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Identifying Wood: a Guide and a Key
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Cooperative Extension Service
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IDENTIFYING WOOD

a guide and a key

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Like most useful arts, wood identification takes time and skill to learn. The best way to learn is to become familiar with the appearance and structure of the various woods under the guidance of one who knows them. This is not always possible, however.

This publication can help you identify woods. However, it includes only those woods commonly encountered by hobbyists, builders, furniture makers, carpenters and do-it-yourselfers. Only three imported woods are included; thus the key is not intended for use on most exotic items such as imported novelties and carvings.

If you work with the same few woods daily, you

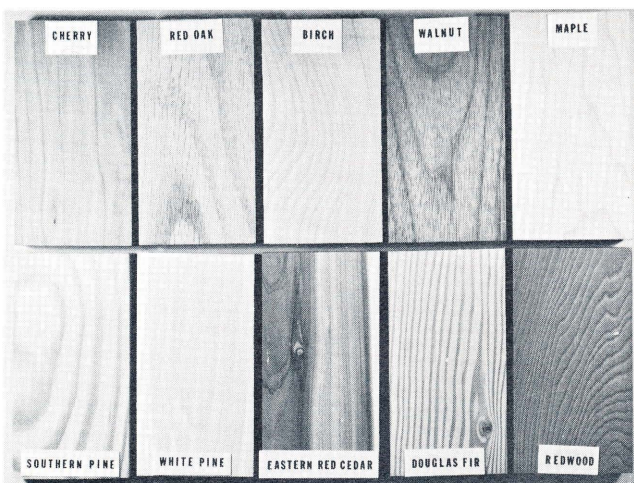
can easily identify these on sight. If you are a novice, however, it is a bit more difficult until you use the key (page 7) several times. Your task will be greater if the wood is covered with a stain or other finish, or if you cannot examine all sides of the piece. Wood turnings may be difficult to identify unless the end of the piece can be examined.

You can easily be fooled by printed grain, overlays, laminates and plastic finished to look like wood unless you are familiar with wood. Much furniture being made today is largely hardboard, particleboard, wood veneer, and plastic laminates.

For positive identification, a 10x hand lens and sharp pocket knife are of great help. Many times, however, the wood part to be identified cannot be cut so other methods must be used.

Wood Characteristics

Grain and Structural Directions—the *grain* runs in the direction of the tree height growth (up and down, parallel to the length of the tree trunk.) This is also referred to as the *longitudinal* direction. If the log is split down the middle, the resulting flat surfaces are called *radial* because they represent a radius of the tree circle. If the bark is removed and boards cut more or less perpendicular (at a right angle) to a radius, the surface is called *tangential*. The *cross section* or *end grain* is the surface appearing when wood is cut perpendicular to the grain. Many of the structural differences of wood appear more clearly here. See Figure 4 for the three structural directions.



Top row — common furniture hardwoods. Bottom row — common softwoods. All are tangential surfaces, except Douglas Fir, which is radial.

Softwoods and Hardwoods

Lumbermen call woods that come from cone or needle-bearing trees “softwoods” and those from broad-leaved trees “hardwoods”. These names have little to do with the hardness or softness of the wood. Softwoods, in general, are more difficult to distinguish from each other than are hardwoods. Hardwoods have pores, softwoods do not, see Figure 5.

All temperate-zone trees have growth rings which can be seen on the end of a board. If the whole tree trunk is examined, concentric rings can be seen as in Figure 4. Each ring indicates one year’s growth. The apparent rings on American mahogany are a result of a special type of cell that forms. Most tropical woods do not have growth rings on the log end. They may, however, have bands of cells that give the appearance of growth rings.

Pores

All hardwoods have pores. Pores are the largest cells in hardwoods. Their function in the standing tree is to transport water and dissolved substances. If they are of approximately the same size throughout the growth ring, the wood is called *diffuse porous* as with cottonwood or maple, shown in Figures 3 and 6. If the pores are markedly larger in the early wood as with oak or elm, the wood is called *ring porous*. The appearance of the pores can be seen in Figure 2.

Resin Ducts and Canals

In some softwoods, such as pines, tiny openings scattered along the growth ring are frequently visible to the unaided eye. These are resin ducts or canals. They are not nearly as numerous as pores in hardwoods. They can be seen in Figures 1 and 5 on Southern pine cross section. They are also easily seen in sugar pine on the radial or tangential surface, as in Figure 11.

Rays

Rays extend outward from the interior on a tree trunk cross section to the bark. They mark the true radial direction. They are distinctive in the oaks and beech, where they are quite broad, and also stand out well in maple on the radial surface. Rays are most readily seen on the cross section, but are also a help in identification on the radial surface, Figure 7.

Color and Odor

Color¹ can sometimes be used to identify woods. For example, there is no other American wood that has the color of eastern red cedar (juniper). There are, however, three difficulties in the use of color for

identification: colors can vary considerably in the same kind of wood, woods are frequently stained to alter their color, or they change color with exposure to light.

Odor is useful in identifying some woods such as Douglas Fir, basswood, and the cedars. Odors cannot be described except by referring to an already familiar one. Thus, one has to associate the distinctive odor with a known sample of the wood in question. The odor can only be detected by placing the wood close to the nose; in some cases, a fresh cut has to be made and the newly exposed surface moistened for the odor to be noticed. A board cut long ago may lose its odor.

