

Wood Anatomy for wood workers

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summary

- How wood is formed
- Types of wood
- Wood functions
- Cells found in wood
 - Living, dead, moisture content
 - Tissues found in wood (rays)
- Perils of Reaction wood



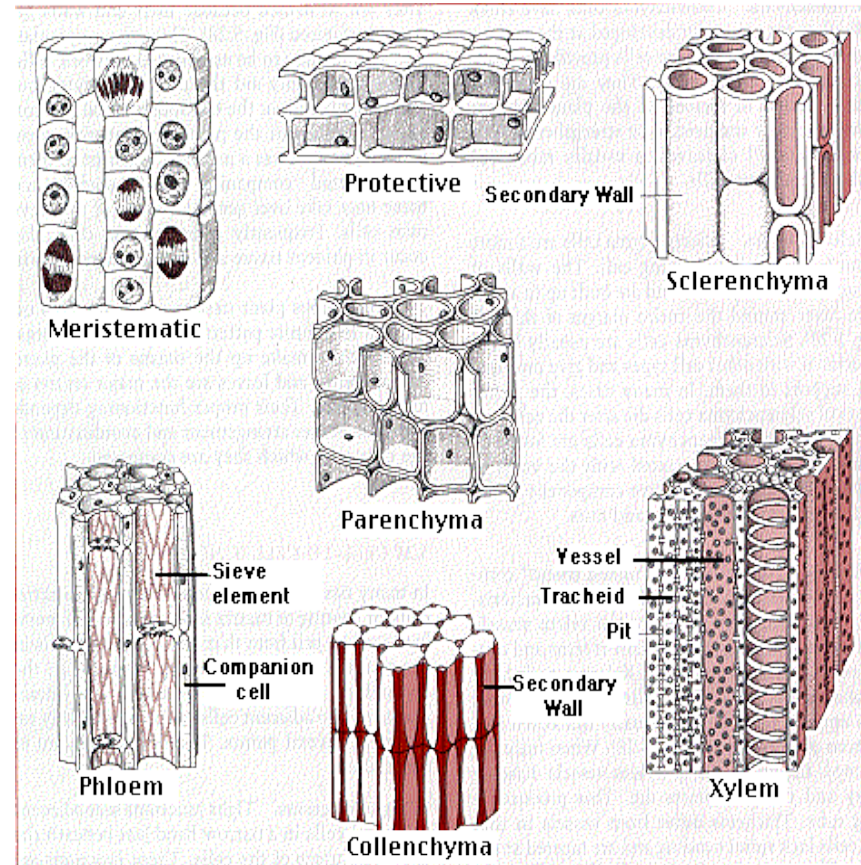
Wood Types

- Softwood (gymnosperm)
- Hardwood (angiosperm)
 - Ring porous
 - Diffuse porous
- Heartwood vs Sapwood
- Early wood vs Latewood



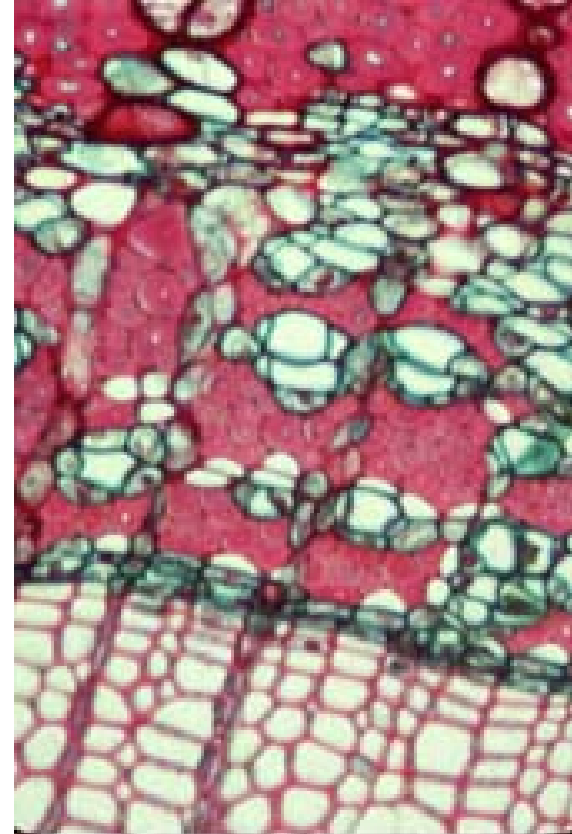
Cells and Tissues

- Cells have specialized functions, different shapes, cell wall thickenings and contents
- Some cells are dead at maturity and some are alive. Some have living functions some do not.



