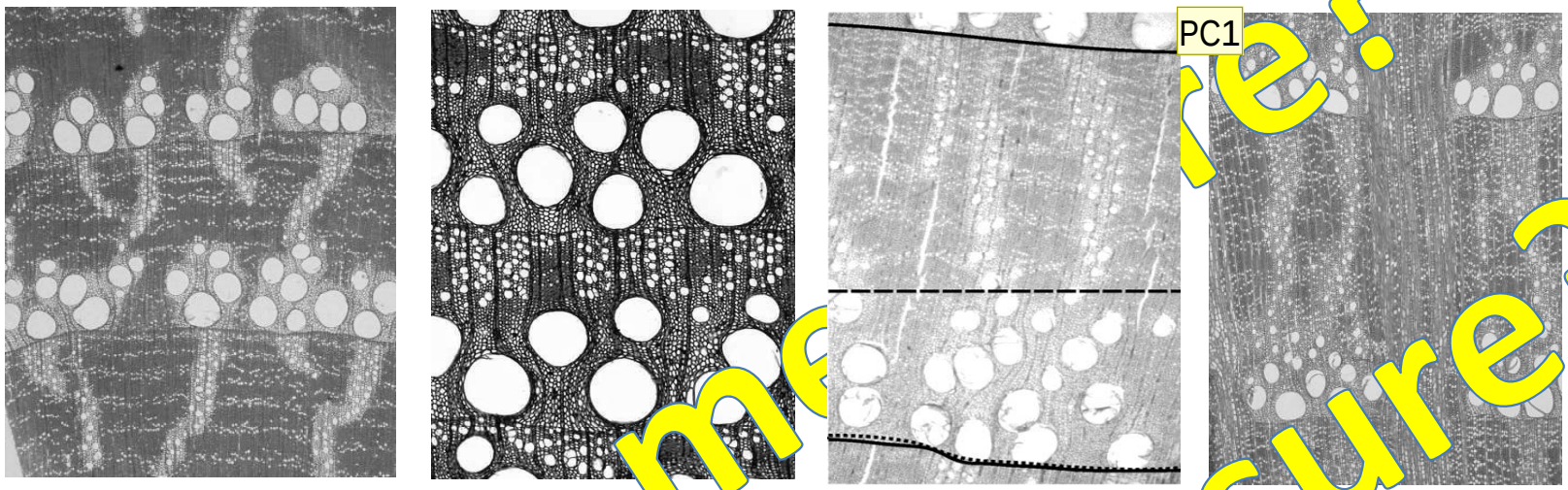
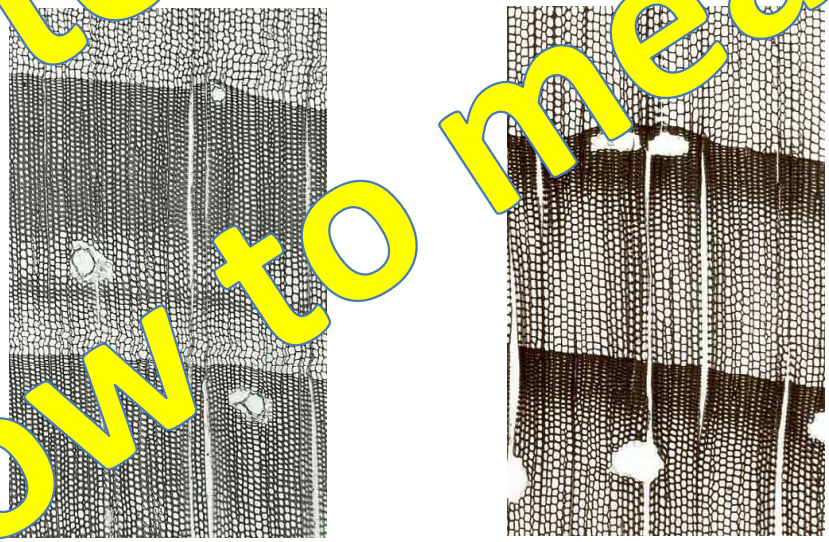








Oak species. From left to the right: *Q. robur, Q. petraea, Q. pyrenaica* and *Q. faginea*



Pine species. On the left – *Pinus sylvestris.* On the right – *Pinus nigra*

What to measure?

