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A Guide and a Key to...

IDENTIFYING WOOD

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Although a useful art, 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 by examination 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-yourselvers. This includes only three imported woods; thus the key is not intended for use on most exotic items such as imported novelties and carvings.

Persons working with the same few woods day in and day out can easily identify these on sight. The novice, however, will find it a bit more difficult until he has used the key (page 7) several times. His task will be greater if the wood is covered with a stain or other finish, or if he cannot examine all sides of the piece. Wood turnings may be difficult to identify unless the end of the piece can be examined.

One can easily be fooled by printed grain, overlays, laminates and plastic finished to look like wood unless he is familiar with wood. Much furniture being made today contains only reconstituted wood such as particle board, or veneers, 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 approaches must be used.

WOOD CHARACTERISTICS

Grain and Structural Directions—the *grain* is said to be in the direction of the tree height growth, in other words—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* surfaces because they represent a radius of the tree circle. If the bark is removed and boards cut more or less perpendicular to a radius, the surface is called *tangential*. The *cross section* or *end grain* is the surface appearing when the log is first cut, the circular area, see Figure 4. Many of the structural differences of wood appear more clearly here.

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 or Canals

In some softwoods, such as the pines, there are tiny openings scattered along the growth ring that 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 or 5 on Southern pine cross section. They are also easily seen in a wood such as 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

Color (1) can sometimes be used to identify woods. For example, there is no other wood that has the color of juniper, sometimes called eastern red cedar. There are, however, three difficulties in the use of color for identification: colors can vary appreciably 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.

The inner portion of the trunk of most trees is colored differently from the wood next to the bark. Sapwoods are of 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 tree 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 termed latewood. In softwoods, at least the earlywood forms when the tree twigs are lengthening. 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 of ring porous woods 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, in most diffuse porous woods there is no distinction between earlywood and latewood.

Figure refers to a pattern or distinctive mark as the radial or tangential surface of a wood. The contrast between growth rings or parts of a growth ring contribute to this figure. A wood, such as basswood, has little or no figure while oak or birch has a recognizable figure.

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(1) A good reference for wood color is U.S. Dept. Agr. Handbook No. 101-Wood: Colors and Kinds for sale by Supt. Documents, Gov't Printing Office, Washington, D.C. 25001, for 50 cents.

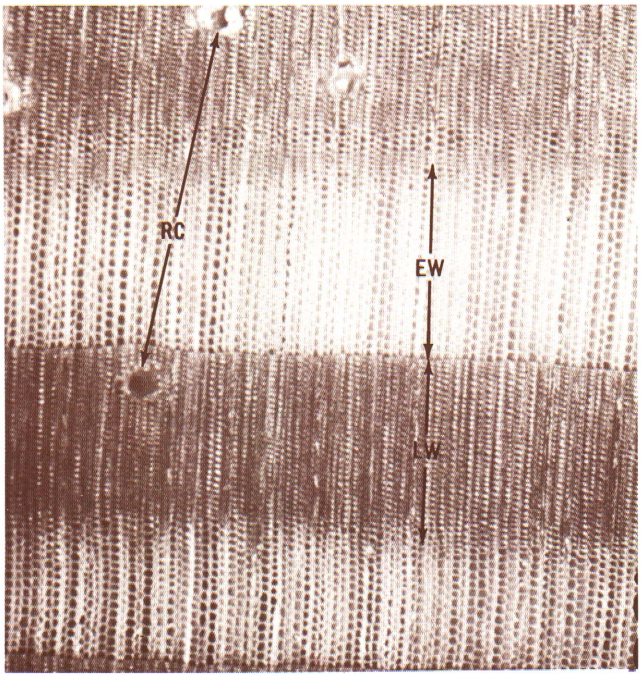

Figure 1—Cross section of southern pine with thin-walled cells in earlywood, EW; thicker cell walls in latewood, LW, and large resin canals, RC.