Cambial Region ie the Vascular Cambium

- Defines a Tree
- Is regulated by the environment.

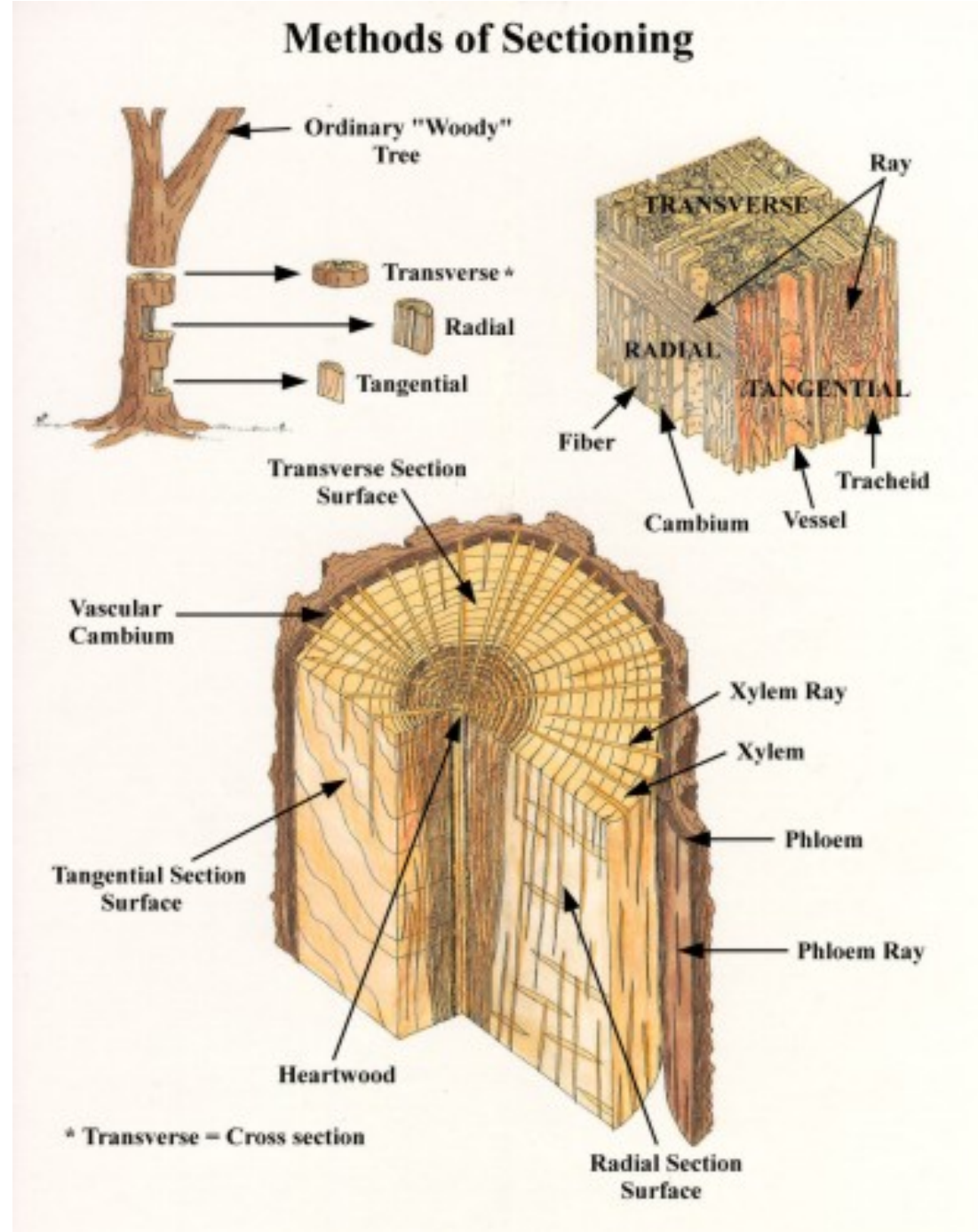


Tilia vascular cambium cross section.

Wood is formed by the vascular cambium (VC)

- So is the bark
- The vascular cambium is sensitive to moisture changes
- Trees growing in dry climates form tight annual rings and therefore very dense wood
- Moisture availability determines the kinds of cells that are formed by the VC
- When the vascular cambium forms cells close together year after year the wood is hard and dense (see Bristlecone Pine).