The inner portion of the trunk of most trees is colored differently from the wood next to the bark. Sapwoods have no distinct color or odor. Only heartwoods have characteristic color and odor. The contrast due to difference in color can be seen in Figure 4. Sapwood is the living portion of the trunk found in all trees, and it varies considerably in thickness depending on the tree species. As an example, it may be 2 inches thick on ponderosa pine but only one-half inch thick on northern white cedar. When identifying sapwood, one must rely on structural features. Heartwood, found inside the sapwood in the central portion of the trunk, is largely dead when the tree is cut. It is easier to identify because of color, and sometimes, odor.

Earlywood and Latewood

The distinct parts of growth rings are most evident in softwoods and ring porous hardwoods. In softwoods, the portion of a year’s growth that forms in the spring is called earlywood. That which forms later is called latewood. The earlywood cells in softwoods are relatively thin-walled while the latewood cell walls are thicker, and the cells are smaller in the radial direction as shown in Figure 1. Pores in the earlywood or ring porous species are distinctly larger in a wood such as white oak shown in Figure 2. Those in a diffuse porous wood such as soft maple are approximately equal sized in earlywood and latewood, Figure 3. In fact, there is no distinction between earlywood and latewood in most diffuse porous woods.

Figure

“Figure” refers to a pattern or distinctive mark on the radial or tangential surface of a wood. The contrast between growth rings or parts of a growth ring contribute to this figure. Basswood has little or no figure while oak or elm has a recognizable figure.

¹ A good reference for wood color is U.S. Dept. Agr. Handbook No. 101, “Wood: Colors and Kinds,” for sale by Supt. of Documents, Gov’t Printing Office, Washington, D.C. 20402.

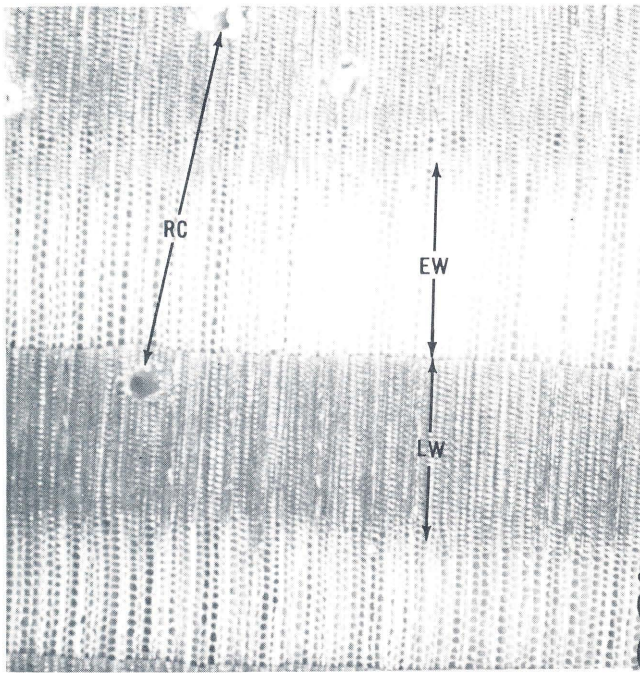


Figure 1—Cross section of southern pine with thin-walled cells in earlywood, EW; thicker cell walls in latewood, LW, and large resin canals, RC. (About 10x magnification).

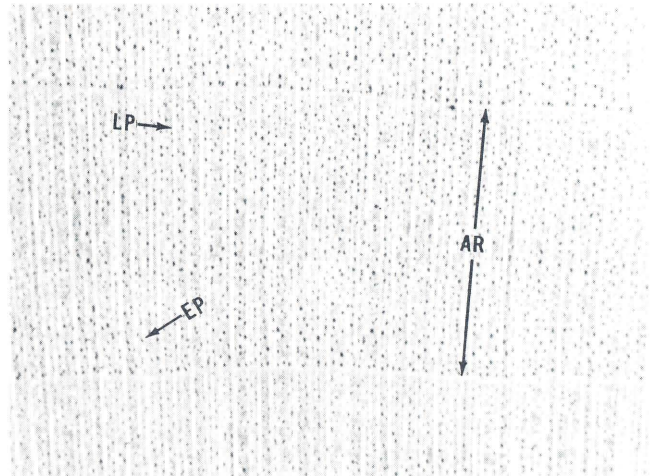


Figure 3—Soft maple, a diffuse porous hardwood with no difference in earlywood and latewood pores, EP, LP. Growth rings, AR, not as distinct as in ring porous wood. (About 10x magnification).