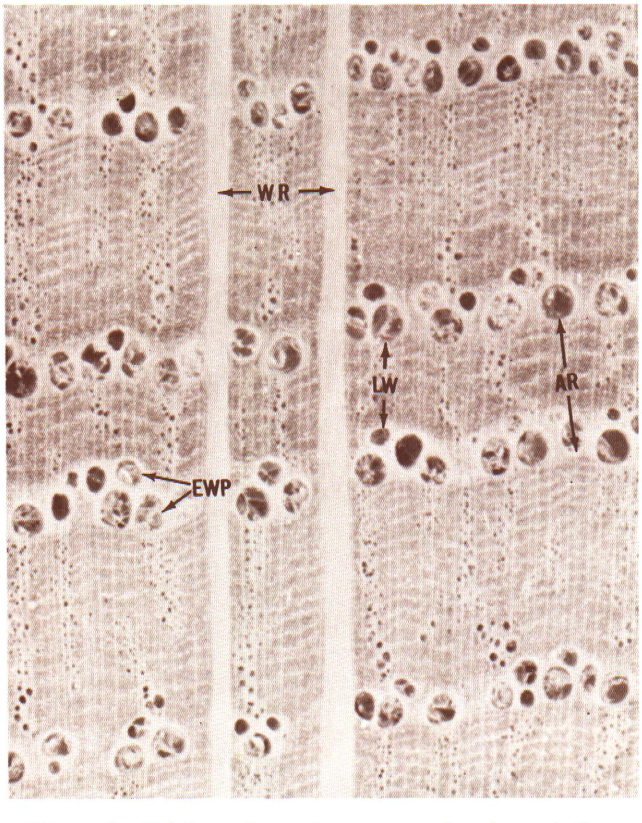

Figure 2—White oak, a ring porous hardwood. Large earlywood pores, EWP, with tyloses; latewood, LW, with small pores composing one growth ring, AR. Large rays, WR.

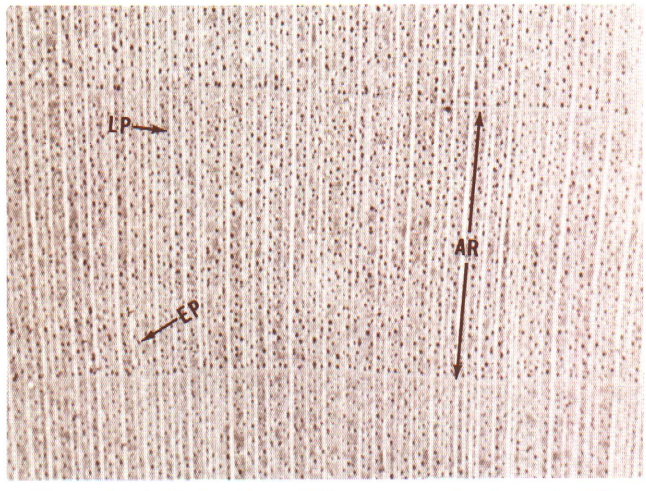

Figure 3—Soft maple, a diffuse porous hardwood with no difference in earlywood and latewood pores, EP, LP. Growth rings, AR, not as distinct as in ring porous wood.

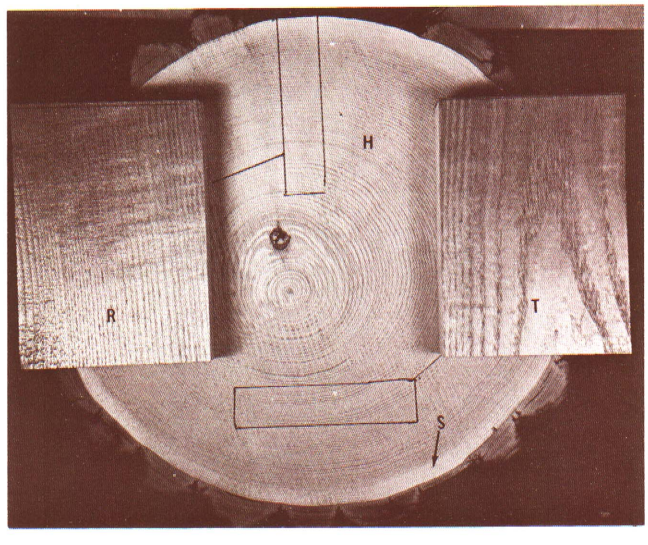

Figure 4—Cross-section of a log showing sapwood, S, heartwood, H, Quarter sawn board with radial surface, R, plain sawn board with tangential surface, T, and area from which they were cut.