Wood



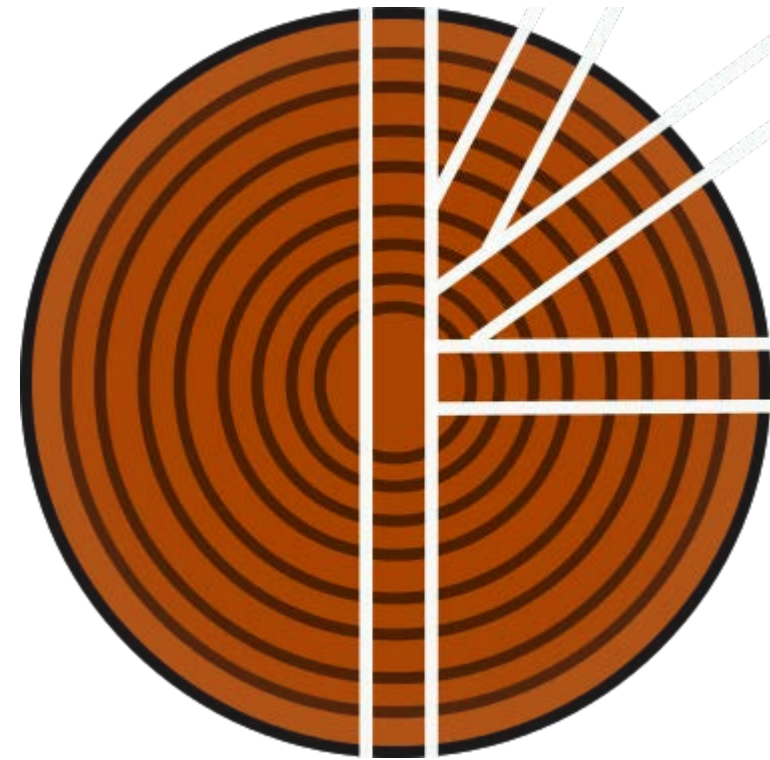
There is much to be learned from splitting wood

- Wood splits well along rays
- Wood splits better along latewood or annual rings
- Conifers split better than hardwoods (generally)



riftsawn

- Produces wood with greatest stability
 - Saw cuts at right angles to the growth rings
 - Straightest grain
 - Wastefull sawmill procedure



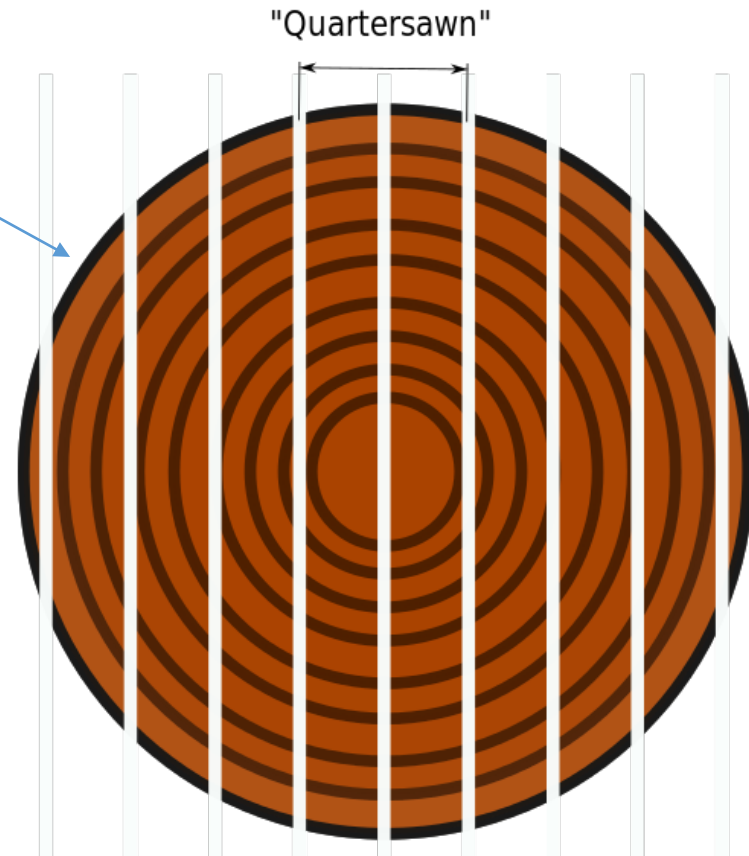
Quarter sawn

- “In quartersawn wood, only the center board of the quarter-log is cut with the growth rings truly perpendicular to the surface of the board.”



