



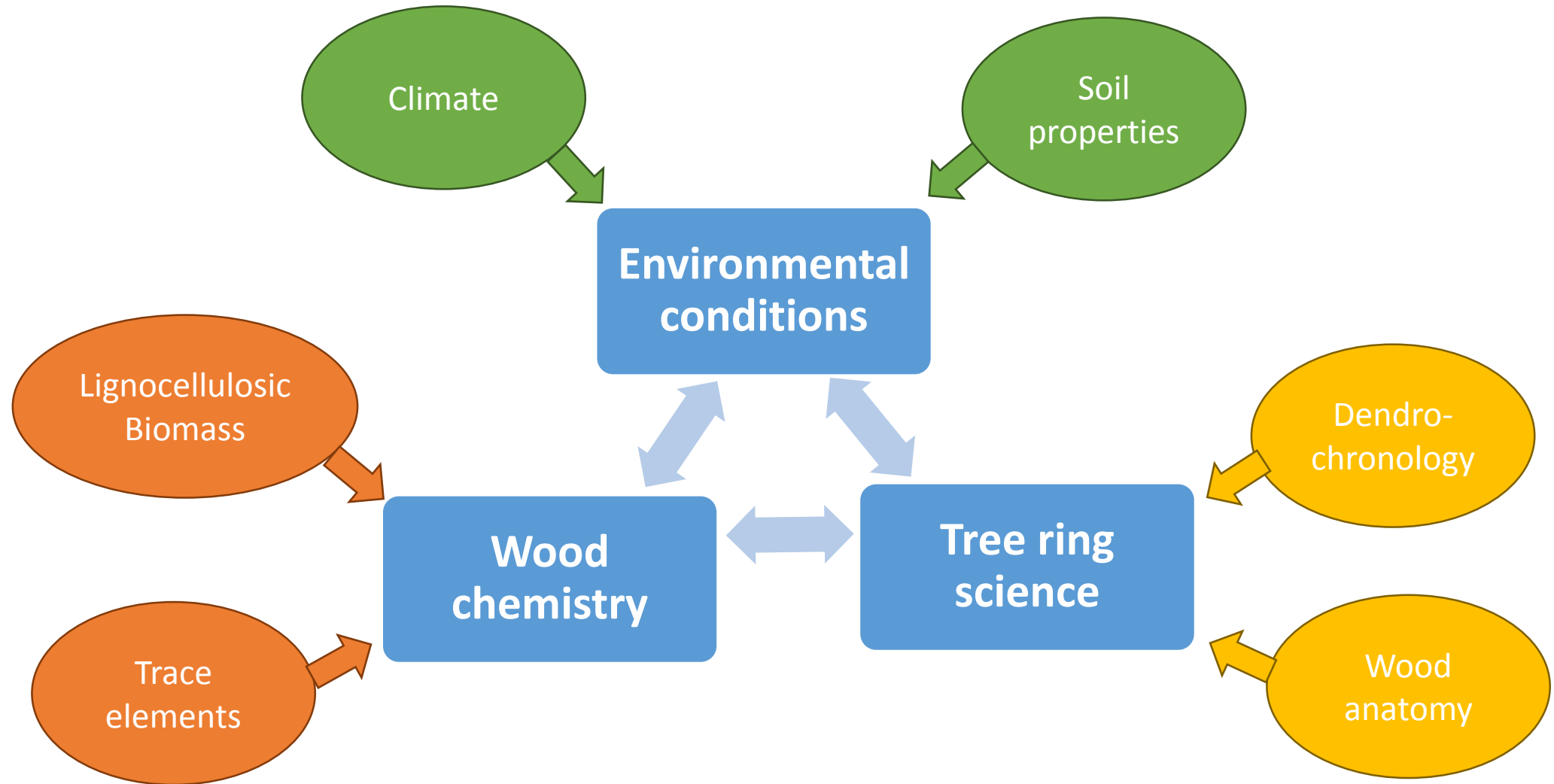
Wood chemistry supporting tree ring analysis