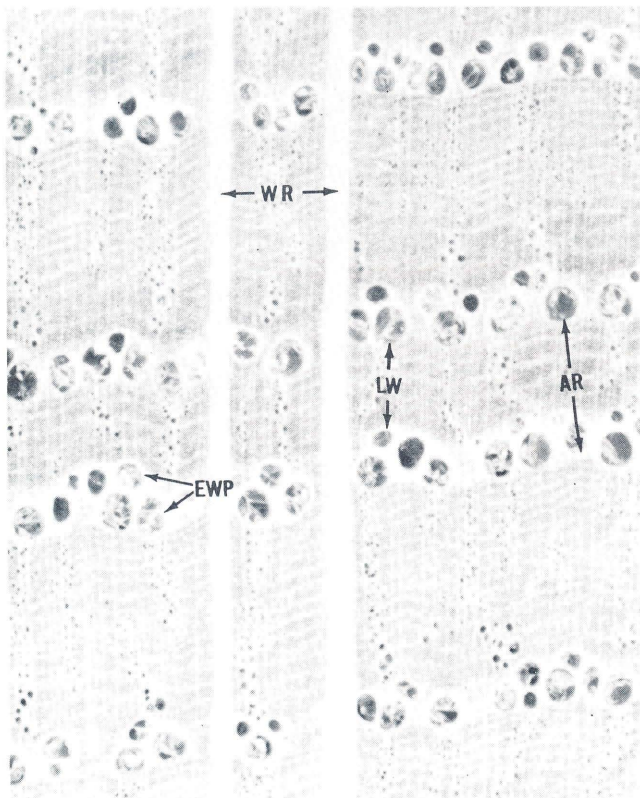


Figure 2—White oak, a ring porous hardwood. Large earlywood pores, EWP; latewood, LW, with small pores composing one growth ring, AR. Large rays, WR. (About 10x magnification).

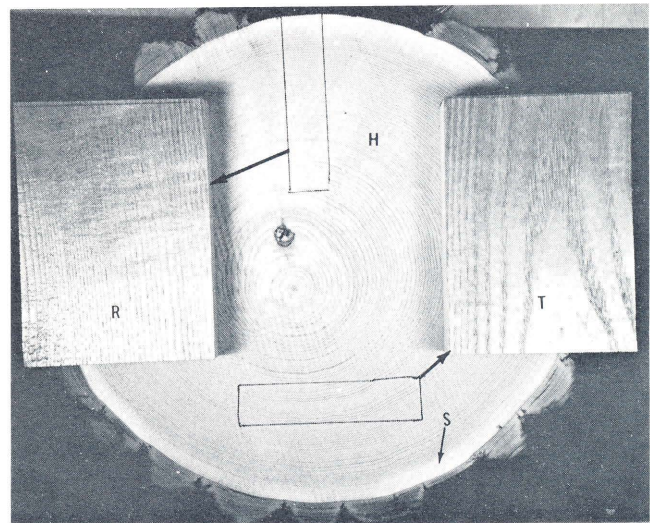


Figure 4—Cross-section of a log showing sapwood, S, heartwood, H, Quarter sawn board with radial surface, R, plain sawn board with tangential surface, T, and area from which they were cut.

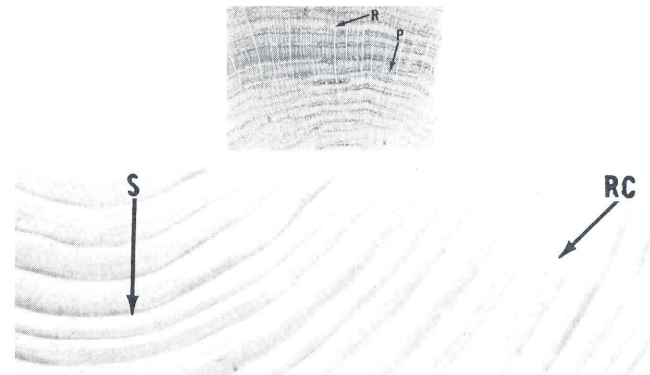


Figure 5—(Top) cross section of red oak, a hardwood with large pores, P; rays, R. (Bottom) southern pine, a softwood with dense latewood, S, and resin canals, RC (dark or light "spots.")

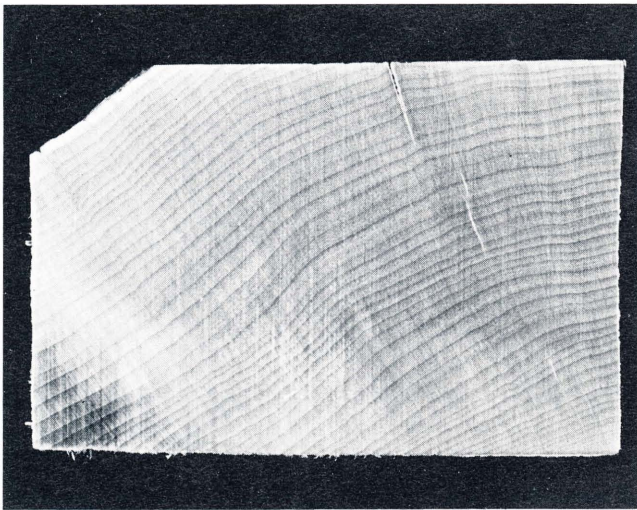


Figure 6—Cross section of sugar maple, a diffuse porous hardwood.