Flat sawn

- This is the least stable and the most likely to cup and warp after milling.



Cell types found in wood

Angiosperms

- Parenchyma
- Trachieds
- Fibers
- Fiber-Trachieds
- Vessels elements

Gymnosperms

- Parenchyma
- Trachieds
- Fiber-trachieds
- Fibers

Conifer/Gymnosperm wood

- All tracheary elements are trachieds
- Have resin ducts
- Cells are uniform in size
- Rays are uniseriate

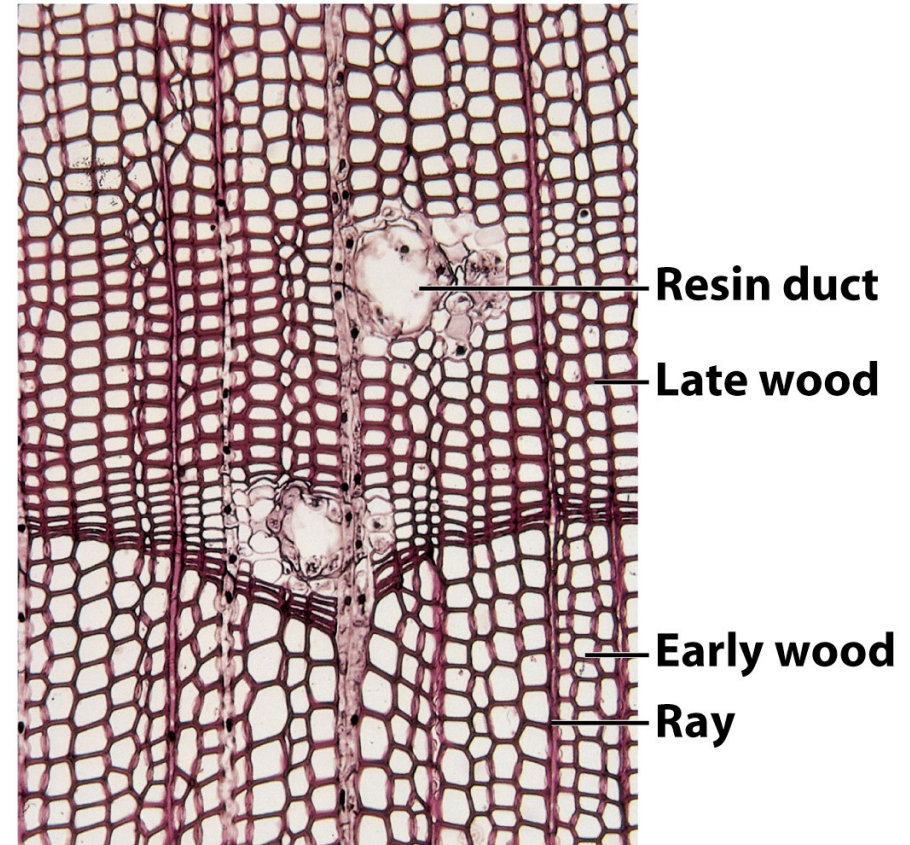


Figure 26-20a
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Angiosperm wood

- Ring porous vs diffuse porous
- Main difference is the presence of multiseriate rays