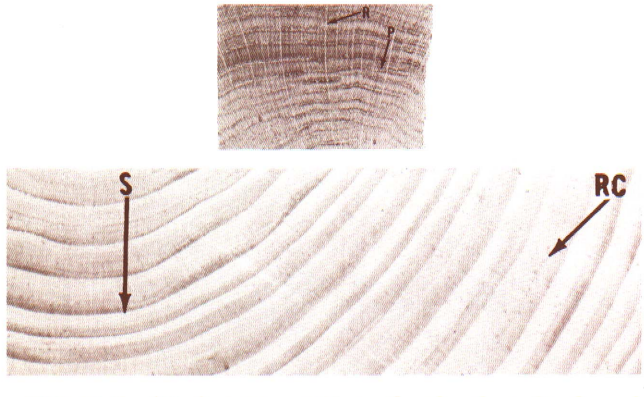

Figure 5—(Top) cross section of red oak, a hardwood with large pores, P; rays, R. (Bottom) southern pine, a softwood with dense latewood, S, and resin canals, RC (dark or light "spots.")

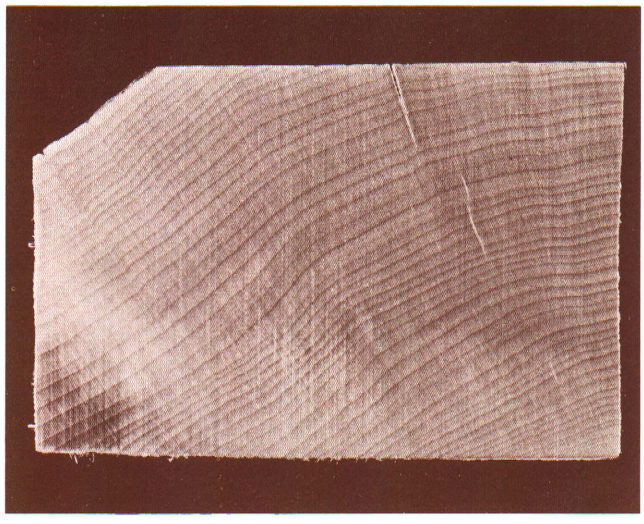

Figure 6—Cross section of sugar maple, a diffuse porous hardwood.

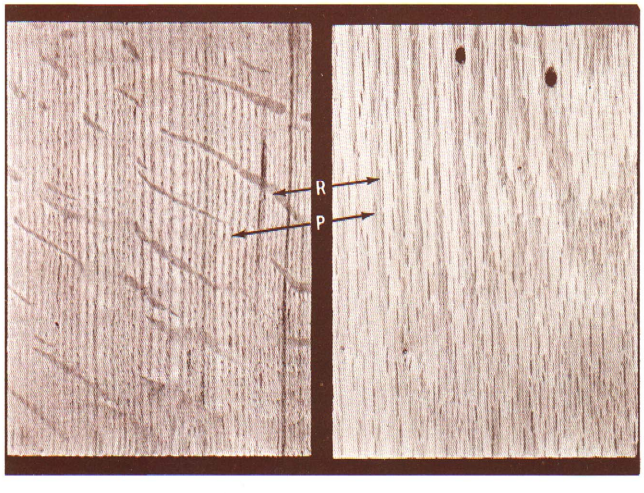

Figure 7—Red oak radial surface with prominent rays, R, on left, and tangential surface on right. Earlywood pores, P.