Mohamed Traoré

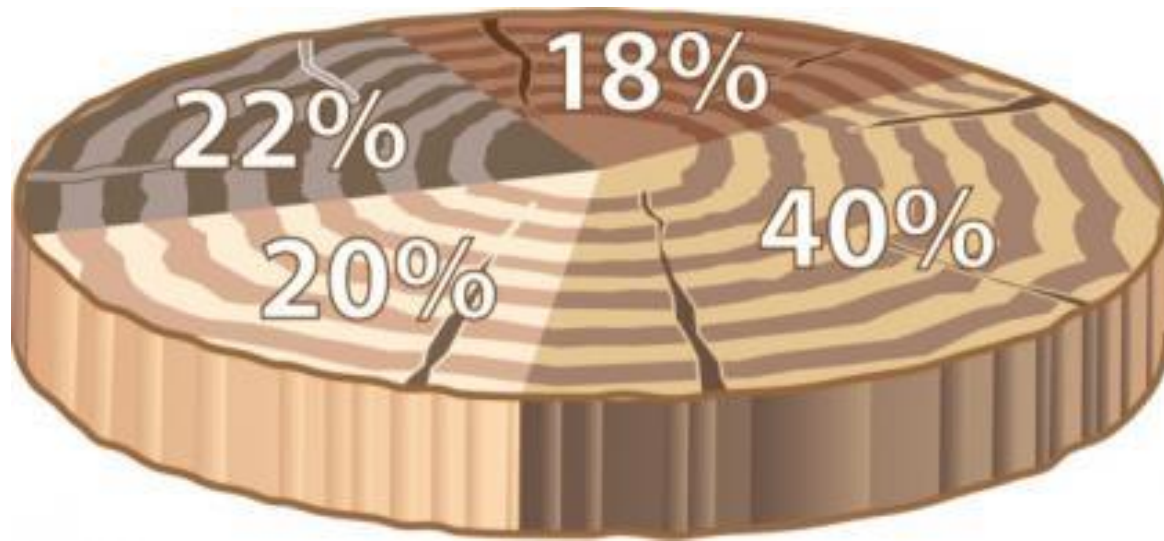
12/09/2015



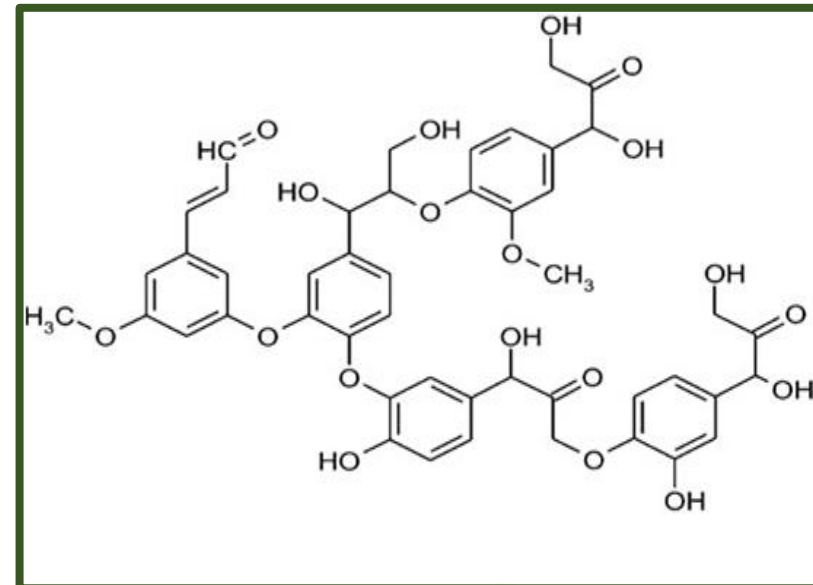
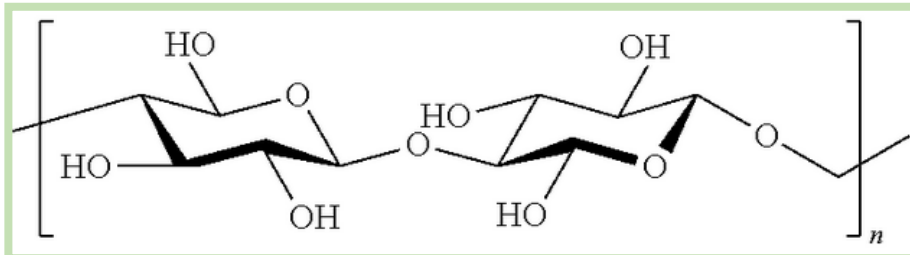
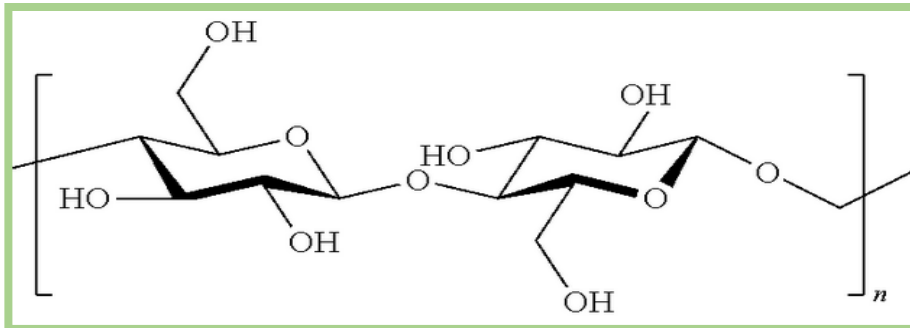
Wood research



Wood as biomass



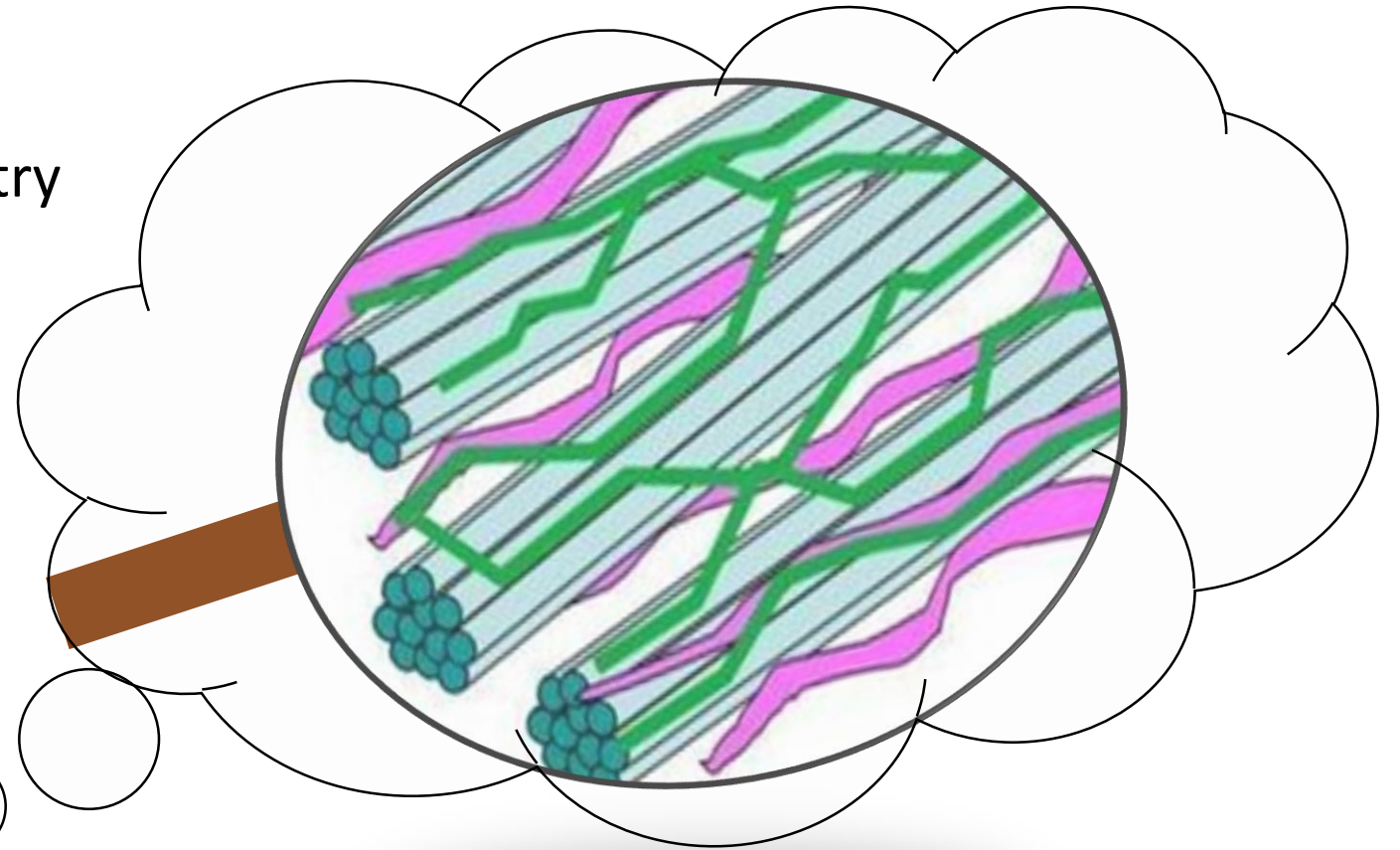
- Cellulose
- Hemicellulose
- Lignin
- Other



