Wood Identification:

Equipment & Technique

Society of Wood Science and Technology

Teaching Unit Number 1

Slide Set 3

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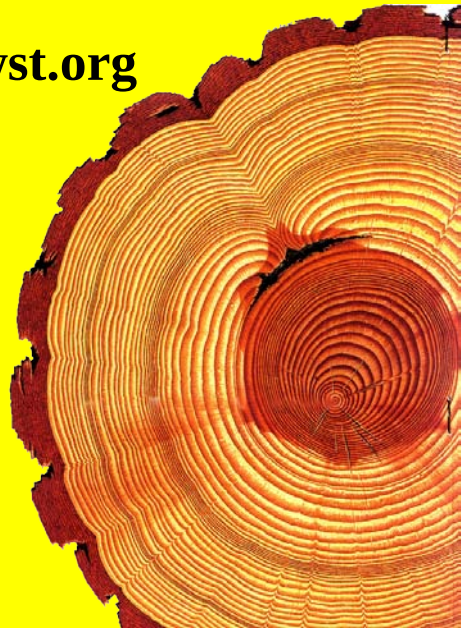


Background

This part of SWST's teaching unit is intended only to introduce the subject of wood identification and does not represent a comprehensive tutorial. It will, however, help you get started with wood id.

The presentation focuses on six wood samples for the purpose of studying wood structure and to introduce hand-lens identification. A hand lens is necessary for observation of wood cell structural characteristics. You will also need to have several (10 or 15) single-edge razor blades for use in producing smooth cross-sectional (end-grain) cuts on which many diagnostic anatomical features may be observed.

If you haven't already, you should contact SWST to purchase the wood block set and a hand lens prior to attempting the rest of this unit.

Study of the slides and the text accompanying <u>Teaching Unit 1, Set 2 - Structure of Wood</u> provides basic terminology for wood anatomy and should be completed prior to attempting wood id. Take a minute or two now to review.

Pay particular attention to slides 31-33 and 34-37 which are low-magnification views of wood that reveal the degree of structural detail discernable at 10 to 16X magnification. Comparison of the wood samples with these images is helpful as you learn to tell woods apart based on cross-sectional anatomy.

The wood blocks included in Unit No. 1 Slide Set 3 are each labeled with a number corresponding to the following:

1 = red oak (*Quercus* spp.)

2 = white ash (*Fraxinus* spp.)

3 = yellow-poplar *(Liriodendron tulipifera)*

4 = southern yellow pine (*Pinus* spp.)

5 = spruce (*Picea* spp.)

6 = redwood *(Sequoia sempervirons)*

Wood Identification:

Equipment and Technique

Identifying wood using the cell features is a bit of a challenge at first because we are not used to looking at fine cell structure and attributing it to particular wood types. But, with a little practice, a good hand lens, and a smooth, clean surface, it becomes quite routine. As you will see, it is a systematic process and not a mysterious art.

Wood id. is based on examining the anatomical features of a wood specimen usually with a hand-held magnifying glass of 10X - 15X power (a hand lens). So knowledge of wood anatomy from Teaching Unit 1- Set 2 - Structure of Wood is crucial to your success in wood identification. Continually review Set 2 as you go through the rest of this unit.

Let’s get started

In most cases, wood id. begins with examining the end grain surface of the specimen. End-grain is also known as the cross-sectional surface of a wood block. This is the surface that is exposed when the wood cells have been cut perpendicular to their length (at a right angle to the tree stem axis). Growth rings are seen as arcs on this surface. Wood cells are seen as circles and holes, rather like looking at the ends of straws or tubes. Review slides 3, 4, and 14 in Unit 1 Set 2.

Equipment: To identify wood using cell anatomy features, you will need to cut the end grain surface so cleanly that the essential cell features can be seen easily. The best tools are single edge razor blades and a 10X - 15X hand lens (magnifying lens). A bench clamp is especially useful for holding small samples while cutting.