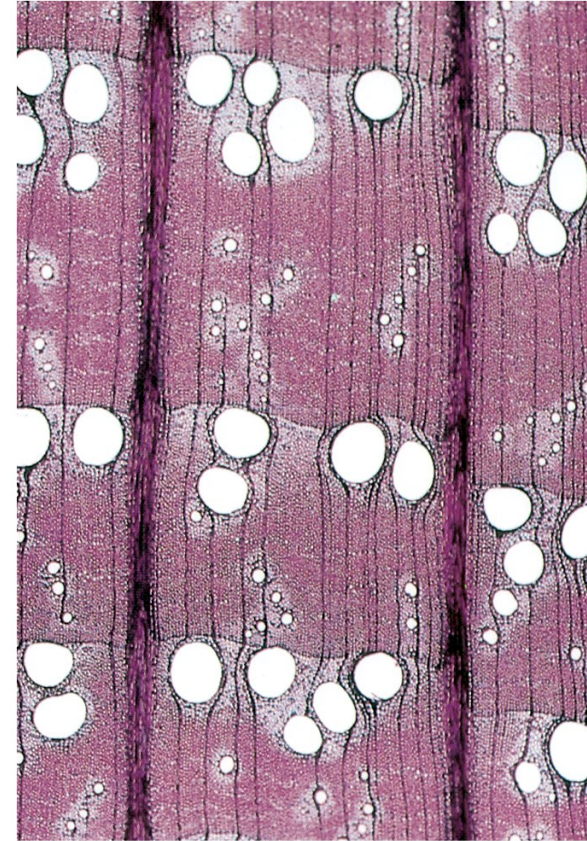
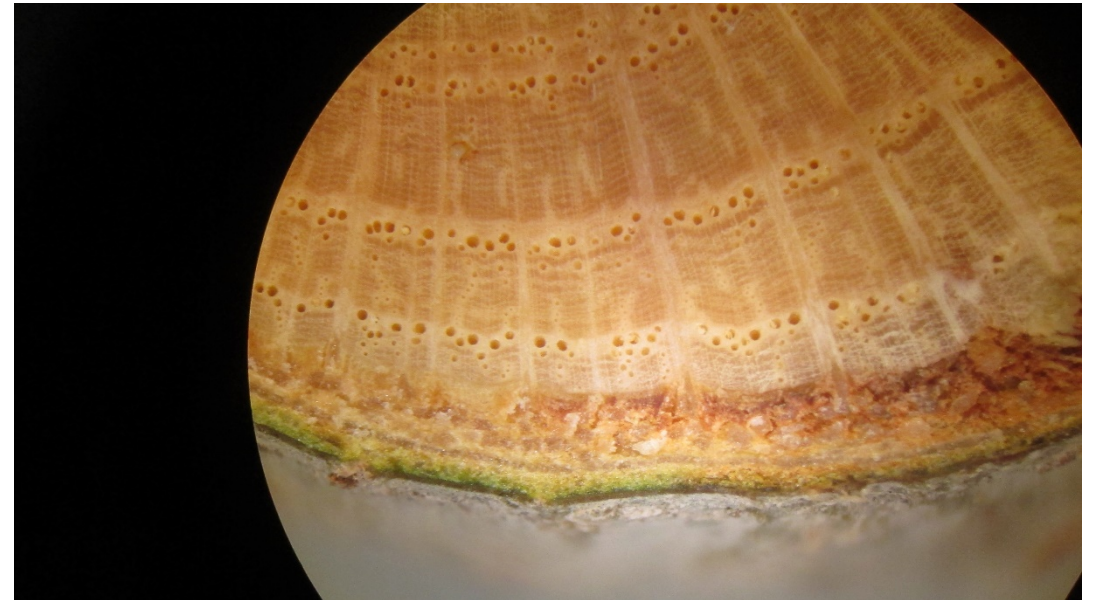
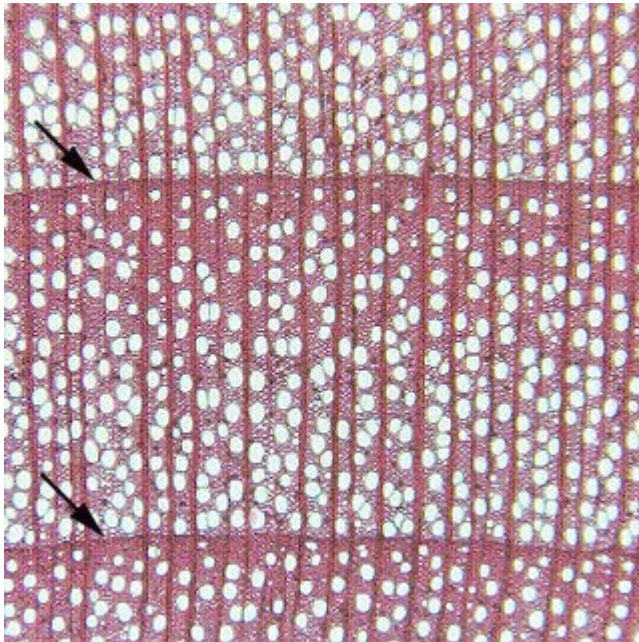


Figure 26-23a
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Diffuse porous vs. ring porous wood