Wood as biomass

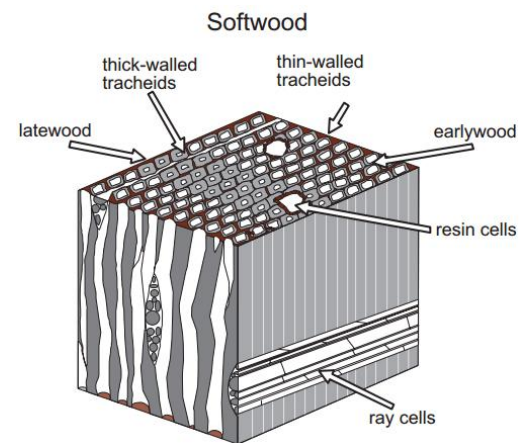
Key answer got from wood chemistry

- Type of wood?
- Part of wood?
- Quality of wood?
- A part of the Story of wood?



Cellulose Lignin Hemicellulose

Softwood vs Hardwood

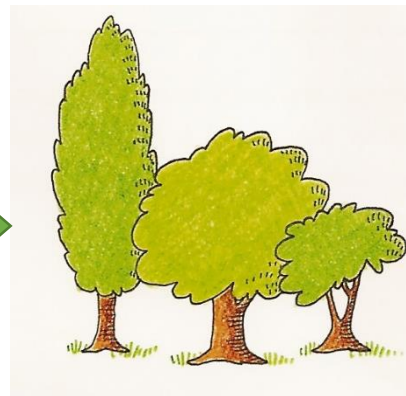


Medullary rays and tracheids transport water

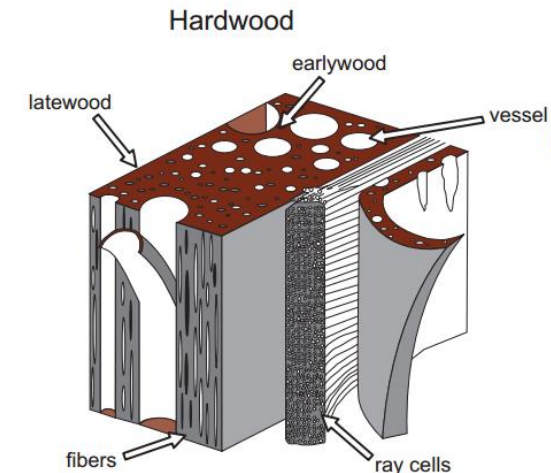
Softwood: gymnosperms



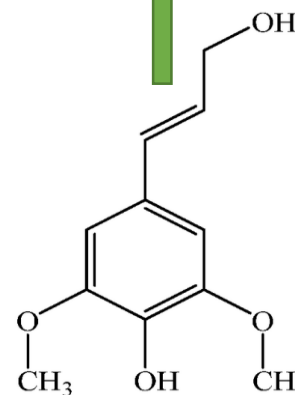
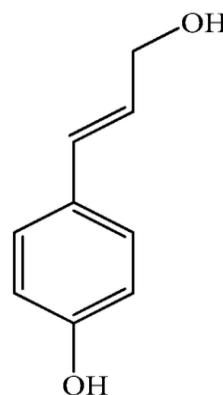
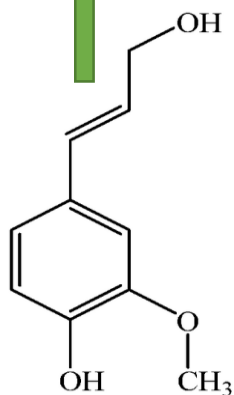
Hardwood: angiosperms



LIGNINS



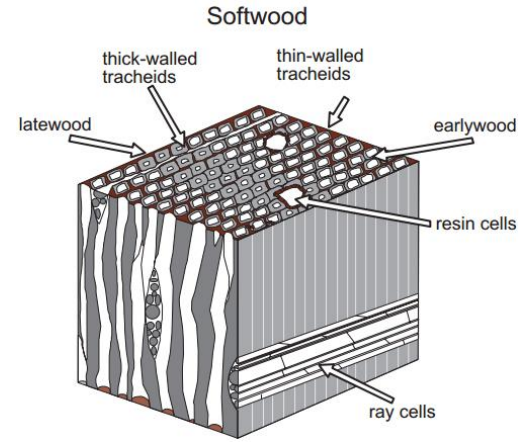
Fibers and vessel elements transport water



Three phenylpropanoid monomers at the base of lignin formation

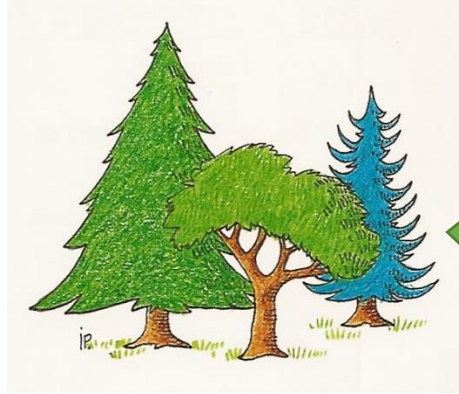
Lignin of softwood are dominated by coniferilic alcohols while lignin in hardwood are dominated by synapilic alcohol.