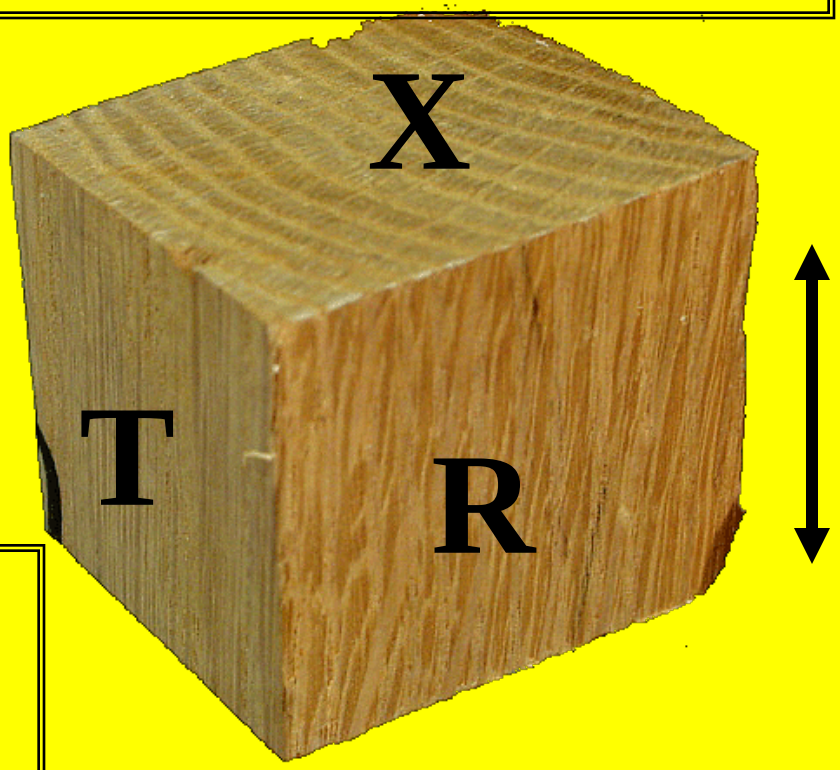
Before we cut any wood, FIRST a word or two of CAUTION:

Specimen preparation involves using extremely sharp tools and is therefore an inherently dangerous activity. Proper technique will minimize your risk. The next section describes how to prepare specimens for identification using the cell features.

Spend a little time getting acquainted with the technique first.

Specimen preparation

The ***first step*** in specimen preparation is to identify the end grain surface or cross-sectional surface. It is shown below as the surface with the “X”.



X indicates the cross section
R = Radial surface
T = Tangential surface
arrow indicates grain direction

Wood cuts best if the surface is slight wet, so the ***next step*** is to slightly moisten the surface to be cut (only the surface to be cut, and only slightly).

Always use a fresh, sharp razor blade so that you do not have to exert excessive force to push (or pull) the blade through the wood. While the blade may look sharp, microscopic nicks and rounding of the edge make the blade not sharp enough. Make only a few cuts per blade. **BUT DO NOT CUT YET!!!**

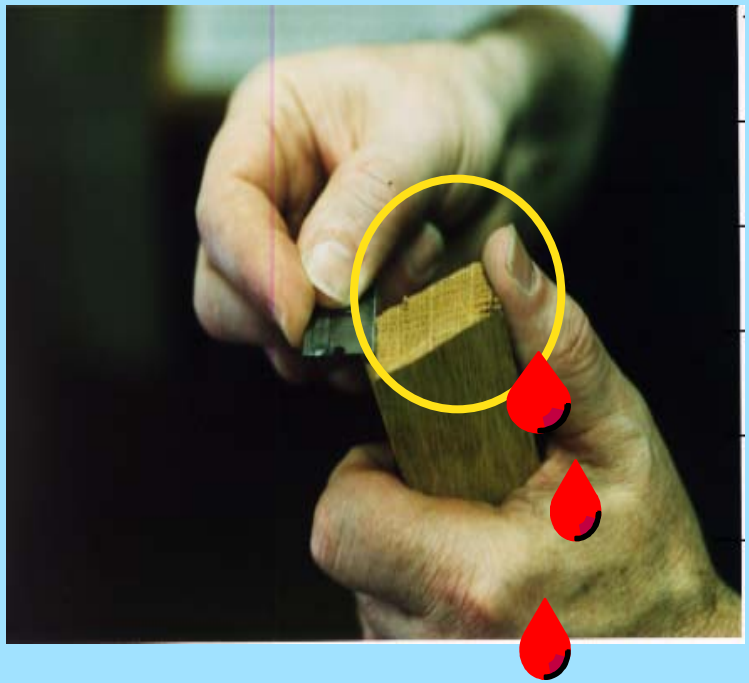
Be sure to dispose of used razor blades properly in a rigid, sealable container. Do not throw them in the trash.

