

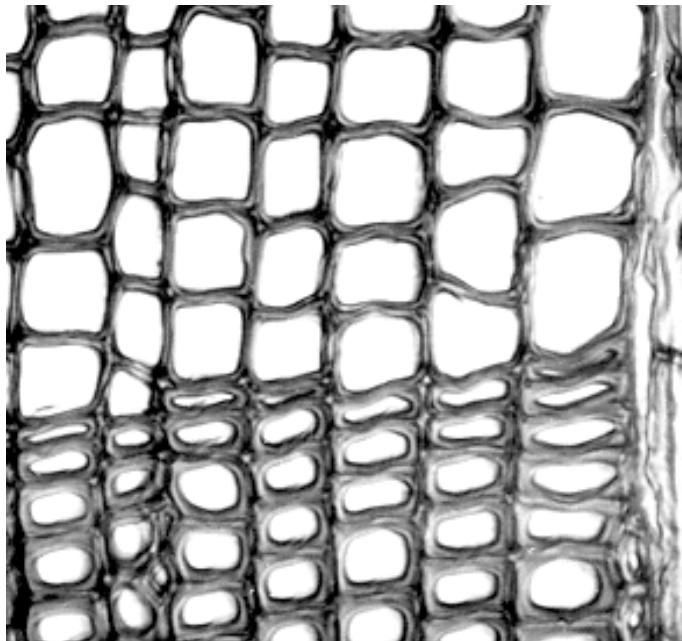
SOFTWOODS

90% Longitudinal tracheids

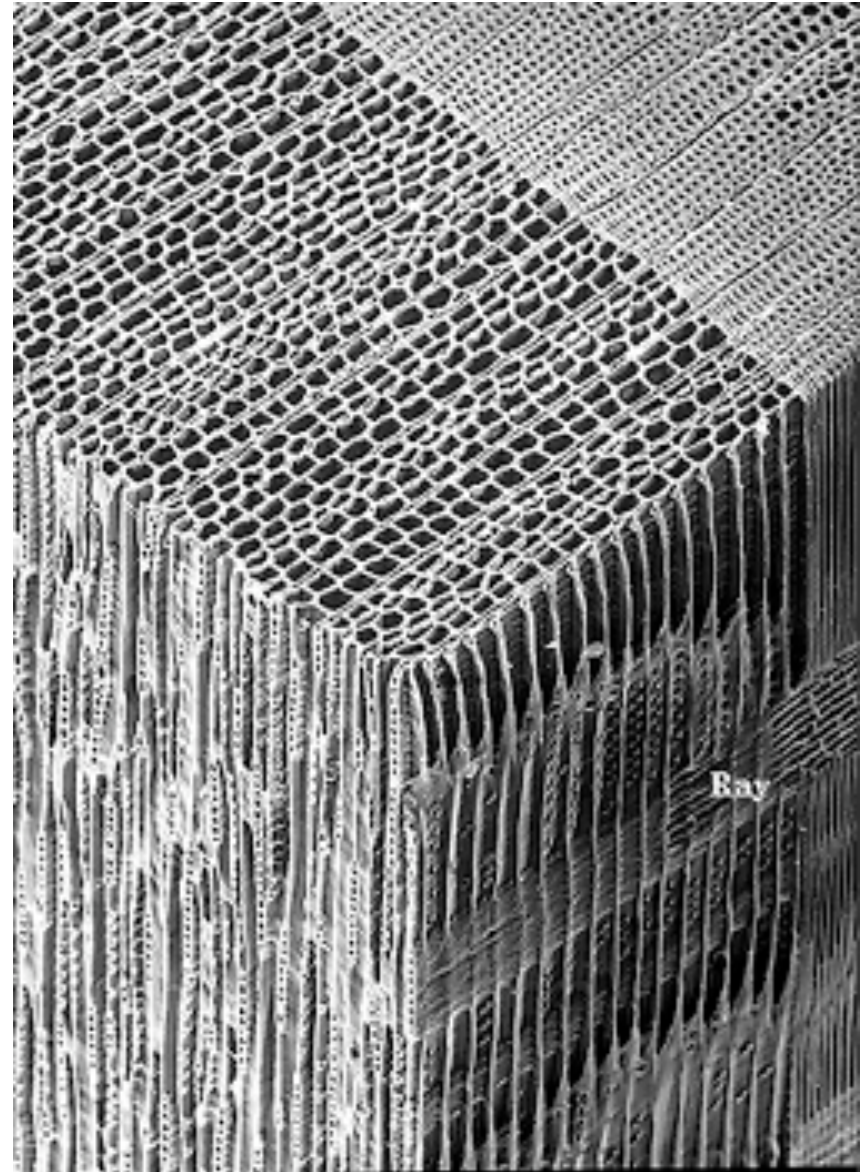
10% Rays

Softwood Rays

are small, mostly 1 cell wide



Light Microscope View. Cross Section