Softwood vs Hardwood



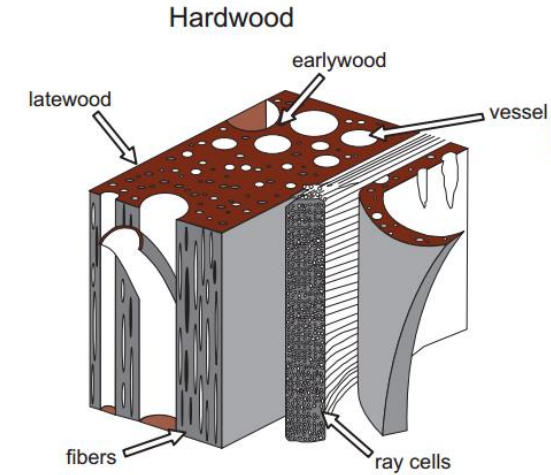
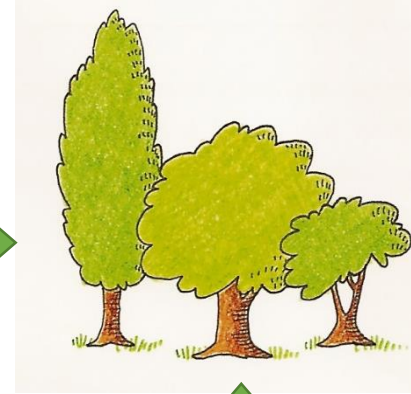
Medullary rays and tracheids transport water

Softwood: gymnosperms

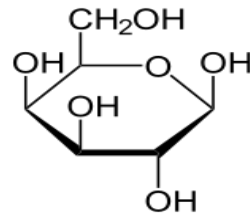
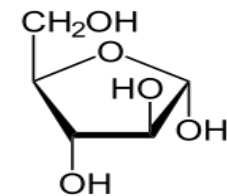
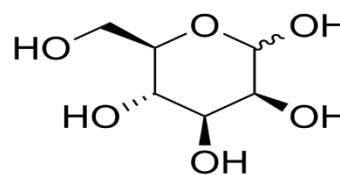
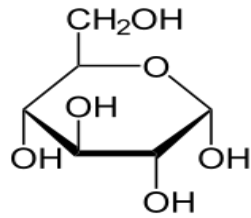


Hemicellulose

Hardwood: angiosperms



Fibers and vessel elements transport water



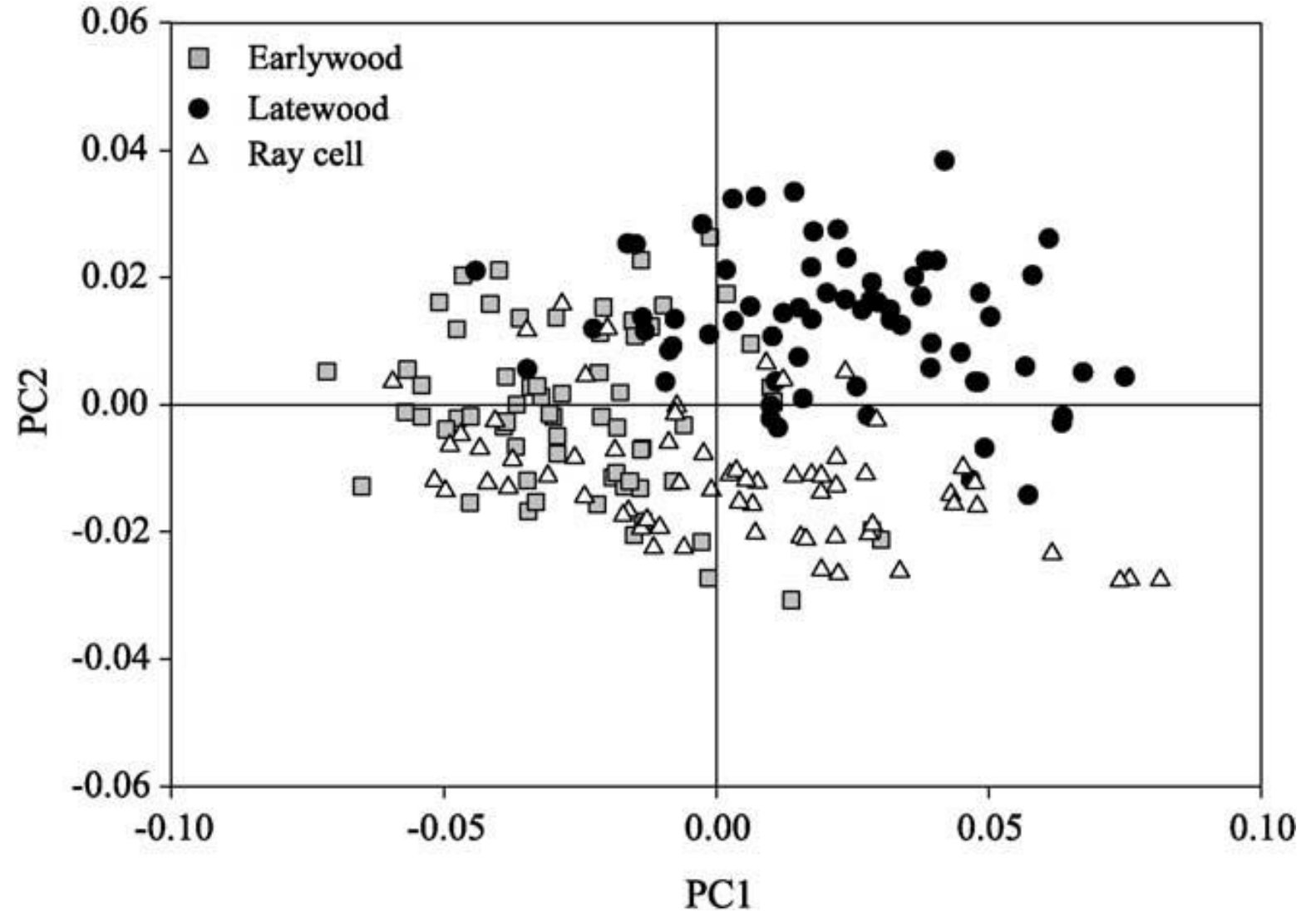
The monosaccharides at the base of hemicellulose formation