Next, secure the block tightly in a vise or grip the block firmly in your hand so that the cross section is up. See the picture below.

If holding the block by hand, BE SURE to keep all your fingers **BELOW** the cutting surface and anticipate the direction of travel of the blade. See the result of incorrect gripping in the next slide →

Wood block secured in vise

How to cut wood



How to cut fingers

<u>Now</u> you are ready to make your first cut

Now that you know how to grip the block, position the blade at the far corner of the block and pull the blade toward you in a FLAT slicing motion, taking a thin, light clean cut.
Do not angle the blade too much, a flat cut is the way to go.
<u>Look at the example above for proper technique.</u> Excessive force should not be required, if it is, the blade is TOO DULL.

The goal is to provide a **flat**, **clean** surface that exposes at least 1 growth ring. NOTE: a large area is not needed, make only a small slice.

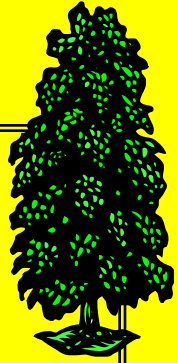
Next up, how to look with your new hand lens.....

To view the cut surface, **bring the hand lens up to your eye**, THEN bring the block near the lens and move the block toward you and away until the wood surface is in focus.

You can take the block out of the vise first if you prefer, entirely up to you.

If you have a strong light that can be directed on the cut surface, that might help too. Look at the picture below for an example or how to use the lens.

How to use your lens



Finally, what kind of wood is it?

The first question that must be answered is whether the specimen is a **softwood or hardwood?** (Unit 1 Set 2 slides 12-14). This can be accomplished by scanning the end grain surface for the presence or absence of vessel elements (see Unit 1 Set 2 slides 17, 21, 23, & 25, for examples of vessels).

If the specimen has no vessels, the search for the wood type is immediately narrowed down to a softwood candidate. If the specimen has vessels which are obvious on the end grain surface, the specimen is one of the hardwoods and the next question that is usually asked is “what is the arrangement of those vessel elements?” Refer to Unit 1 Set 2 for vessel arrangements, slides 21 - 26.

If the specimen is a softwood, an early question which must be answered is whether or not it is a resinous or non-resinous softwood (see slides 16, 19, & 34-37).

Here are some id. features to look for in the wood blocks that are included in this unit:

Oak and **ash** are both ring-porous hardwoods, with different latewood vessel patterns and differing ray widths. Oak has some VERY wide rays and some narrow rays, ash does not.

Yellow-poplar is a diffuse porous hardwood. Vessels are almost the same size throughout the growth rings.

Pine and **spruce** are softwoods with resin canals, but the canals differ in their size (diameter). Pine has large, numerous resin canals, while spruce has small, sparse resin canals.