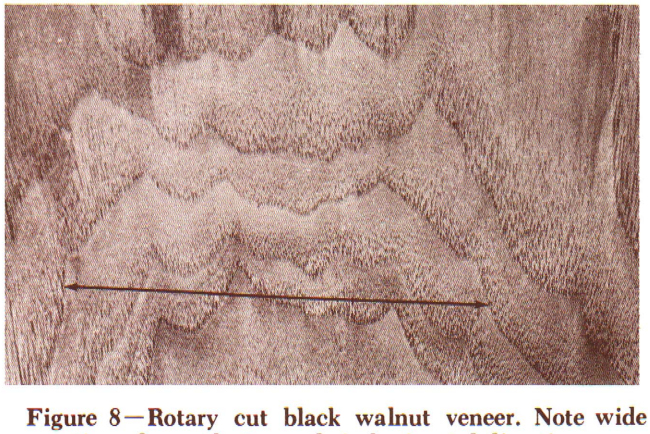

Figure 8—Rotary cut black walnut veneer. Note wide separation of growth ring ends in horizontal direction.

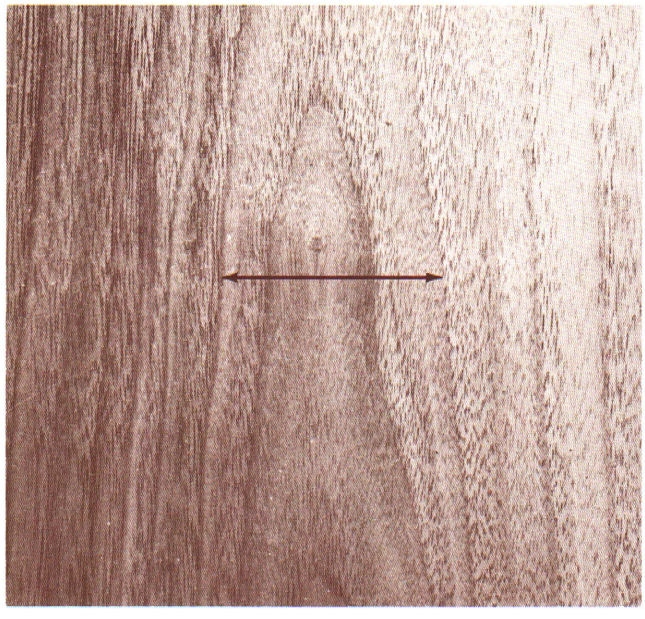

Figure 9—Sliced black walnut veneer. Narrower separation of growth ring ends.

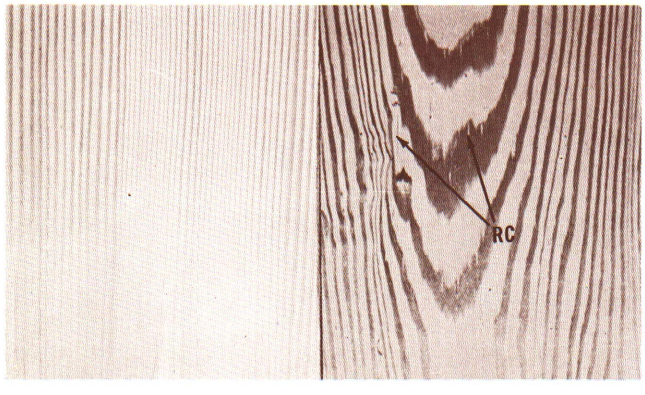

Figure 10—Radial surface of douglas fir on left, Tangential surface of southern pine on right showing resin canals, RC.