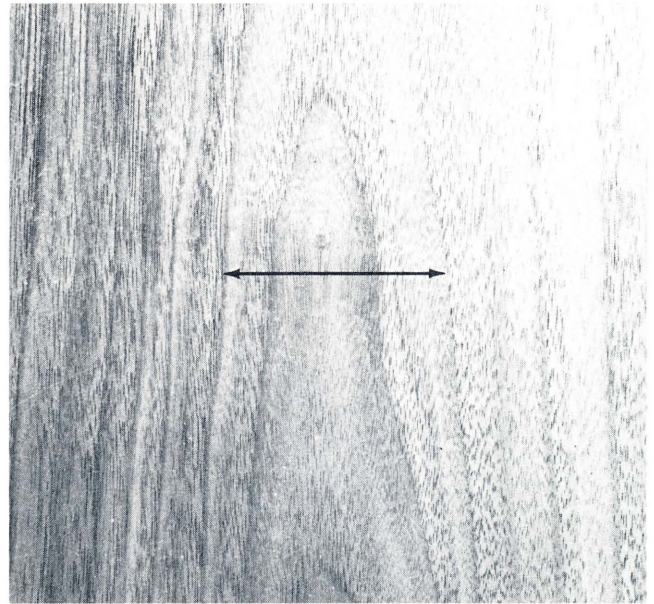


Figure 9—Sliced black walnut veneer. Narrower separation of growth ring ends.

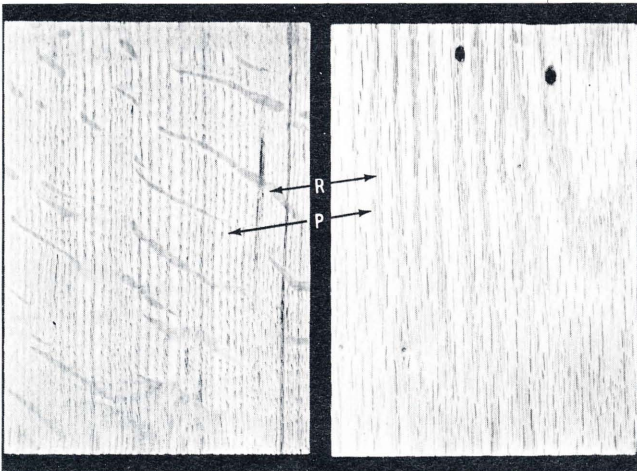


Figure 7—Red oak radial surface with prominent rays, R, on left, and tangential surface on right. Earlywood pores, P.

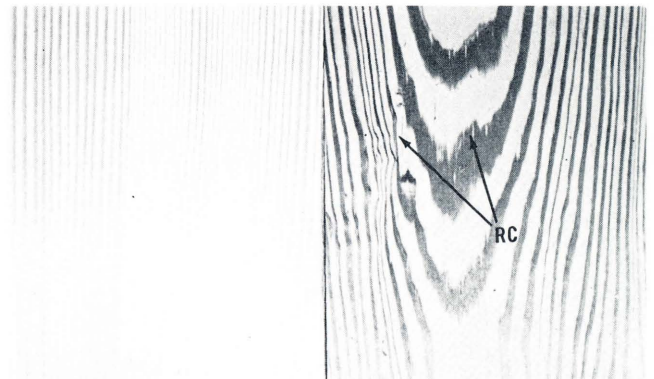


Figure 10—Radial surface of douglas fir on left, Tangential surface of southern pine on right showing resin canals, RC.

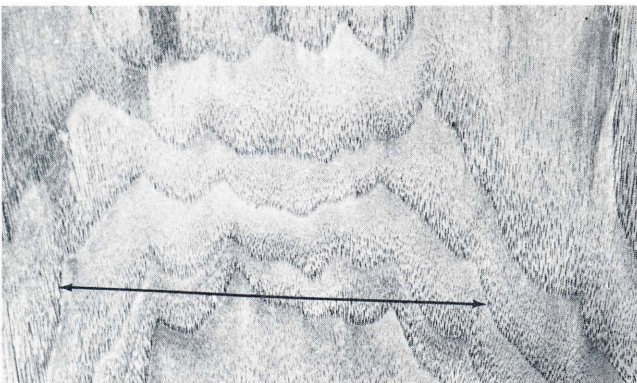


Figure 8—Rotary cut black walnut veneer. Note wide separation of growth ring ends in horizontal direction.

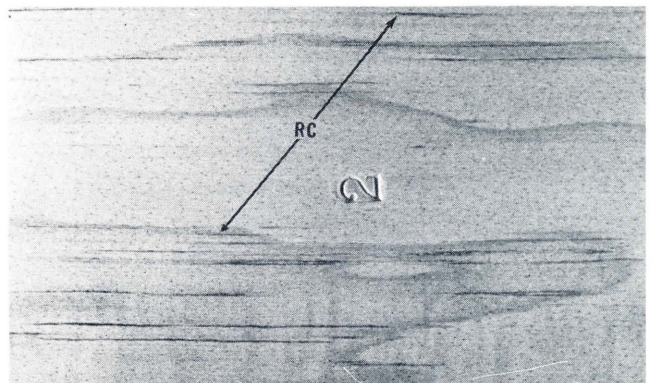


Figure 11—Sugar pine with large resin canals, RC.

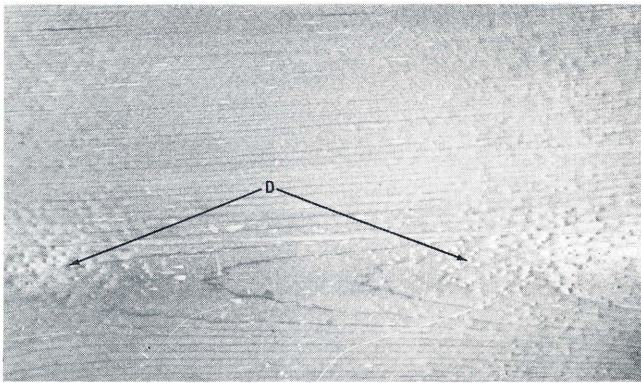


Figure 12—Dimpled ponderosa pine, D. Some spruces are also dimpled but do not have as distinct resin canals.