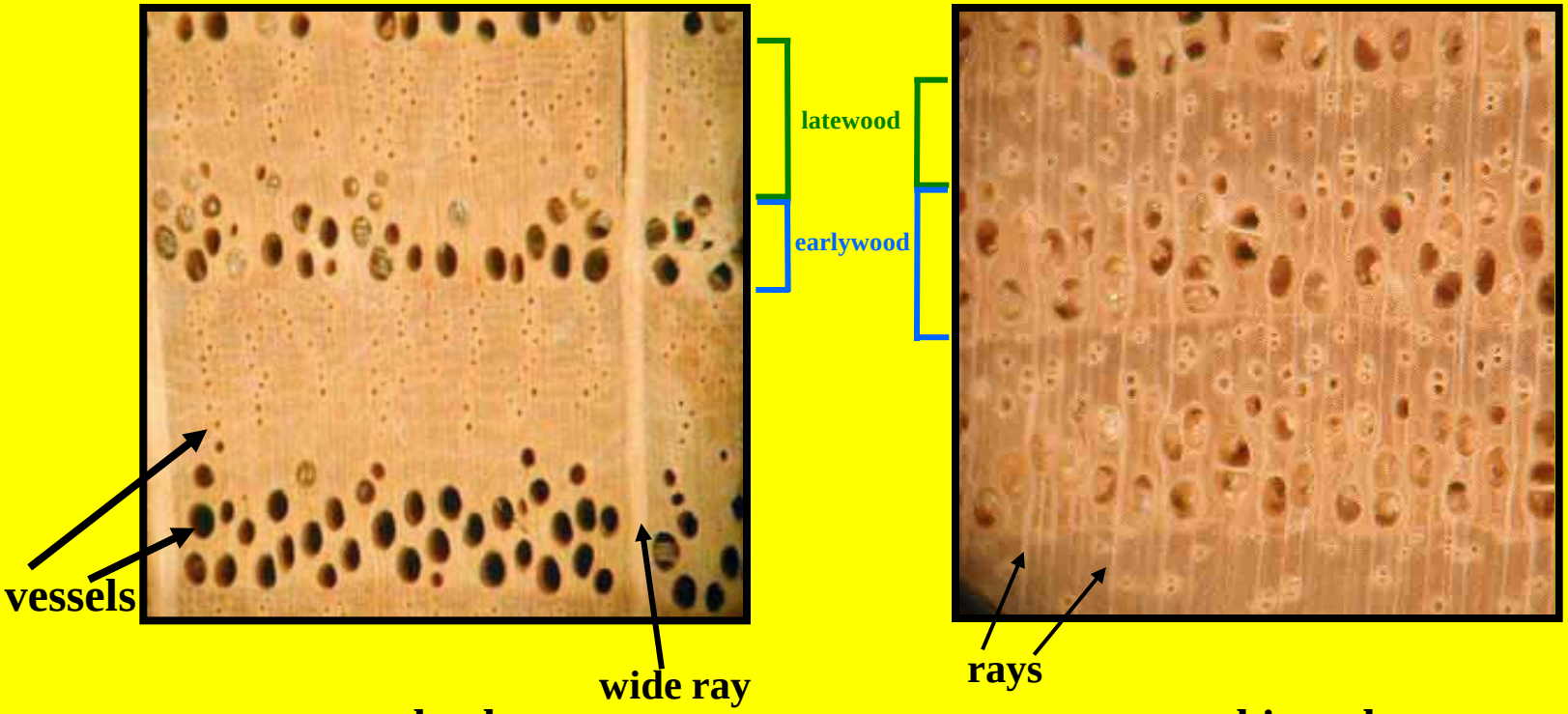
Redwood is a softwood with no resin canals. It has very large cells (tracheids) for a softwood and lives up to its name – it's red (or least dark brown).

LOOK at the next few slides to see examples of the above types of wood. Then look for the features described above and in Unit 1 Set 2 on the end grain of your wood blocks.

Oak and **ash** are both ring-porous hardwoods,

with different latewood vessel patterns and differing ray widths.

Oak has some VERY wide rays, ash does not.