Growth Ring Boundary



SEM View of Pine Block
Photo courtesy SUNY-Syracuse

Presentation by Elisabeth Wheeler, PhD, N.C. State University

Earlywood / Latewood

- **Earlywood**
(springwood) longitudinal tracheids have 'large' lumens (hollow centers of cell).
- **Latewood**
(summerwood) longitudinal tracheids have narrow lumens.

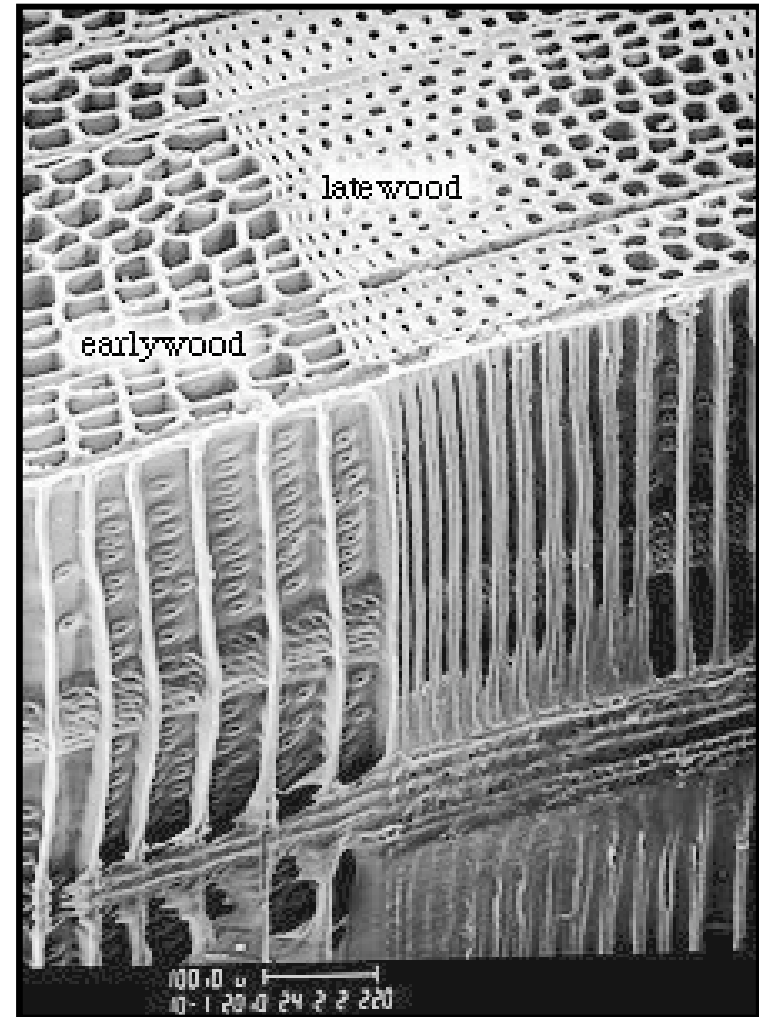
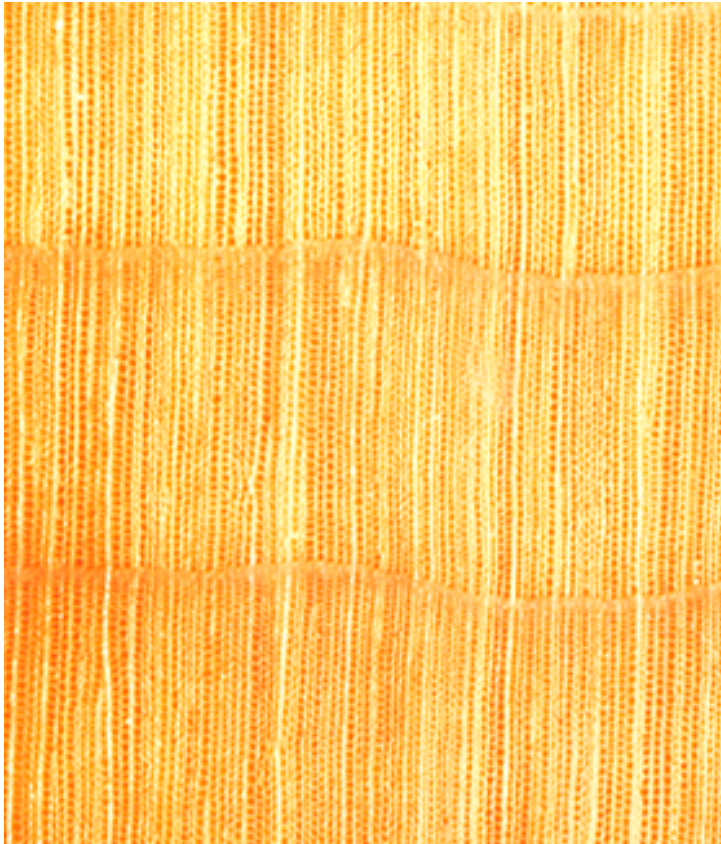