How to measure?

Diapositiva 8

PC1 Search for another adult wood

Copini, Paul; 09/01/2015

Potential anatomical features for provenancing (oak)

Variable	Conclusion
Earlywood (EW)	Contains environmental signal
Latewood (LW)	More sensitive to climate, than early wood or entire ring width (*Q. robur* and *Q. petraea*). More sensitive than vessel area chronologies
First raw earlywood vessels (total number and lumen area)	Often lead to successful results when comparing to climate
Earlywood vessel lumen area	Contains strong ecophysiological signal
Latewood vessel lumen area	May provide even more information than earlywood vessels because of their greater variability
Total vessel lumen area	Drought treatment causes a strong reduction
LW and EW average density	Contains more climatic information than MAX and MIN densities
Parenchyma cells density	Tends to (slightly) increase after drought periods
Radial diameter of fibers	Decreases after drought period
Fibers cells size	Significantly smaller when produced under drought conditions
Vessels grouping value	Increases with water limitation

Potential anatomical features for provenancing (pines)

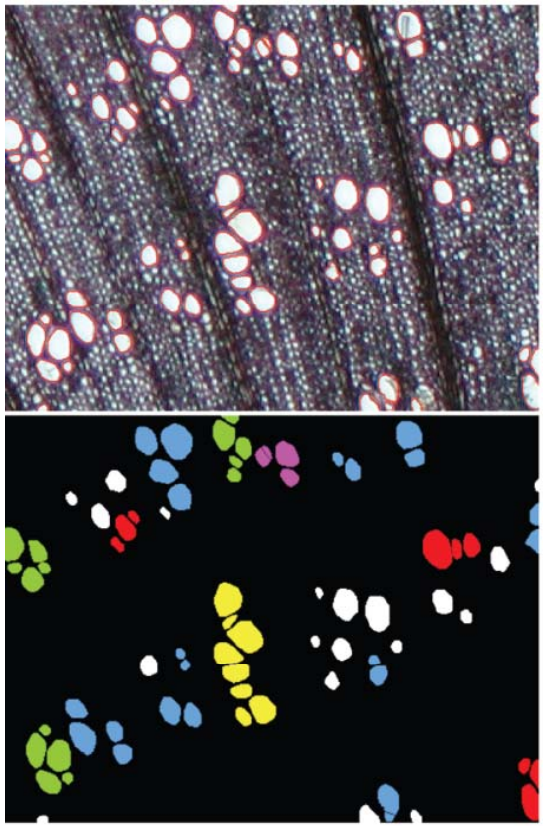
Variable	Conclusion
IADF in EW and LW (presence and absence)	Related to climatic conditions during growing season
Tangential bands in RC (presence and absence)	Related to climatic conditions during growing season
Radial tracheid diameter	Increase (in earlywood) under drought conditions
Cell-wall thickness	Has very strong correlation with climate; thickness of latewood cells has a stronger correlation with summer temperature
Annual cell number	Vary due to the climate sensitivity of cambial activity; shows higher correlation than other anatomical parameters
Tracheid lumen area	Strong relationship to climate; strongly depend on conditions during the late winter; reduced under drought conditions
Microfibril angle	Decreases with growth decrease under stress, i.e. wind etc.
Presence and absence of resin canals (In EW and LW)	Proven to be highly dependent on climatic variability
Resin duct density	Depends on a summer climatic conditions
Radial trends of uniseriate ray heights	Slightly decreasing under heavy stress
Maximum ring density	Similar or better climate proxy than cell-wall thickness

Three main criteria of choice

1. Easy to measure (degraded wood)
2. Site specific information
3. Does not lose significance with age

Anatomical features (oak)