red oak

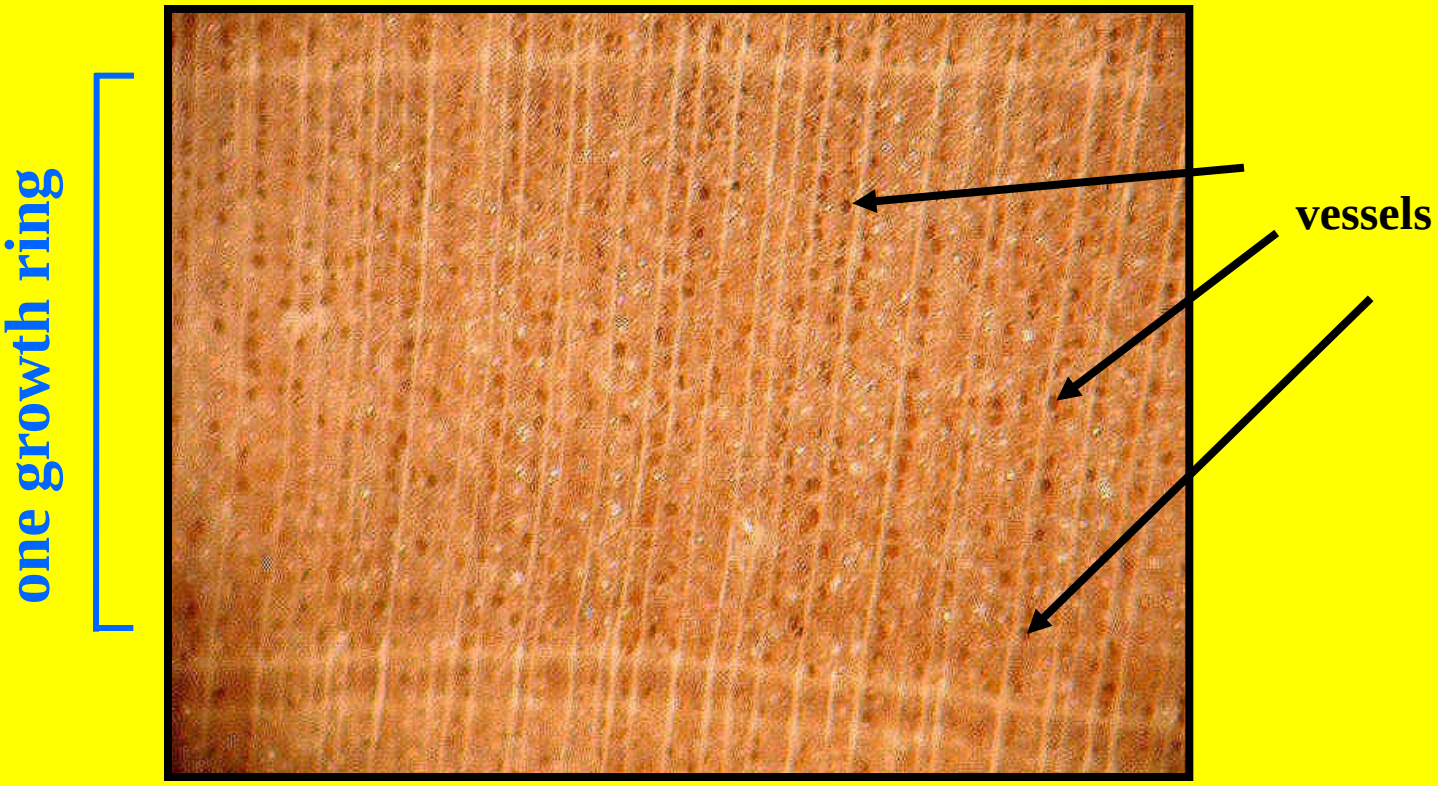
cross section, 20X

white ash

cross section, 20X

Yellow-poplar is a diffuse porous hardwood.

Notice how the vessels are almost the same size throughout the growth ring.