The xylan content is higher in hardwoods than in softwoods

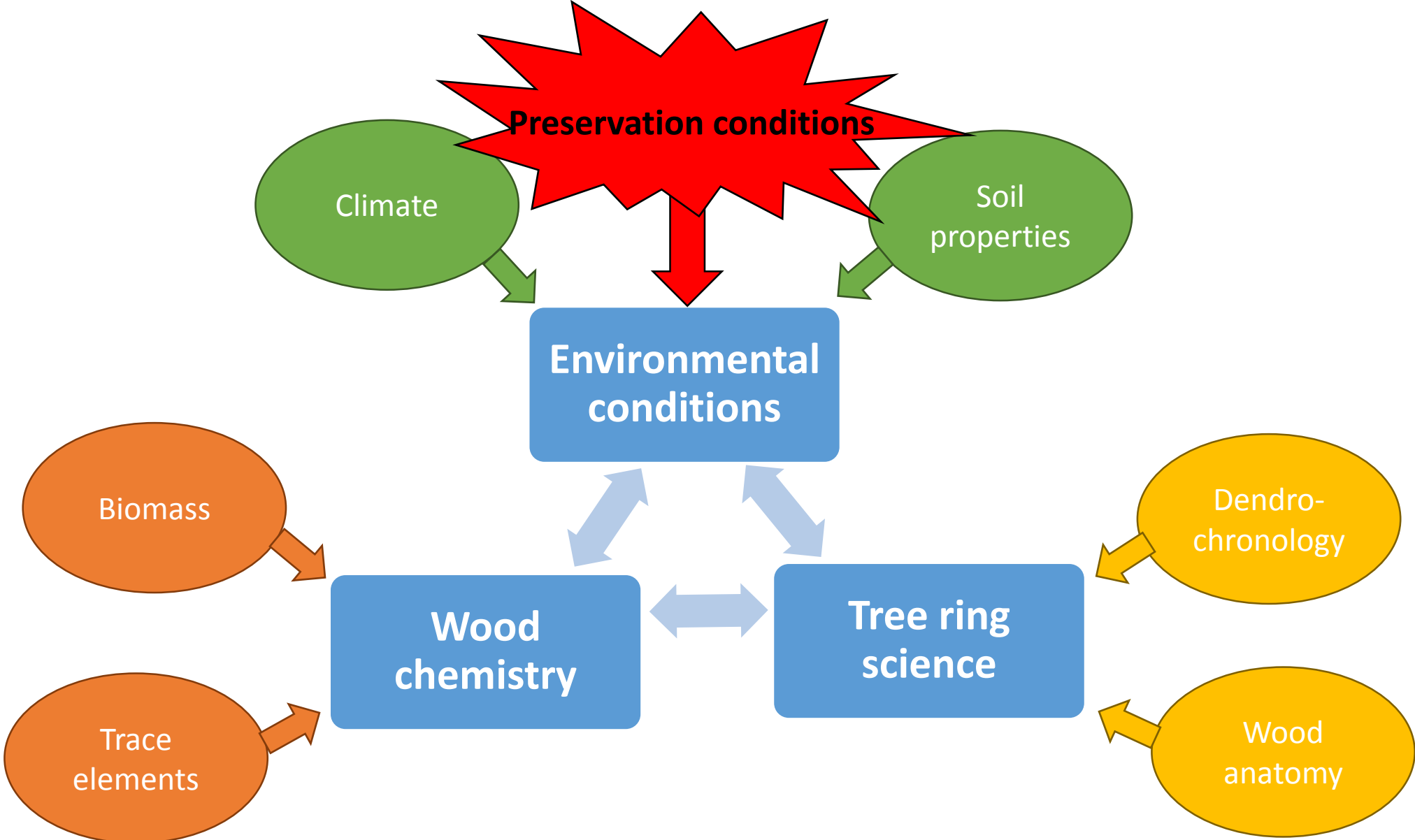
Earlywood vs Latewood

[Fig.3-Hori et al 2003]: PC1 (cellulose) vs PC2 (hemicellulose with arabinose) in wood cells.

More cellulose in earlywood than in latewood, [Larson, 1966](#)



Archeological context



Some damage due to preservation conditions

Micro-organism effects

- Discoloration

- Losing of physical properties



Some damage du to preservation conditions

Lignins are oxidize (lignin depolymerization)