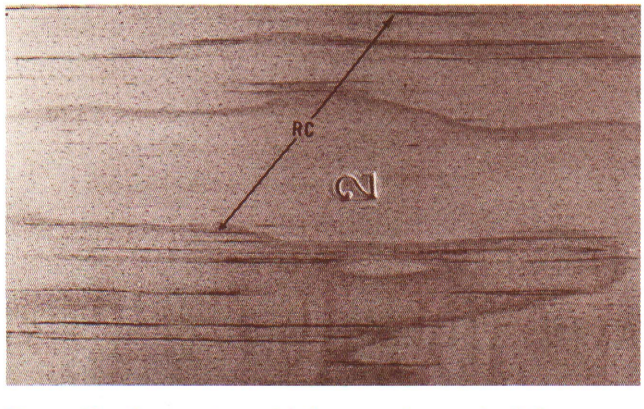

Figure 11—Sugar pine with large resin canals, RC.

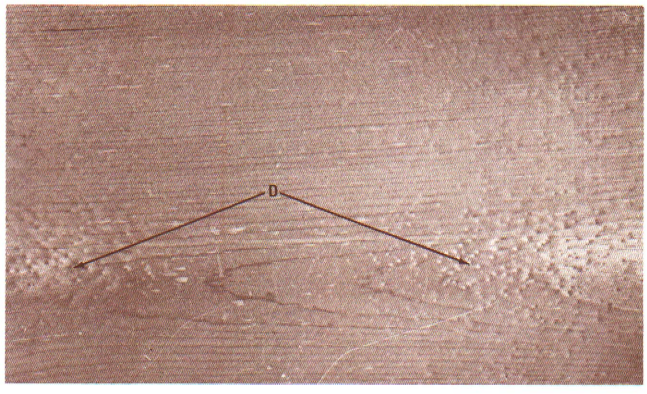

Figure 12—Dimpled ponderosa pine, D. Some spruces are also dimpled but do not have as distinct resin canals.

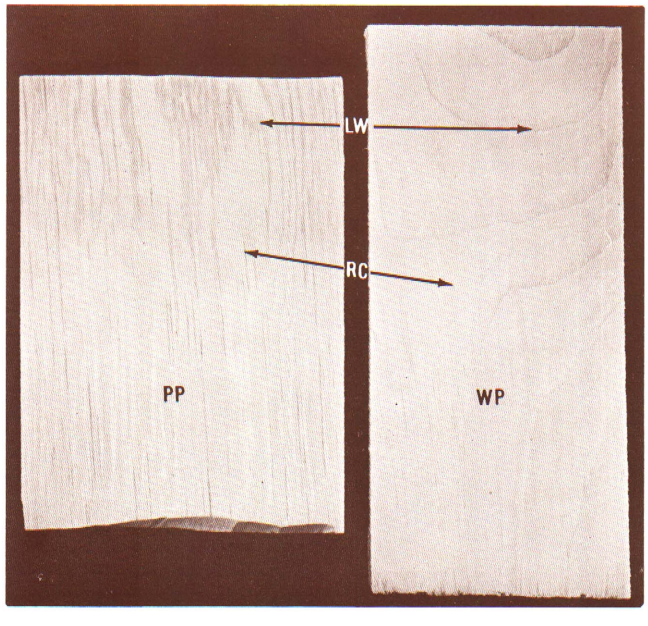

Figure 13—Ponderosa pine PP with resin canals, RC, and more distinct latewood, LW. White pine, WP, with less distinct resin canals and latewood.

Figure 14—Tangential face of teak.

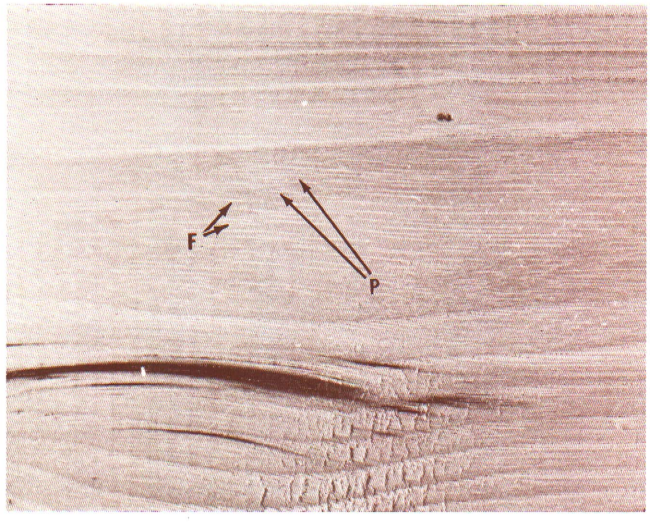

Figure 15—Hickory. Pores in narrow bands, P, separated by smooth hard surface, F.