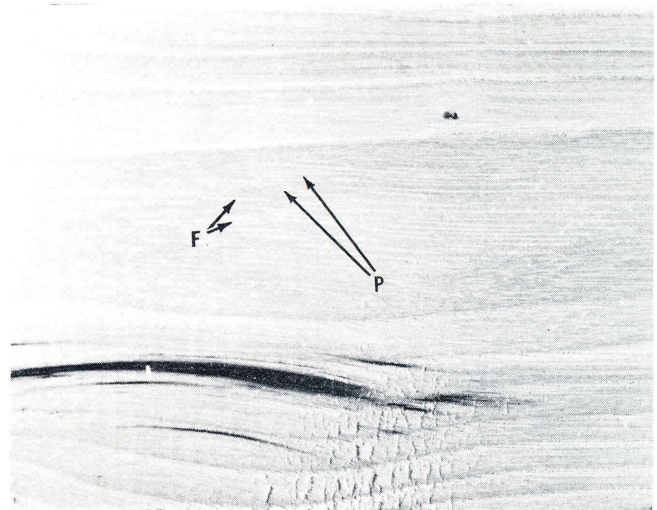


Figure 15—Hickory. Pores in narrow bands, P, separated by smooth hard surface, F.

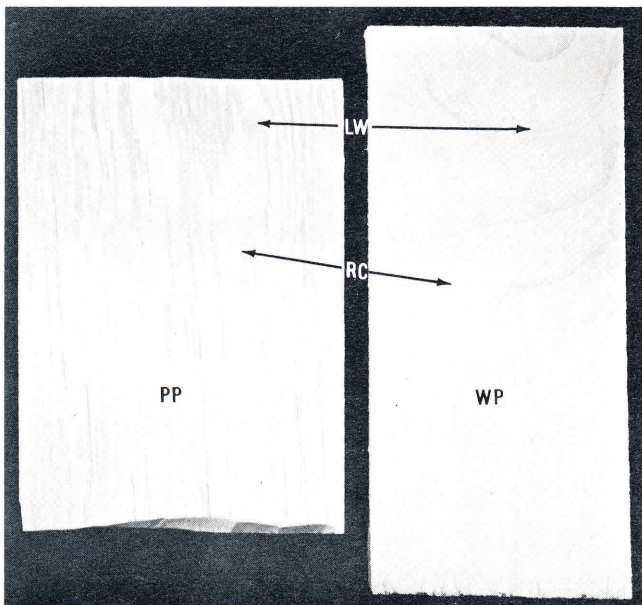


Figure 13—Ponderosa pine PP with resin canals, RC, and more distinct latewood, LW. White pine, WP, with less distinct resin canals and latewood.

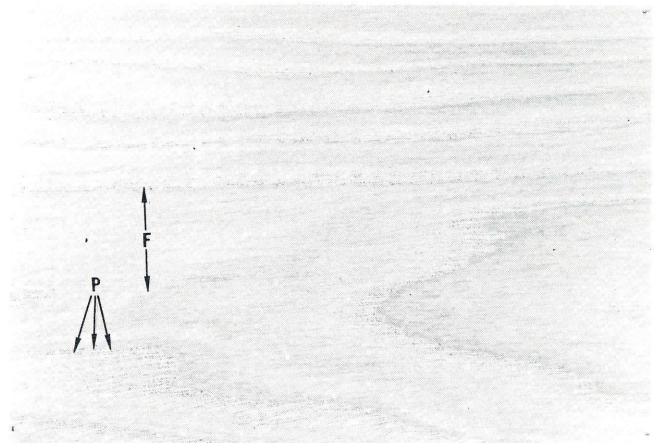


Figure 16—White Ash. Earlywood pores, P, poreless smooth areas, F.

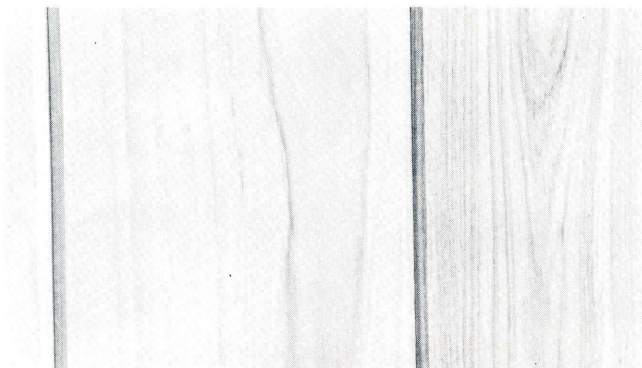


Figure 14—Tangential face of teak.