Photo courtesy SUNY

Earlywood to Latewood Transition



Transition from earlywood to latewood within 1 ring is GRADUAL in this wood.

Growth rings are present,
But
NO distinct band of latewood.

Longitudinal tracheids gradually become narrower as progress through the growth ring

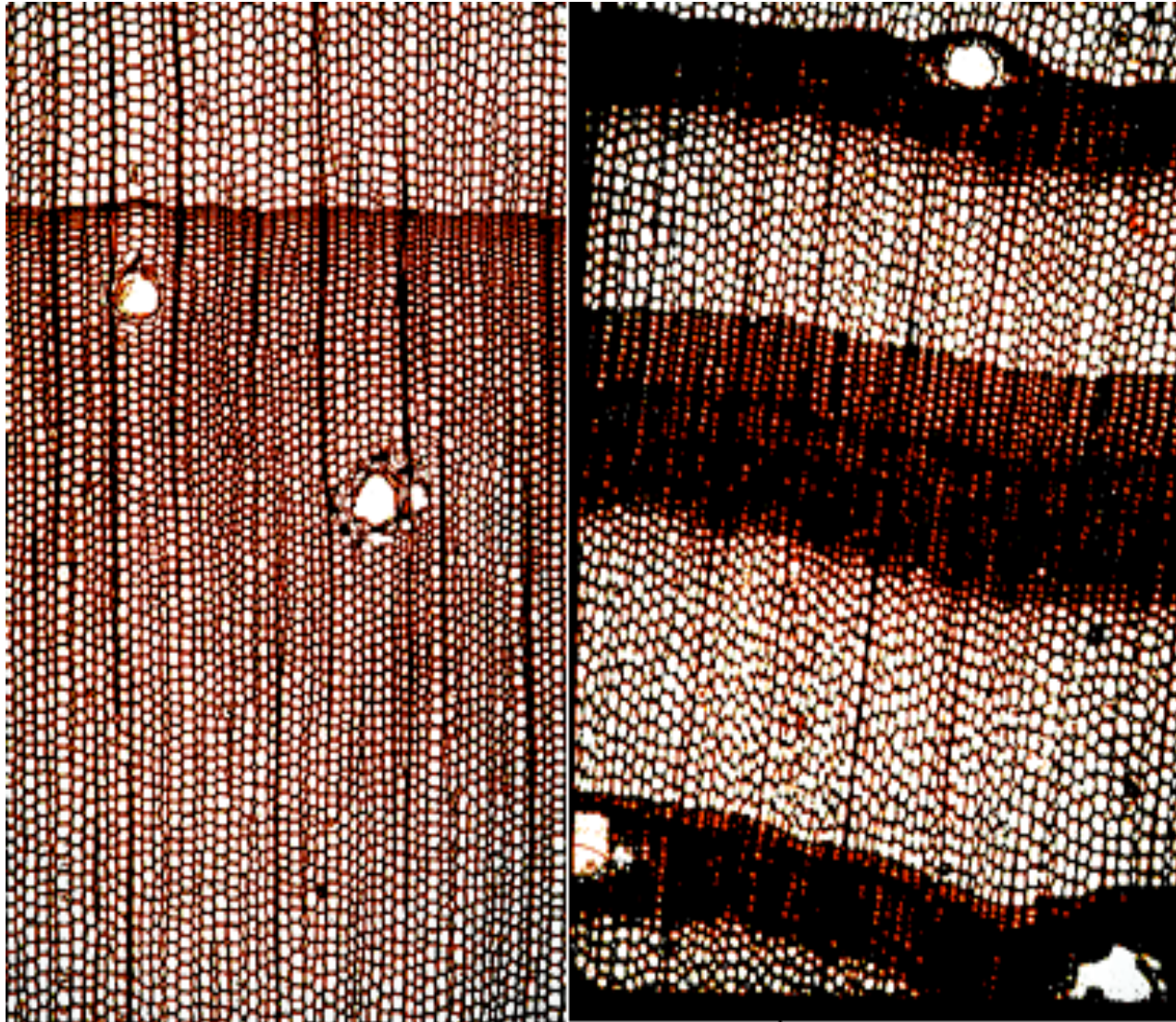
True Fir. *Abies* sp. Dissecting scope view, can make out regular radial rows of longitudinal tracheids. Very even texture.

Abrupt Earlywood to Latewood Transition



Loblolly Pine (*Pinus taeda*)

EARLYWOOD / LATEWOOD



Left. Soft Pine with gradual transition from earlywood to latewood

Right. Hard Pine with abrupt transition from earlywood to latewood, a distinct band of latewood

Microscopic view of cross section

RESIN CANALS

Definition: A tubular intercellular duct surrounded by epithelial cells that secrete resins

Normal resin canals only in some members of the Pine family (Pinaceae)

Normal in U.S. species of

- Pines (*Pinus* spp.)
- Spruce (*Picea* spp.)
- Larch (*Larix* spp.)
- Douglas Fir (*Pseudotsuga* spp.)