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

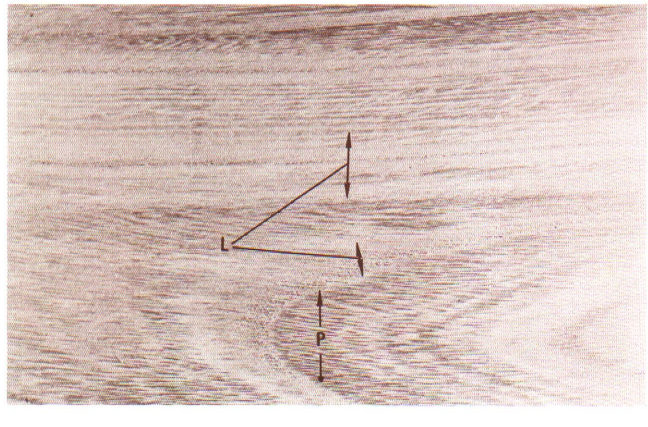

Figure 17—Elm. Earlywood pores in area P, striated latewood area, L.

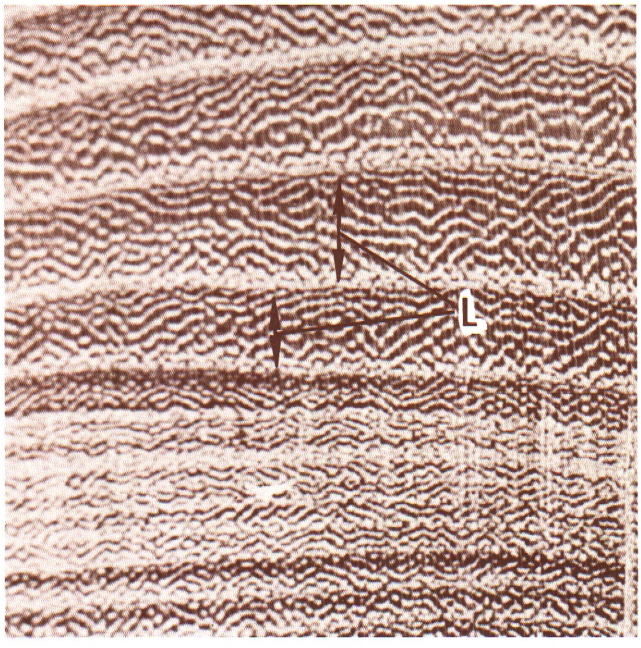

Figure 18—Elm cross section with wavy lines of pores in latewood part, L, of growth ring.

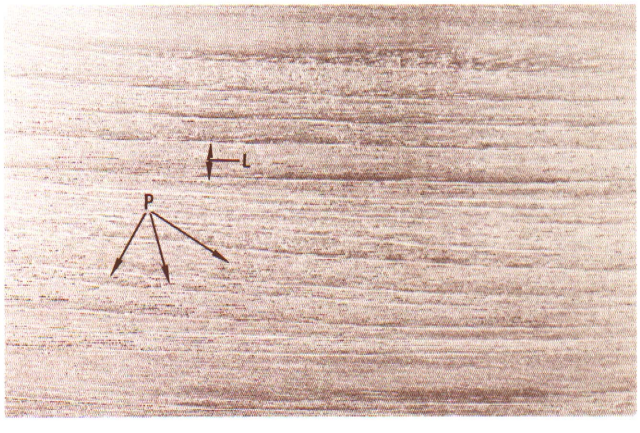

Figure 19—Mahogany (American). Periodic lines, L, and pores, P.