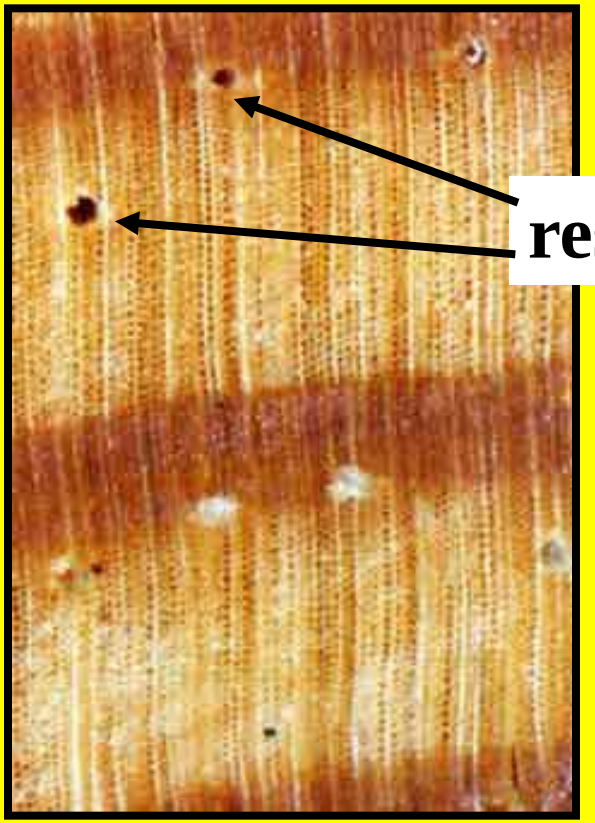
yellow-poplar

cross section, 20X

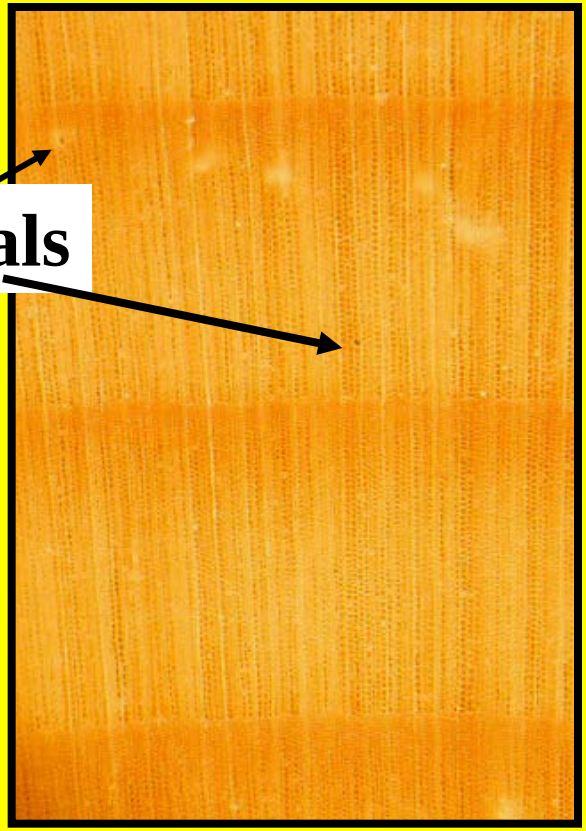
Pine and **spruce** are softwoods with resin canals,

but the canals differ in their size (diameter).

Pine has large, numerous resin canals, while spruce has small, sparse resin canals.



resin canals



southern yellow pine

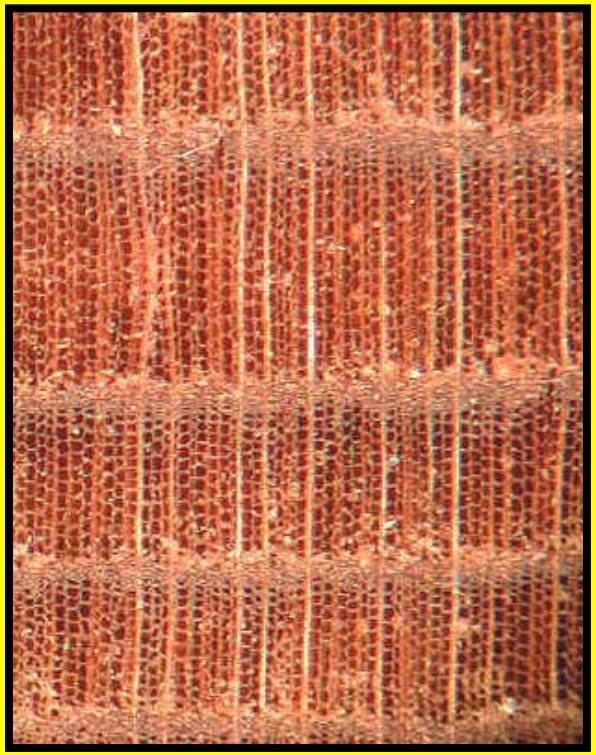
cross section, 20X

spruce

cross section, 20X

Redwood is a softwood with no resin canals.

It has very large cells (tracheids) for a softwood and lives up to its name – it's red (or least dark brown).



redwood

cross section, 20X

Final thoughts:

You are also encouraged to develop your own sets of observations of the characteristics of the woods. Don't forget that physical characteristics such as weight per unit volume (density), relative hardness, color, odor, and even taste may be important clues useful in wood identification.

We hope you have fun as you step through this process and observe wood's unique cell features.

Good Luck in your wood id endeavors. It just takes practice.

A number of books are available on the topic of wood identification. A couple of recommend references are:

Core, H.A., W.A. Cote, and A.C. Day. 1979. Wood Structure and Identification, 2nd ed. Syracuse University Press, Syracuse, New York. Note: This book is out of print but occasionally available at used book stores and via the internet.

Flynn, J.H. and C.D. Holder (Eds.) 2001. A Guide to Useful Woods of the World. Forest Products Society, Madison, WI. http://www.forestprod.org/

Hoadley, R. B. 1990. Identifying Wood: Accurate Results with Simple Tools. Taunton Press, Newtown, CT. 

Milius, S. 2002. The Wood Detective. Science News. Vol. 162 No. 12 pages 184-185 www.sciencenews.org

Panshin, A.J. and C. deZeeuw. 1980. Textbook of Wood Technology, 4th ed. McGraw Hill Book Company, New York.

Also try the USDA Forest Products Lab, Center for Wood Anatomy at: http://www2.fpl.fs.fed.us/Menu.ssi

Additional information concerning careers in the general field of wood science and technology, including those in production management, process engineering, technical sales, and product development can be obtained by contacting:

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