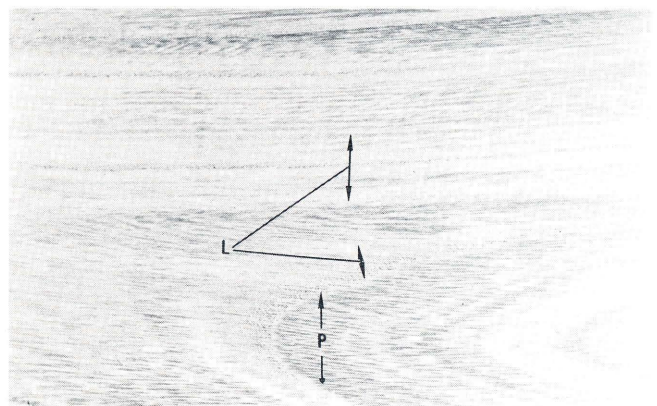


Figure 17—Elm. Earlywood pores in area P, striated latewood area, L.

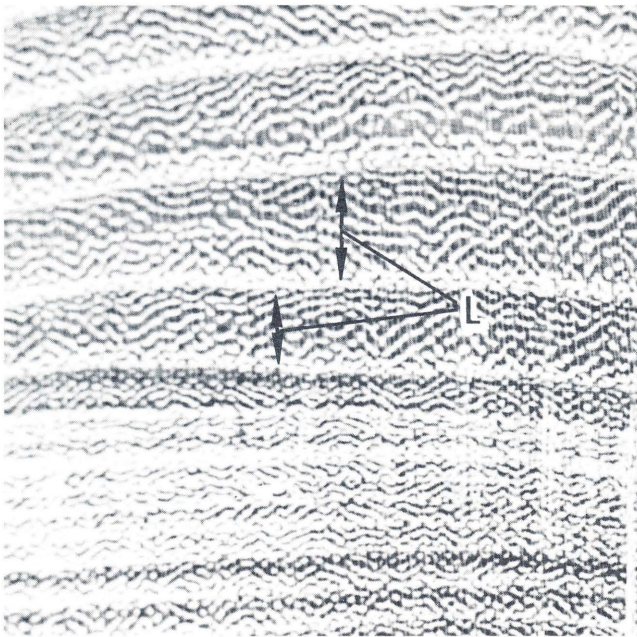


Figure 18 — Elm cross section with wavy lines of pores in latewood part, L, of growth ring. (About 10x magnification).

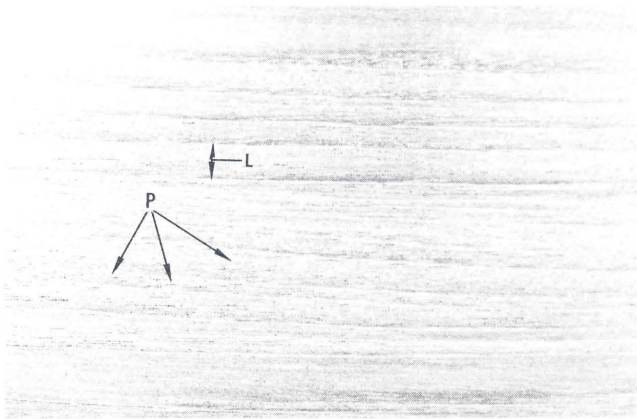


Figure 19 — American mahogany. Periodic lines, L, and pores, P.

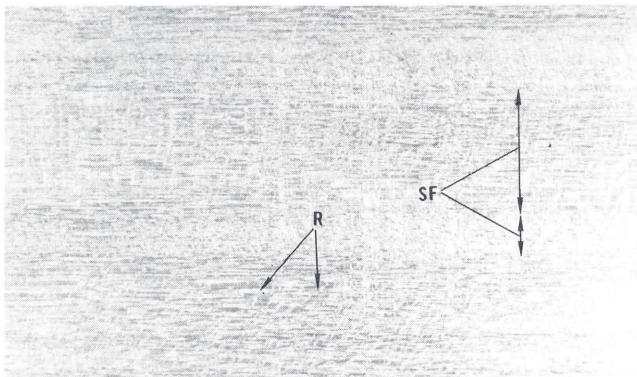


Figure 20 — Red Lauan. Radial surface with prominent rays, R. Stripe figure, SF, consisting of alternating bands of varying light reflection.

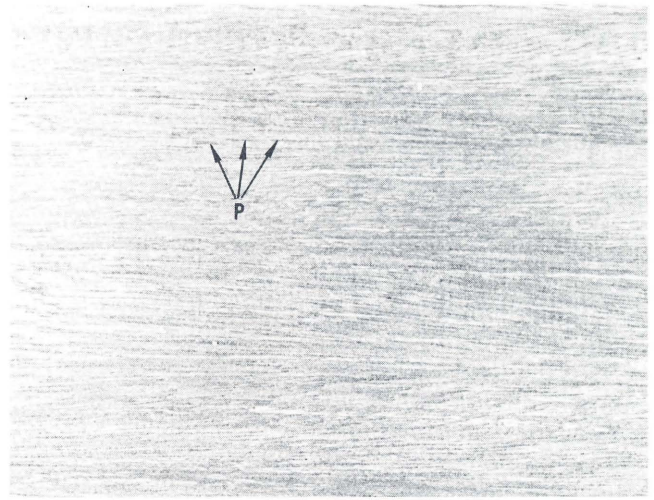


Figure 21 — Lauan with large pores, P.