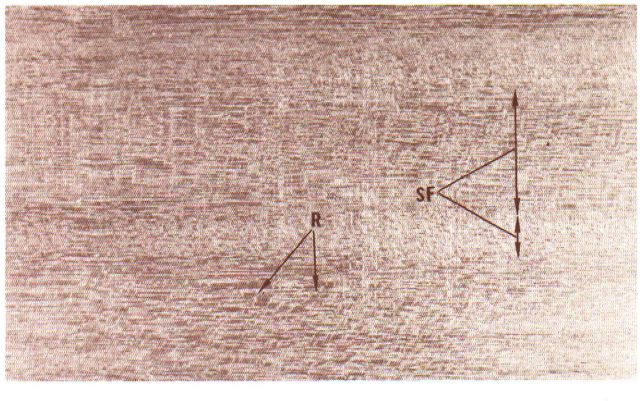

Figure 20—Red Lauan (Philippine mahogany) radial surface with prominent rays, R. Stripe figure, SF, consisting of alternating bands of varying light reflection.

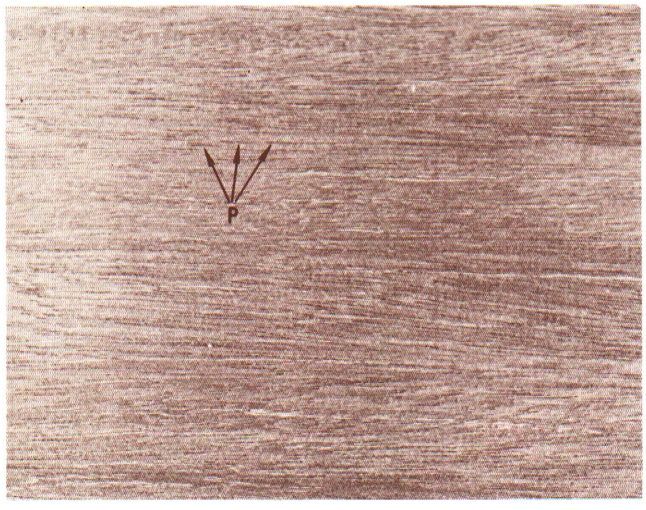

Figure 21—Lauan (Philippine mahogany) with large pores, P.

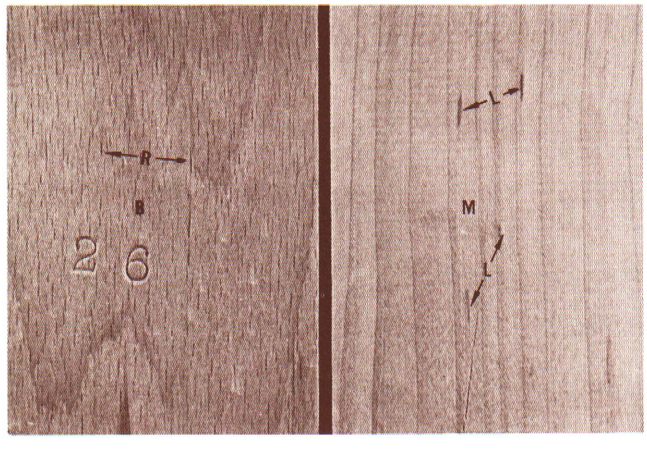

Figure 22—Beech, B, tangential surface with broad rays, R. Maple, M, with smaller rays not readily seen. The dark lines, L, are "mineral streak" a discoloration common in maple.