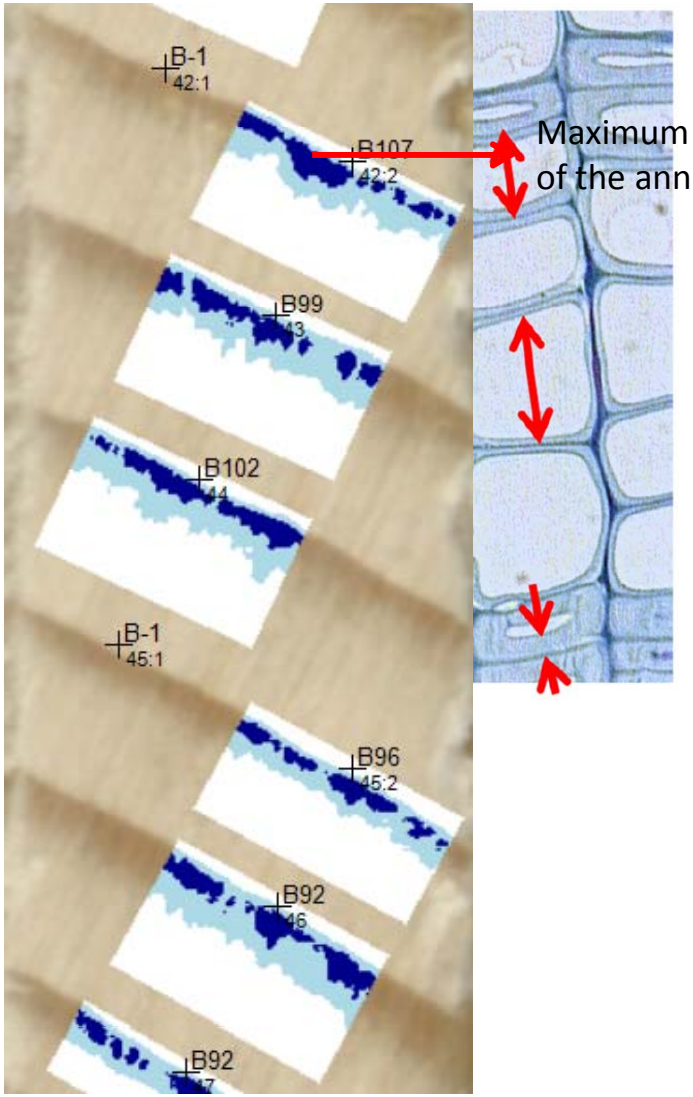
1. Earlywood vessels
2. First raw vessels
3. Earlywood vessel grouping



Verbascum thapsus

Von Arx, 2013

Anatomical features for analyses (pine)



1. Tracheid (cell) dimensions (partitioning approach)

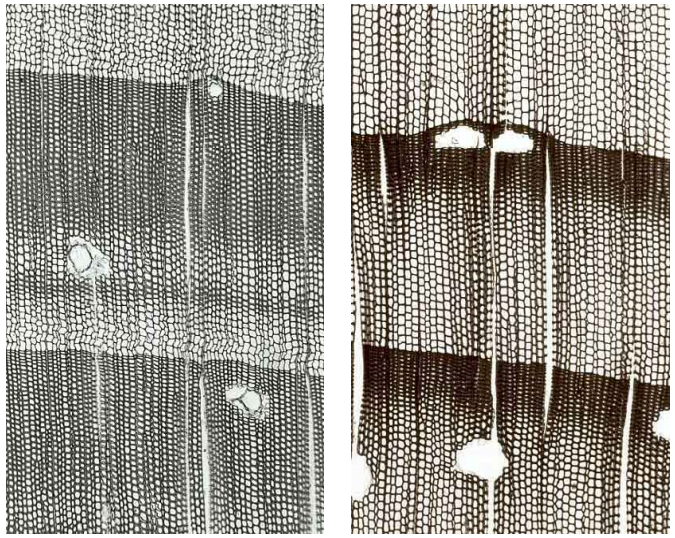
2. Maximum latewood density (“minimum blue intensity” or “maximum blue absorption intensity”)

Janecka, K.

DNA

Reason for genetic analyses:
Not possible/difficult to anatomically differentiate between

- pine species: *Pinus nigra* and *P. sylvestris* (Schweingruber, 1990; Carcaillet, 2001; Crivellaro (pers. obs.))
- oak species: *Quercus robur*, *Q. petraea* and *Q. pubescens*



P. sylvestris or *P. nigra??*

Genetic analyses as a tool for species identification

DNA (challenges)

- No successful extraction of genetic information from waterlogged timber yet;

- No common protocol of extracting genetic information from waterlogged timbers;

- High level of hybridization of tree species under analyses;