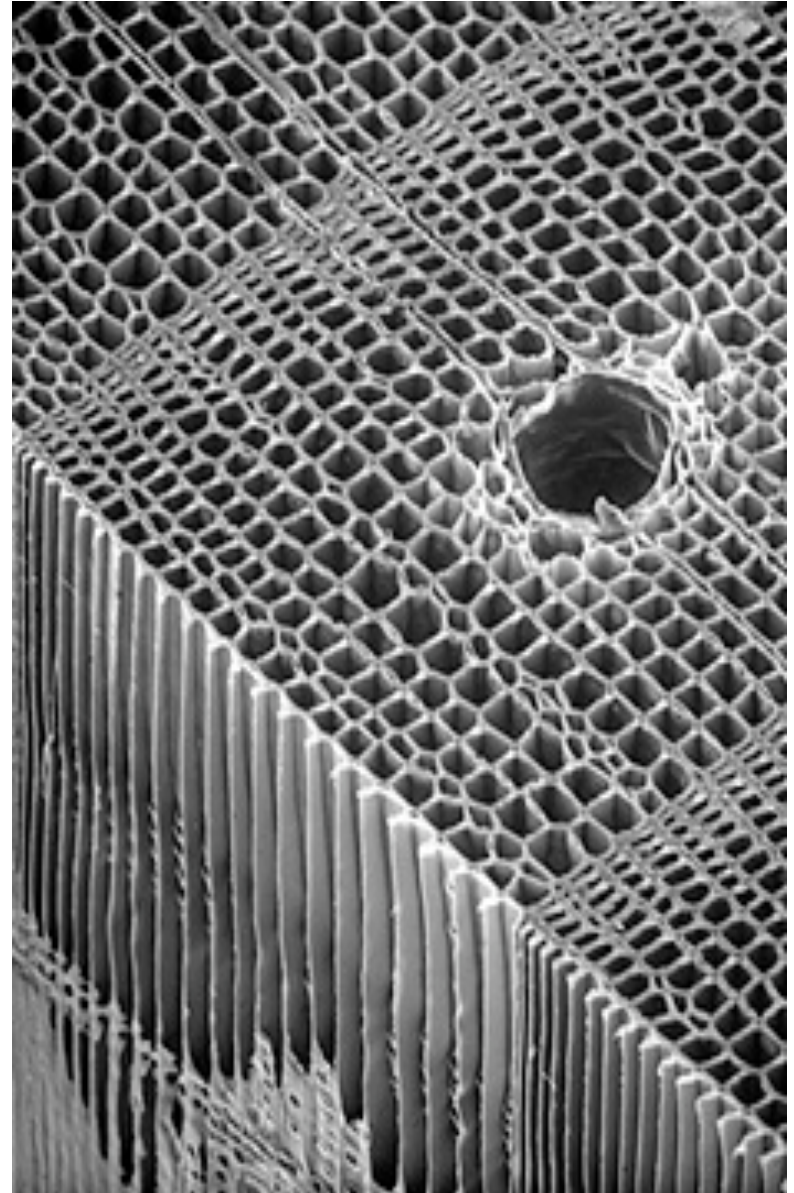


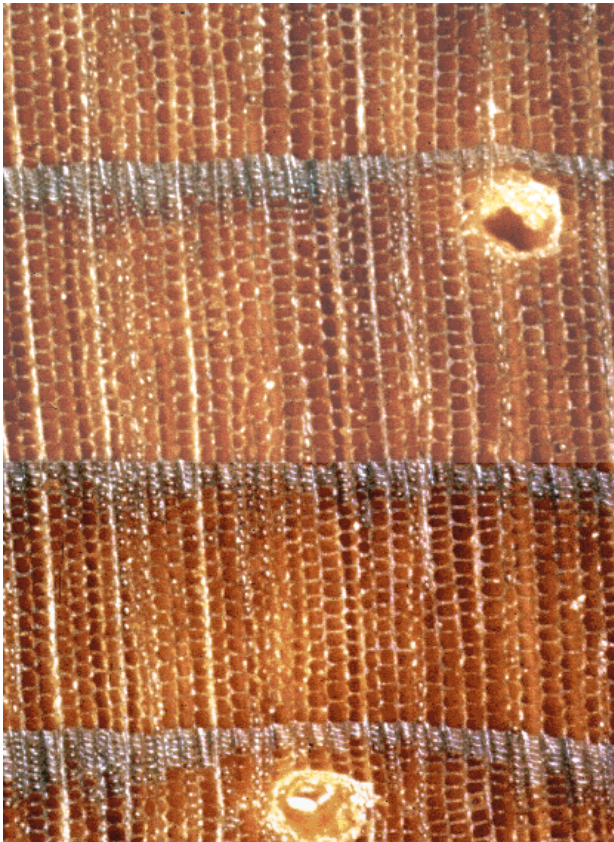
Photo courtesy SUNY

RESIN CANALS

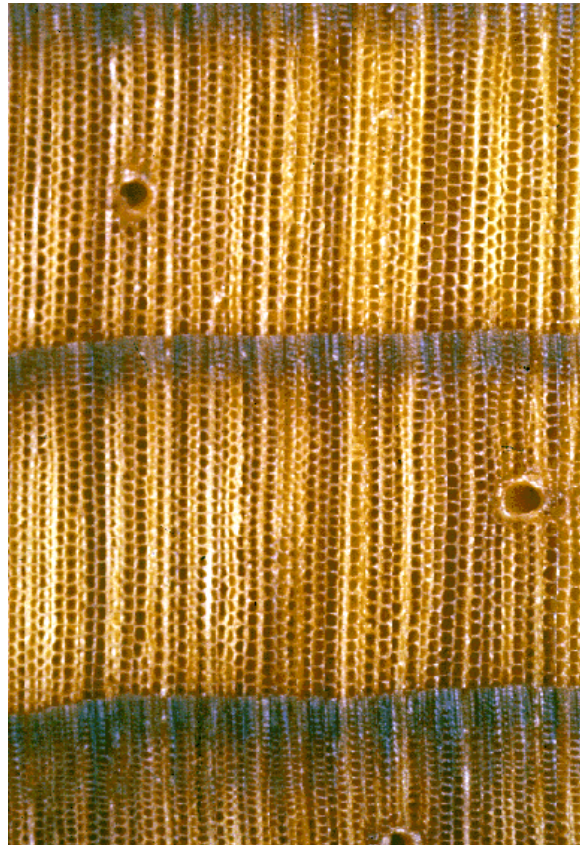
“Large” and usually numerous in the Pines