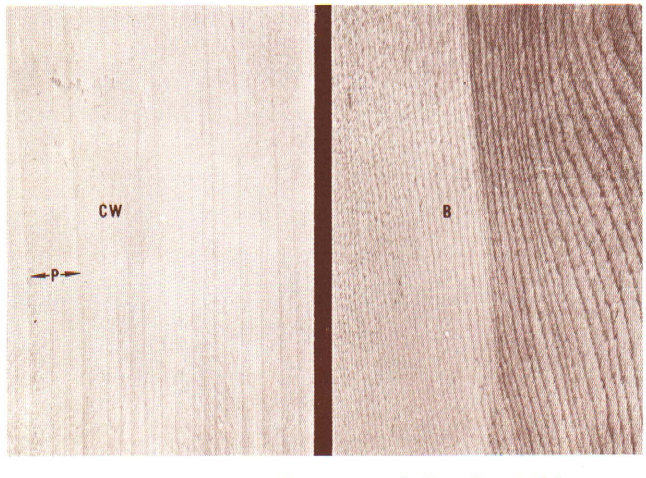

Figure 23—Cottonwood, CW, with barely visible pores, P. Yellow birch, B, showing contrast between heartwood and sapwood.

IDENTIFICATION KEY TO WOODS

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 one has learned the woods correctly, he can try to identify them without the key. He'll be surprised at his prowess when he really becomes familiar with them.

To use the key, first examine the end grain and then the tangential surface. This may not be a true tangential surface on some pieces, so try to select one close to it. In some cases, for example on cabinet doors, rotary cut veneer may make identification difficult. Only experience will help here. Compare Figures 8 and 9 for difference in appearance of rotary cut and sliced veneer of the same species. As an example of its use, enter the key at START and make a choice between the two. If the wood is softwood, the choice is *2*. Then examine the two choices numbered *2* and make a selection here. Assume that no resin canals can be seen, then go to *7*. If the wood is a deep reddish brown color, the choice is *8*. Again the choice is on color and the way the wood cuts. The reddish brown wood is *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 2
1. **START:** Wood with pores; rays sometimes visible to the naked eye 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) 3
2. Resin canals not easily visible to the naked eye or with a hand lens 7

3. Wood rather hard to cut across grain, latewood usually prominent on cross section 4
3. Wood softer, easier to cut, latewood not as prominent 5

4. Numerous resin canals, wood shades of yellow brown . . . . . **Southern pines**
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 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 purplish brown 8
7. Heartwood a light shade of tan or cream 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 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. 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, distinct odor . . . . . **Douglas fir**
11. Wood easier to cut across grain. 12

12. Wood soft, light in weight, heartwood grayish tan, distinct odor . . . . . **Northern White cedar**
12. Wood medium weight, heartwood creamy or lilac-tan, no odor. 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) 15
14. Diffuse porous. Pores about uniform in size scattered through the growth ring (Fig. 3, 6) 21

15. Rays broad and distinct on all surfaces (See Figs. 2, 5 & 7) 16
15. Rays not broad 17

16. Heartwood with a pink cast, pores generally open, rays on tangential surface about ½ 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 18
17. Heartwood light shades of brown or tan 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 & 17) 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 finger nail will be caught when moved across the wood grain, dark color in pores if filled, wood dark shades of brown 22
21. Pores small, not evident on any surface to naked eye . 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 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 (Philippine Mahogany)**
23. Inconspicuous rays, pores not as crowded, rows of cells give the appearance of growth rings 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 26
25. Rays usually not visible on any surface with a lens, pores can sometimes be felt on radial or tangential surfaces 27

26. Rays broad and easily seen on cross section and tangential surface (Fig. 22) . . . . . **Beech**
26. Rays not readily visible on cross section without hand lens, prominent on radial surface but only as minute flecks on tangential surface (Fig. 22). . . . . **Maple**

27. Shades of red brown to grayish brown 28
27. Tan, greenish, or cream color 30

28. Rays visible on cross section to naked eye, deep reddish brown color . . . . . **Black Cherry**
28. Rays not visible on cross section to naked eye 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, pale yellowish green or purple, 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 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 32

32. Very pale, almost white, sometimes with brown areas around knots . . . . . **Aspen**
32. Buff, streaked or creamy color, or pale grayish 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, distinct odor when wetted, rays relatively widely spaced . . . . . **Basswood**

NOTE

Dimpling sometimes is seen on spruce and ponderosa pine. It is most readily seen on a split tangential surface but can sometimes be seen on planed surfaces.

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