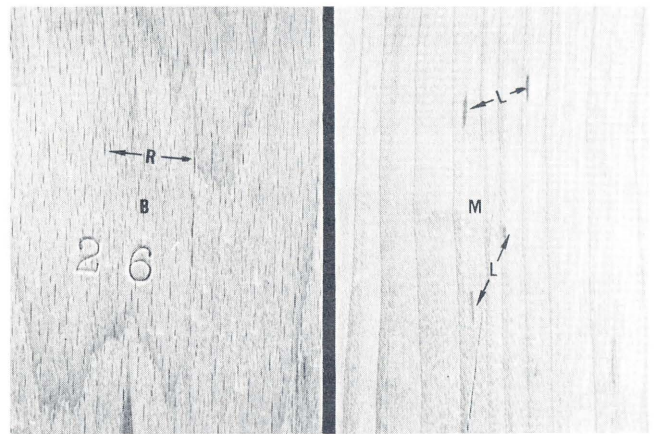


Figure 22 — Beech, B, tangential surface with broad rays, R. Maple, M, with smaller rays not readily seen. The dark lines, L, are "mineral streak" a discoloration common in maple.

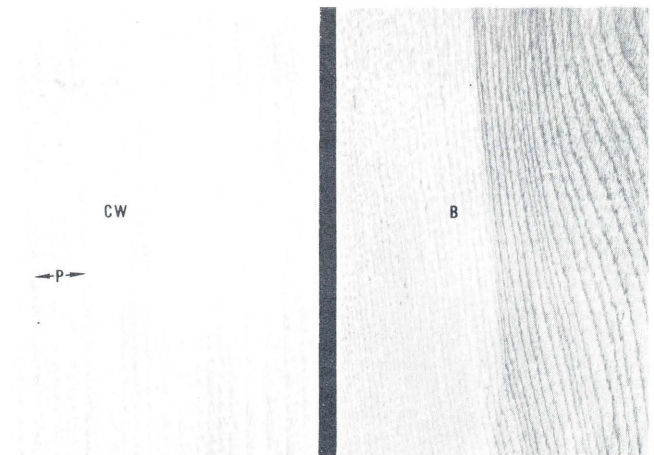


Figure 23 — Cottonwood, CW, with barely visible pores, P. Yellow birch, B, showing contrast between heartwood and sapwood.

WOOD IDENTIFICATION KEY

This key can be used with only the aid of the senses of sight, touch, and smell, but a sharp knife and inexpensive 10x to 15x hand lens will be a great help on some woods. After you have learned to identify correctly, try without the key. You'll be surprised at your prowess when you really become familiar with different woods.

Before using the key, first examine the end grain and then the tangential surface. There may not be a true tangential surface on some pieces, so try to select one close to it. In some cases (for example on a cabinet door), rotary cut veneer may make identification difficult. Only experience will help here. Com-

pare Figures 8 and 9 for difference in appearance of rotary cut and sliced veneer of the same species.

To use the key, enter at "START" and make a choice between the two. If the wood is softwood, go to "2". Then examine the two choices numbered 2 and make a selection. Assume that no resin canals can be seen, then go to "7". If the wood is a deep reddish brown color, go to "8". Again the choice is based on color and the way the wood cuts. For the reddish brown wood, go to "9". Since it is evenly colored we go to "10" and find it is redwood. It will be most helpful to use the key a few times with known pieces of wood.

1. **START:** Wood without pores; rays not distinct without using lens go to 2
1. **START:** Wood with pores; rays sometimes visible to the naked eye go to 14
2. Resin canals visible as light or dark colored dots on cross section or as tiny interrupted streaks on radial or tangential surface (Fig. 5, 10, 11) go to 3
2. Resin canals not easily visible to the naked eye or with a hand lens go to 7
3. Wood rather hard to cut across grain, latewood usually prominent on cross section go to 4
3. Wood softer, easier to cut, latewood not as prominent go to 5
4. Numerous resin canals, wood shades of yellow brown **Southern pine**
4. Resin canals not numerous, wood with an orange-red cast; when moistened, wood has a distinct odor **Douglas fir**
5. Latewood distinct, sharp boundary with earlywood in the same growth ring, latewood clearly contrasted on tangential surface, Figure 13. Wood frequently dimpled (appear as indentations) Figure 12. Resin canals appear as pale dots, not holes, on cross section **Ponderosa pine**
5. Latewood indistinct, gradual boundary with earlywood in the same growth ring, not contrasty on tangential surface. Resin canals appear as open holes on cross section go to 6
6. Resin canals large and numerous, appearing as brown streaks on radial or tangential surfaces **Sugar pine**
6. Resin canals smaller and less numerous, not as prominent on radial or tangential surfaces, Fig. 13. **Western or Eastern White pine**
7. Heartwood a dark shade of brown, red brown, or reddish purple go to 8
7. Heartwood a light shade of tan or cream go to 11
8. Purplish to rose brown, frequently with small spots of creamy colored wood enclosed. Cells small, wood smooth cutting. Distinctive cedar chest odor **Eastern Red cedar**
8. Dull brown to reddish brown, cells larger; or if orange brown, more resistant to cutting go to 9
9. Wood hard to cut across grain, latewood very hard and much darker color than earlywood, shades of orange brown **Douglas fir**
9. Wood easier to cut across grain, early and latewood of the same general shade of color go to 10
10. Odor when moistened, heartwood dull brown to medium brown **Western Red cedar**
10. No odor, heartwood reddish brown **Redwood**
11. Summerwood hard, offers considerable resistance when being cut across the grain with a sharp knife **Douglas fir**
11. Wood easier to cut across grain go to 12
12. Wood soft, light in weight, heartwood grayish tan, distinct odor **Northern White cedar**
12. Wood medium weight, heartwood creamy or lilac-tan to light brown go to 13
13. Creamy white or with yellowish cast, may be dimpled, resin canals can sometimes be seen, wood shows lustre of light reflection on split surface **Spruce**
13. Lilac-tan or pale-brown shade, no dimples, no resin canals **Western hemlock or True fir**
14. Ring porous. Pores at the beginning of a growth ring clearly larger than those in latewood. Earlywood pores visible to naked eye (Fig. 5, 7) go to 15
14. Diffuse porous. Pores about uniform in size scattered through the growth ring (Fig. 3, 6) go to 21
15. Rays broad and distinct on all surfaces (See Figs. 2, 5 and 7) go to 16
15. Rays not broad go to 17
16. Heartwood with a red-brown cast, pores generally open, rays on tangential surface about 1/2 inch long, maximum **Red oak**
16. Heartwood with a yellowish cast, earlywood pores plugged, rays frequently over an inch long on tangential surface **White oak**
17. Heartwood dark shades of chocolate or golden brown, earlywood pores not touching to form a continuous row go to 18
17. Heartwood light shades of brown or tan go to 19