“Small” and usually fewer in Spruce, Larch, and Douglas Fir.

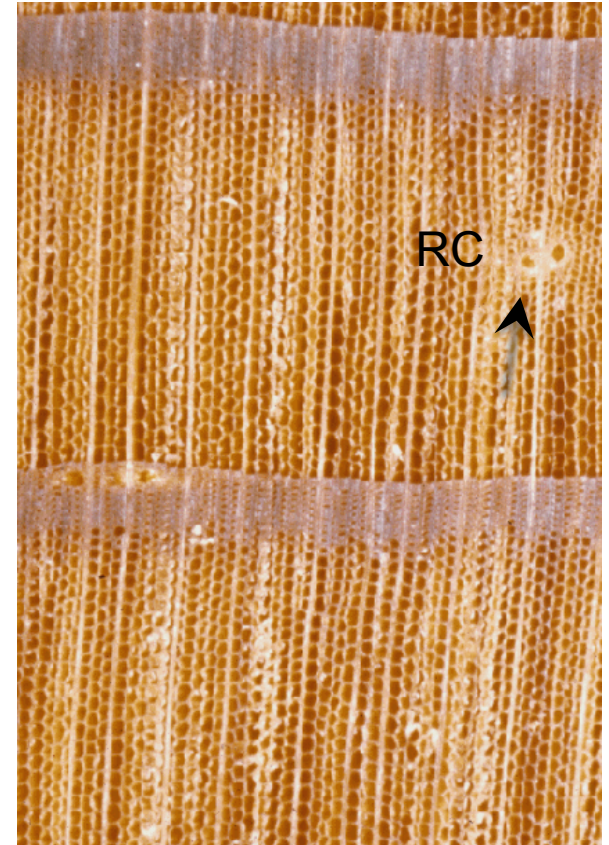
Usually more common in the latewood, but not restricted to latewood