Air dried conditions

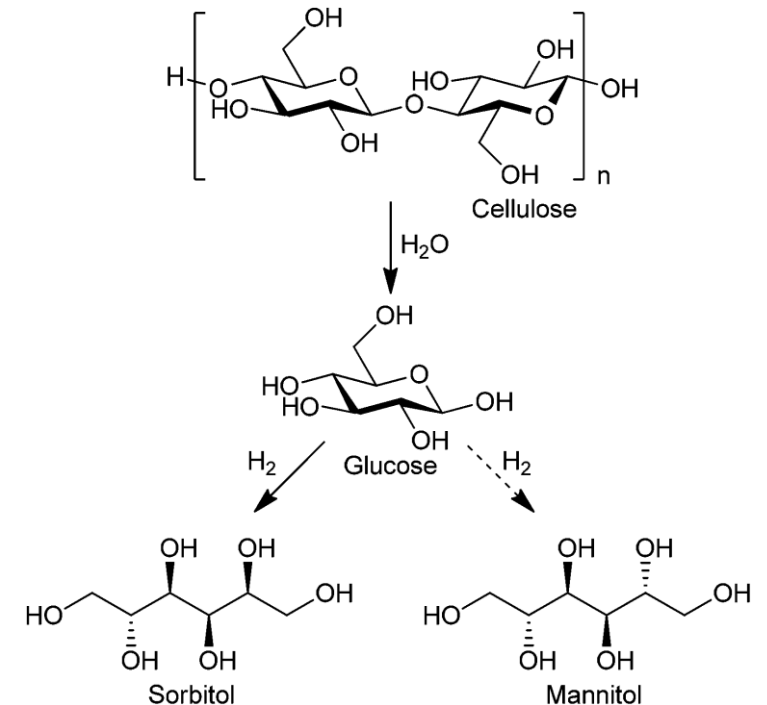


Increasing of the relative proportion of carbohydrate

Anoxic conditions

Hydrolyze and leach out of polysaccharides

Increasing of the relative proportion of carbohydrate





Results and integrating approach from the WP3 within ForSEAdiscovery

Mohamed Traoré

12/11/2015



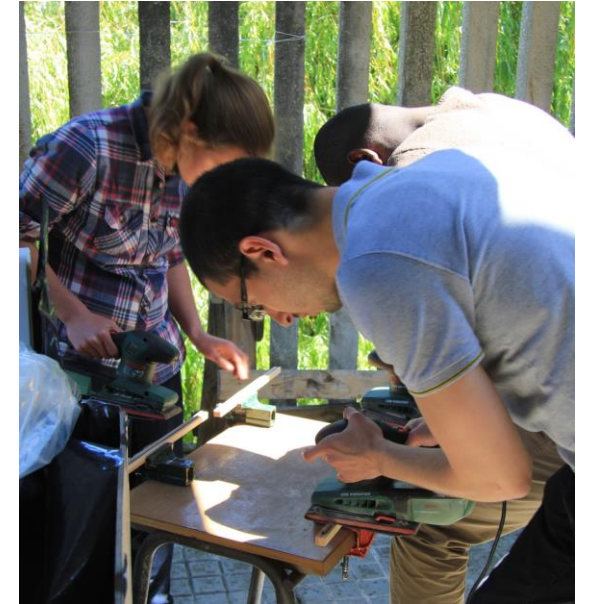
Getting data from wood

Which type of wood is it ?

Sound wood could have some compound that may influence the signal of the main compounds.

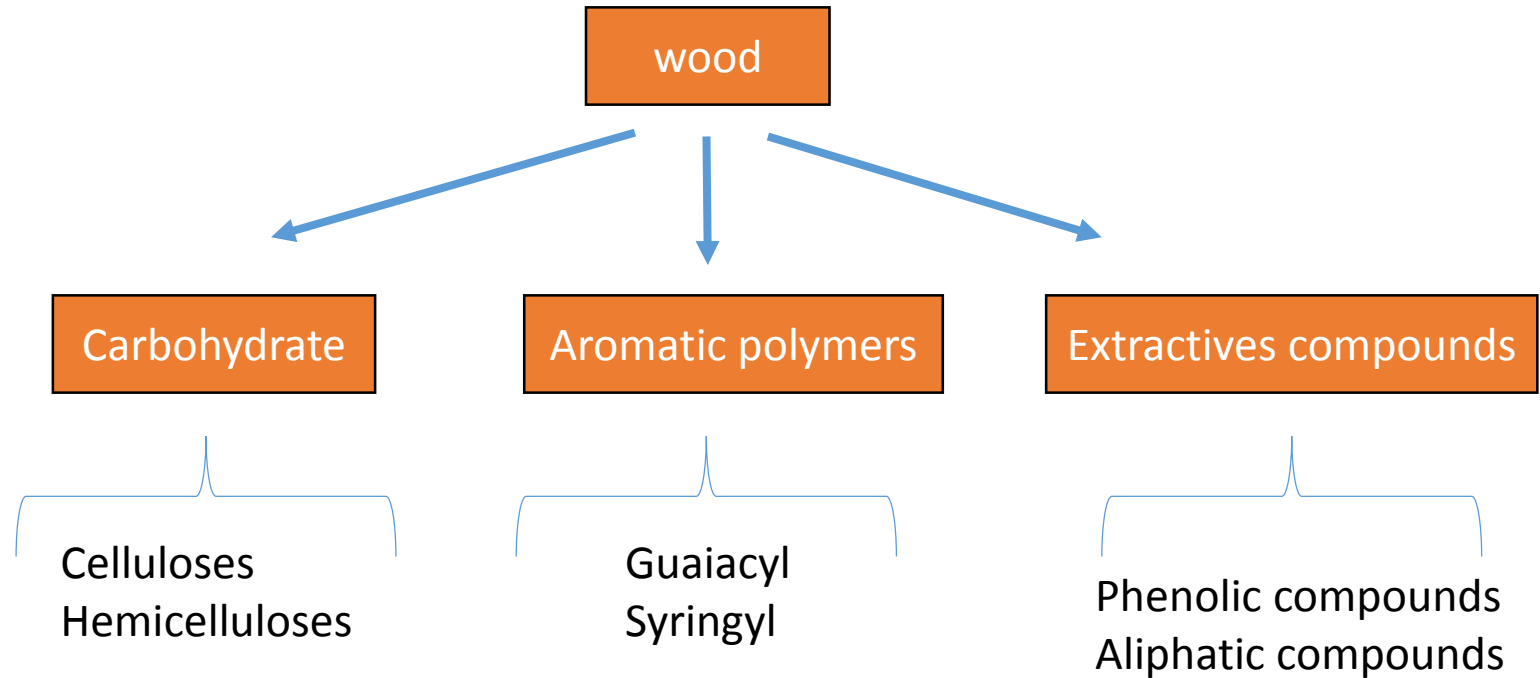
Archeological wood could get low signal from the main compounds.