Ring Porous vs Diffuse porous Hardwoods

Ring

- Elm
- Oak
- Ash
- True Hickory

Diffuse

FW1035

Lab Lecture 3

Diffuse Porous Hardwoods

<u>Common name</u>	<u>Genus/species</u>	<u>Family</u>
• Sugar maple	<i>Acer saccharum</i>	Aceraceae (Sapindaceae)
• Soft maple	<i>Acer rubrum / saccharinum</i>	Aceraceae (Sapindaceae)
• Red Alder	<i>Alnus rubra</i>	Betulaceae
• Basswood	<i>Tilia americana</i>	Tiliaceae
• Yellow poplar	<i>Liriodendron tulipifera</i>	Magnoliaceae
• American beech	<i>Fagus grandifolia</i>	Fagaceae
• Sycamore	<i>Platanus occidentalis</i>	Platanaceae

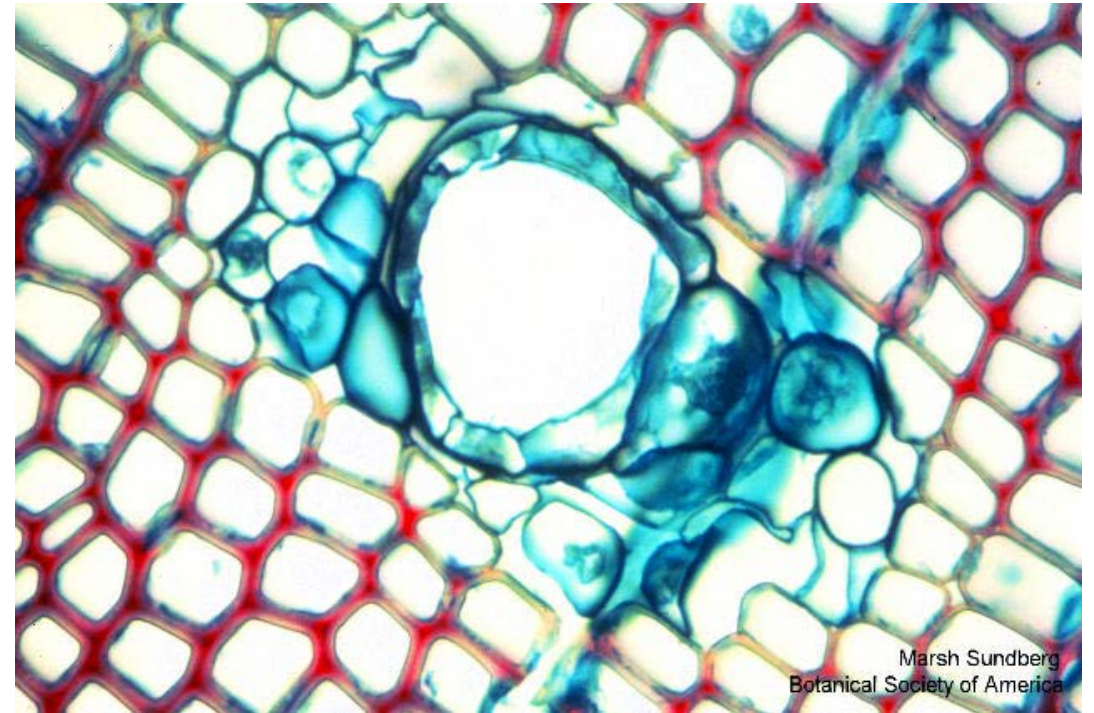
Strong wood results from ring porous growth and the development of multiseriate rays

- The diversity of cells in ring porous wood adds to its strength.
- Large rays in Oak wood (such as *Q. lobata*) also adds to the difficulty of the drying process and the tendency of this wood to deform on drying.



Resin Ducts

- Softwoods produce resin in ducts in their wood
- Can destroy water-based finish attempts.



Marsh Sundberg
Botanical Society of America

Resin



Reaction wood

- Is wood that forms in place of normal wood in response to gravity. It can form on the main stem or branches.
- The cambium produces cells with differing structure
- In Angiosperms reaction wood is called Tension wood
- In Gymnosperms reaction wood is called compression wood



Figure 26-29
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Response growth

- Changes in tree shape can suggest an underlying problem for woodworkers





Reaction wood can be dangerous

- “ripping a piece of reaction wood on a table saw without a splitter or [riving knife](#) installed can lead to kick back of the stock”. *(Wikipedia)*