18. Wood purplish brown to chocolate color, figure prominent on tangential face, surface dry to touch when rubbed with thumb, distinct odor. (Fig. 9) **Black Walnut**
18. Golden brown, subdued figure on tangential face, surface slightly oily or resinous when rubbed by thumb (Fig. 14) **Teak**
19. Wood very hard and heavy, pores in earlywood not in continuous row along the ring, pores on tangential face in narrow bands or lines (See Fig. 15) **Pecan or Hickory**
19. Not exceptionally hard or heavy, pores in earlywood in continuous band; on tangential face pores show as wider bands (Fig. 16 and 17) **go to 20**
20. On cross section latewood appears as wavy bands (Fig. 18), tangential surface with striations throughout the latewood (Fig. 17) **Elm**
20. Latewood with isolated 2 celled pores seen on cross section, poreless areas with few striations on latewood radial surface (Fig. 16) **Ash**
21. Pores relatively large, easily seen on radial or tangential surface; if wood not filled during finishing the fingernail will be caught when moved across the wood grain, dark color in pores if filled, wood dark shades of brown **go to 22**
21. Pores small, not evident on any surface to naked eye. **go to 25**
22. Chocolate to purplish brown, prominent grain figure on tangential surface, distinct odor (Fig. 8 or 9) **Black Walnut**
22. Pale pinkish brown, golden brown or deep orange brown, subdued figure on tangential surface **go to 23**
23. Pores large and conspicuous on radial or tangential surface, prominent rays on some surfaces, no growth rings, stripe figure common on radial surface (Fig. 20, 21) **Lauan**
23. Inconspicuous rays, pores not as crowded, rows of cells give the appearance of growth rings **go to 24**
24. Oily to touch, medium to dark brown (Fig. 14) **Teak**
24. Dry to the touch, orange brown, ribbon stripe figure common (Fig. 19) **American Mahogany**
25. Rays easily visible on tangential or radial surfaces, medium to light shades of tan, pores not readily seen on any surface with naked eye or evident to the touch **go to 26**
25. Rays finer or only visible with a lens, pores can sometimes be felt on radial or tangential surfaces **go to 27**
26. Rays broad and easily seen on cross section and tangential surface (Fig. 22) **Beech**
26. Rays narrower on cross section, prominent on radial surface but only as minute flecks on tangential surface (Fig. 22) **Maple**
27. Shades of red brown to grayish brown **go to 28**
27. Tan, greenish, or cream color **go to 30**
28. Rays visible on cross section to naked eye, medium to deep reddish brown color **Black Cherry**
28. Rays not visible on cross section to naked eye **go to 29**
29. Heartwood pink to deep brown in streaks, frequently with a gray fungus discoloration, wood soft, no tangential figure **Red gum**
29. Light reddish brown, hard, prominent tangential figure, pores can just be seen on tangential or radial surface (Fig. 23) **Yellow Birch**
30. Sapwood creamy color, heartwood green or pale yellowish green, firm to cut, tangential figure, growth rings terminated with a row of light colored cells **Yellow poplar**
30. No green cast to wood. If pale color, no figure on tangential surface if wood soft; if pale color and wood hard, no rows of light colored cells at ends of growth rings **go to 31**
31. Wood with tangential figure, hard, pores can barely be seen on tangential or radial surface (Fig. 23) **Yellow birch**
31. Little or no tangential figure, soft **go to 32**
32. Very pale, almost white, sometimes with brown areas around knots **Aspen**
32. Buff, streaked or creamy color, or pale grayish **go to 33**
33. Grayish, frequently rough surfaces, sometimes unpleasant odor when wetted, pores although tiny, can be seen or felt on radial or tangential surface **Cottonwood**
33. Light buff or cream shades, no pores visible, rays relatively widely spaced **Basswood**



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