- Laboratory fulfilling specific requirements is needed

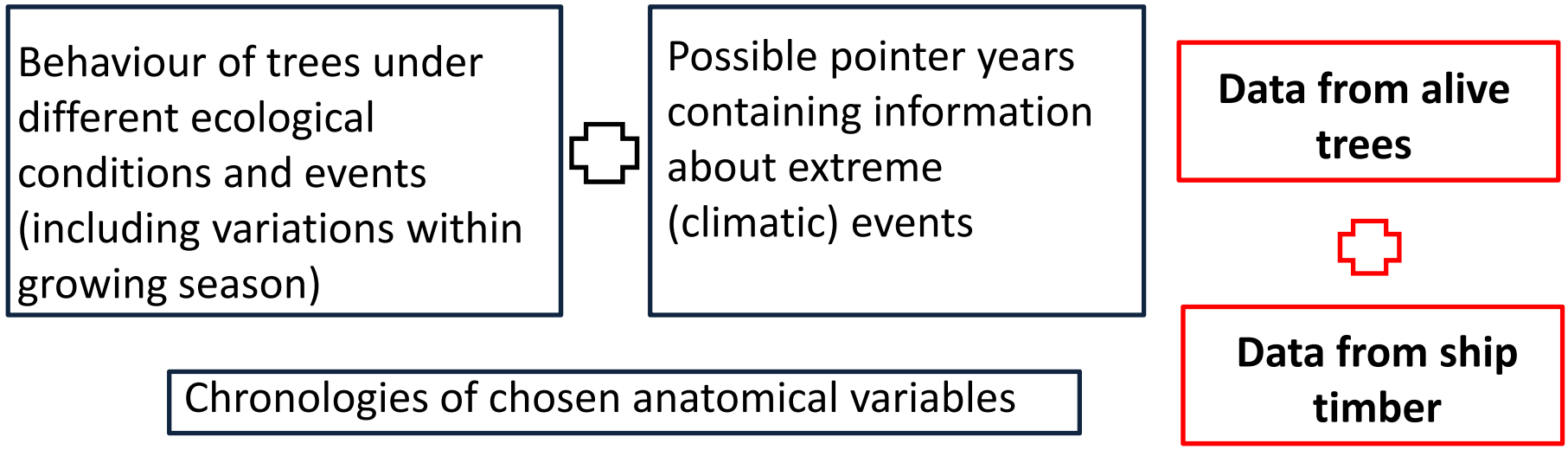
DNA data could also be used for provenancing of ship timber

32 different identified haplotypes of oak in Europe.
Oak chloroplast haplotype maps are existing.

Summary of the PhD project

1. Oak
2. Pine
3. Explorative DNA study
4. Provenancing of ship timber

Potential results into forSEAdicovery (wood anatomy)



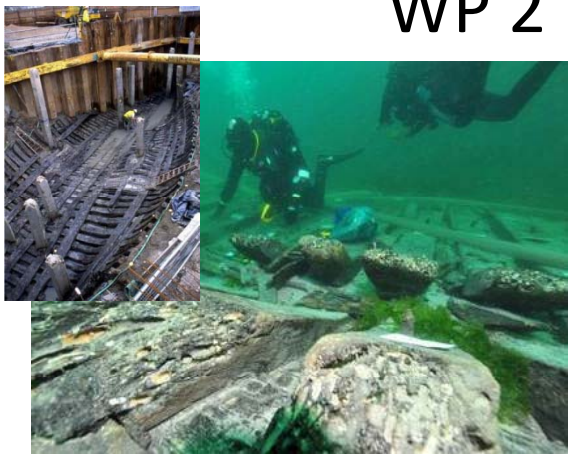
Identification of ecological conditions trees used for ship construction were facing.

Identification of origin of the ship timber.

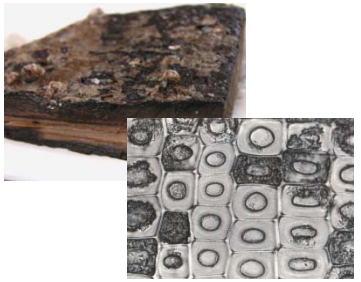
Important input for the analyses

WP 1

WP 2



Data from alive trees



Data from ship timber

Essential for future

1. Results exchange plan between and within Working Packages

2. Discussed and fixed sampling strategy before field campaigns (requirements, restrictions, assumptions)

3. Clear strategy of materials exchange

Thank you for your attention!