It is always better to spend more time in sample preparation.



ForSEAdiscovery samples

What is possible to measure in the shipwreck wood ?



Polysaccharide (PC1) and lignin (PC2) remain in the Ribadeo wreck

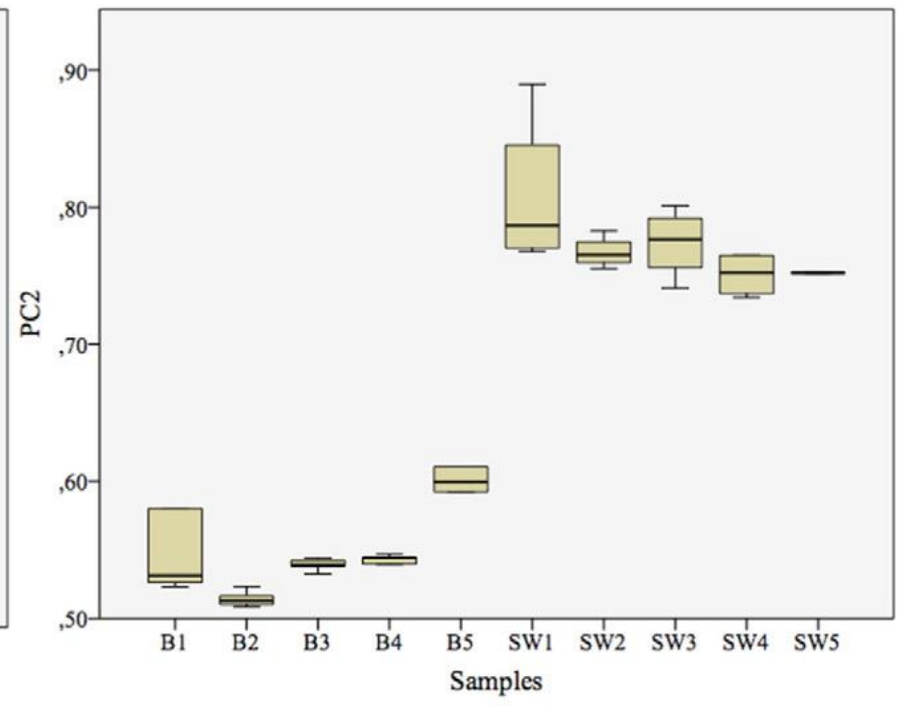
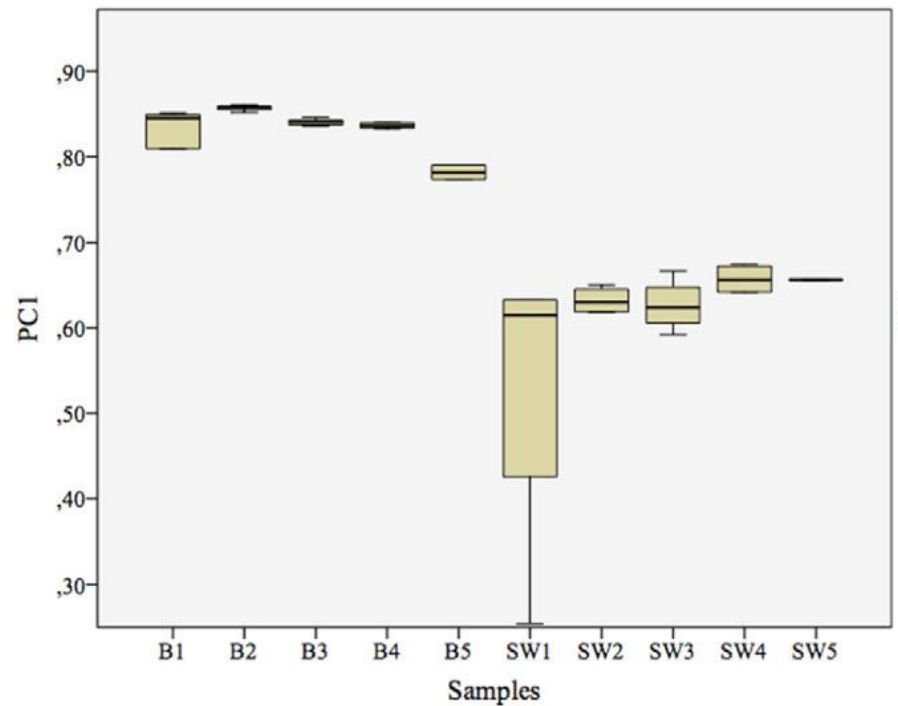
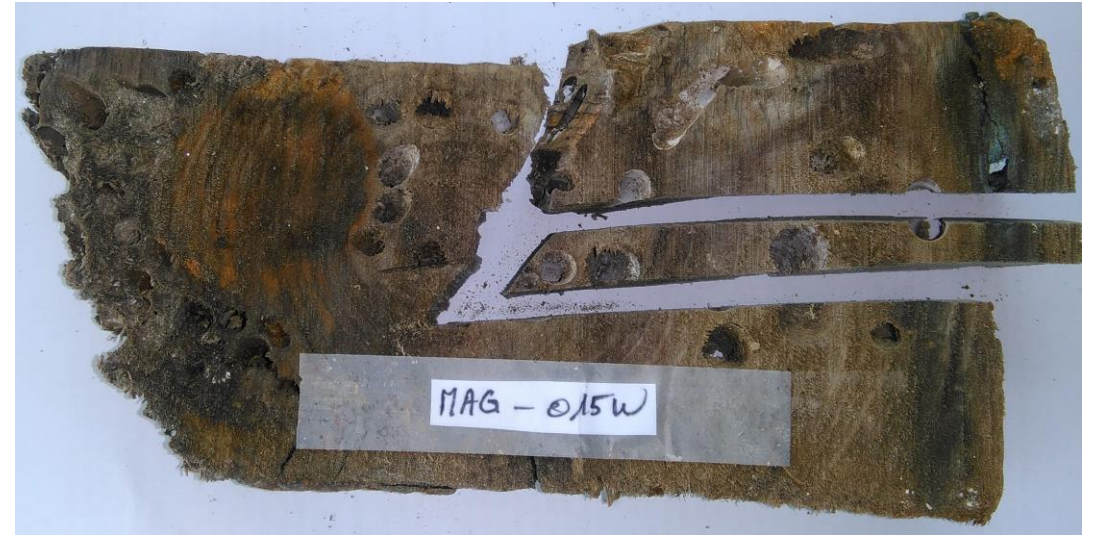
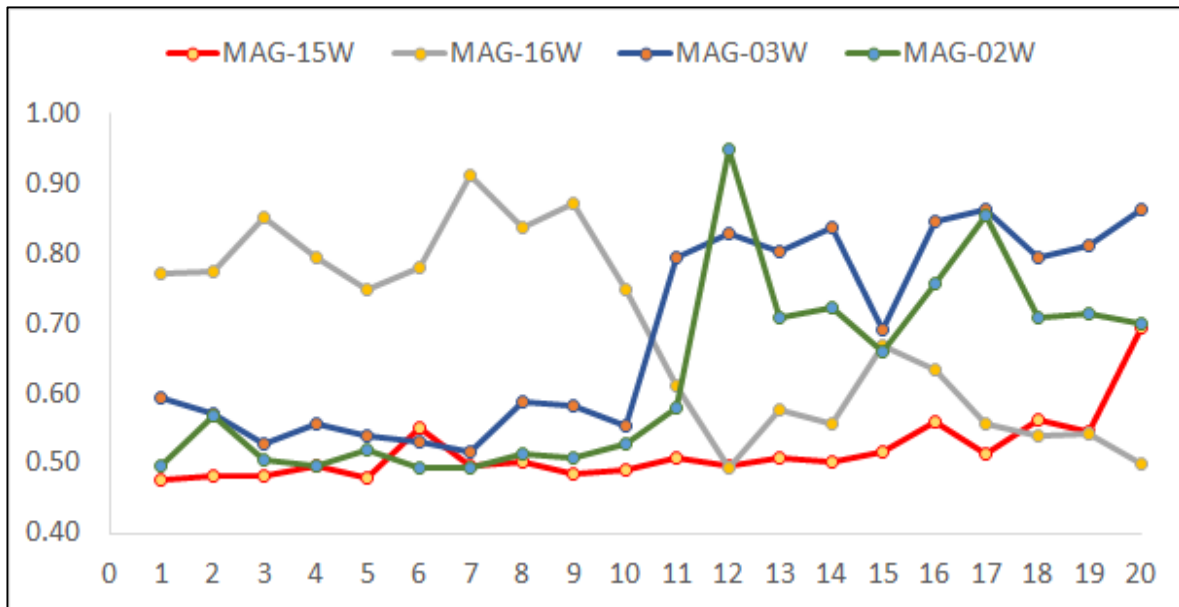