Sugar Pine

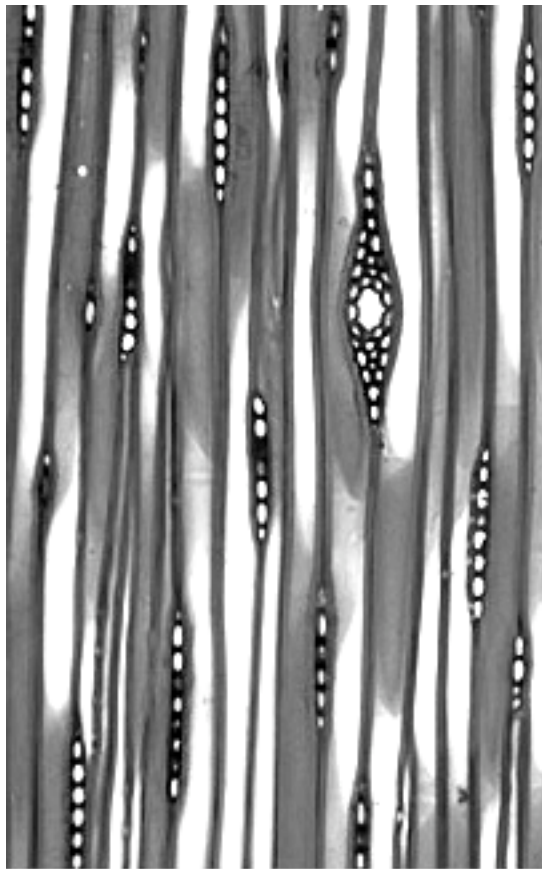


Ponderosa Pine

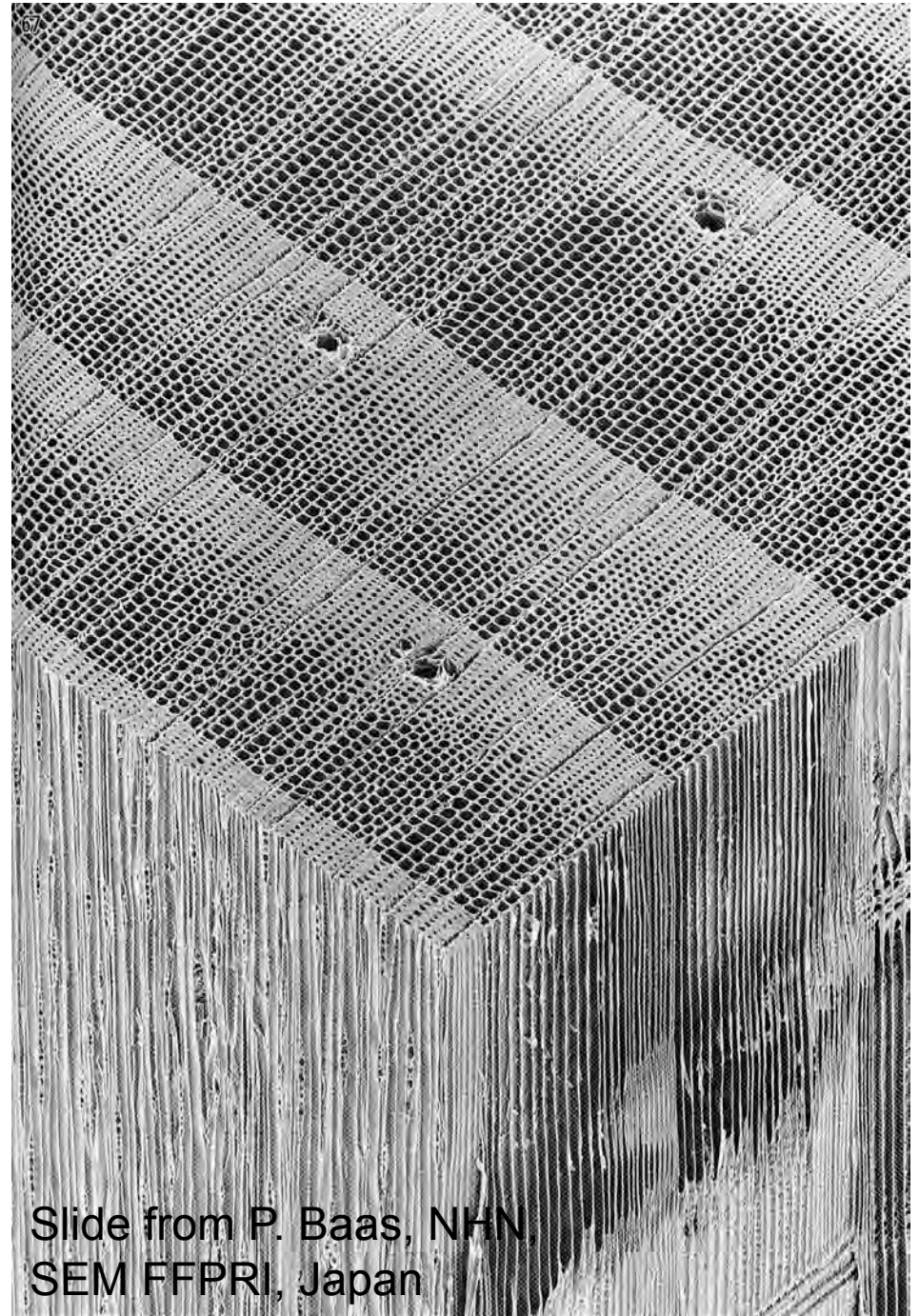


Larch

□
In U.S., if normal axial resin
canals, then some rays will
have resin canals.

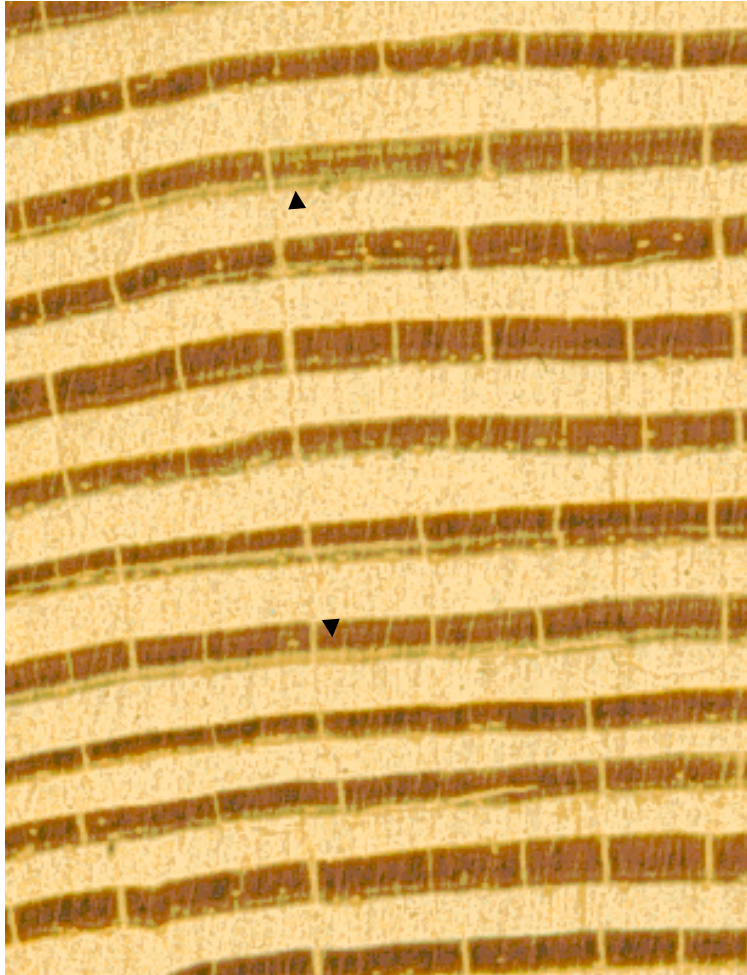


Tangential section



Slide from P. Baas, NHN,
SEM FFPRI, Japan

Hard Pine Resin Canals



Slightly magnified end view of Loblolly Pine (A Cross Section).

Longitudinal resin canals appear as small yellow dots in the latewood.

The “large” yellow stripes going through the latewood are fusiform rays (with radial resin ducts)-- they show up better in the latewood. Arrow parallel to one fusiform ray extending through a number of rings.