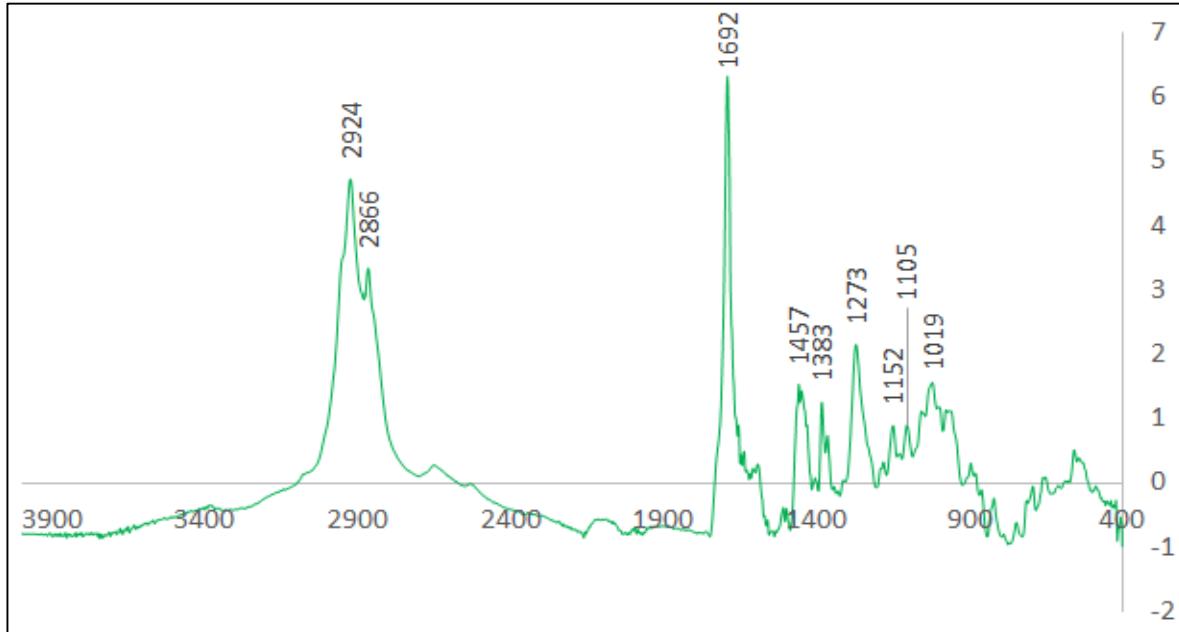


Table 5
Average of total abundance of carbohydrates and guaiacyl (G) and syringyl (S) lignin of the beam and shipwreck woods.

		Building (pine) %	Shipwreck (oak) %
Carbohydrate	Total	47.07	24.73
	Lignin		
	G	43.26	26.33
	S	0.68	43.27
	S + G	43.94	69.60
	S / G	0.02	1.64

Resins in pine archeological woods



MAG - 015W



Resins in pine archeological woods

