Wood Comes From Trees

LECTURE NOTES

1. All ***fibres*** in a tree are long and skinny and most are oriented ***longitudinally***, or parallel with the trunk (up and down). Some fibres are oriented ***radially*** and radiate out from the centre of the tree perpendicular to the trunk. Groups of fibres which radiate out from the centre of the tree are called ***rays***.

2. Wood splits when it is broken apart along a plane parallel to the longitudinal ***grain***. It takes much less force to break wood apart parallel to the grain then it takes to break wood apart across the grain.

3. All growth in the tree is a result of cell division in the ***cambium layer***. The cambium layer is a very thin layer of cells located in-between the ***wood*** and the ***bark***.

4. As a tree grows new fibres are added to the outside surfaces of the wood and to the inside surfaces of the bark. As the woody core of the tree grows larger, the outside layers of bark stretches, peels, or splits to accommodate the increased size of the ***trunk***.

5. Growth in the wood occurs in layers added from the outside. In cross section these layers appear as ***annual rings***. Rings or layers corresponds to annual cycles in the tree's environment.

6. Each ring or layer is made up of ***earlywood*** and ***latewood***. Differences between early wood and latewood contributes to each tree's characteristic ***figure*** or grain pattern.

7. A tree's age, growth pattern and history can be seen by looking at it's rings. Wide rings show fast growth (good growing years). Narrow rings show slow growth (poor growing years).

8. The woody part of a tree is divided into inner wood or ***heart wood***, and outer wood or ***sap wood***.

9. The bark of a tree is divided into ***inner bark*** and ***outer bark***.

10. In order to grow a tree manufactures food for itself. It does this in the ***leaves*** by combining water and nutrients from the soil with ***carbon dioxide*** from the air. Sun acting on the green ***chlorophyll*** in the leaves energize the food production in a process called ***photosynthesis***. This process also produces ***oxygen*** which is given off by the tree as a by-product. Water drawn up from the soil is also given off by the leaves. This ***transpiration*** has a beneficial cooling effect.

11. In producing food, water and ***nutrients*** are carried up through the sap wood. Food produced in the leaves is brought down the tree through the inner bark and is distributed through the rays to feed the growing cells in the cambium.

12. Only wood from the main trunk of the tree is used for ***lumber***.

13. Trees fall in the division of the ***Plant Kingdom*** called ***spermatophytes*** (all seed plants). Two further divisions include the two main tree groups; ***gymnosperms*** (naked seeds) include all trees producing ***softwood*** lumber, and ***angiosperms*** (covered seeds) include all trees producing ***hardwood*** lumber.

14. All softwood trees (gymnosperms) have an ***excurrent*** form, are ***coniferous***, have ***needlelike*** or ***scalelike*** foliage, and are usually ***evergreen***. Wood from a softwood tree is usually, but not always, soft (low density).

15. All hardwood trees (angiosperms) have a ***dendritic*** form and are mostly ***deciduous*** (leaves drop in autumn). Wood from a hardwood tree is usually, but not always, hard (high density).

16. Many factors contribute to the figure and appearance of wood. These include;
    a. surface orientation or "***cut***" (***tangential, radial, transverse***).
    b. earlywood/latewood characteristics (***ring-porous, non porous*** etc.).
    c. grain direction (normal or deviant; e.g., straight, ***bird's-eye, ribbon stripe, burl, curly*** etc.).
    d. presence of ***knots***
    e. size of rays
    f. abnormalities in grain (***reaction wood, compression wood***).
    g. colour.
    h. presence of fungi (***spalting***).
    i. insect damage.

17. As sap wood becomes heartwood extractive substances form in the heartwood which gives the wood it's characteristic density, abrasive quality, colour, and resistance to decay. Some ***extractives*** formulated in wood are toxic or ***sensitizing*** and should be used with caution.

Water and Wood

1. A living tree is full of water.

2. When a tree dies or is cut down it will either ***rot***, if it stays in a wet environment (like a forest floor), or it will ***dry*** out.

3. When wood dries out it ***shrinks***.

4. When wood shrinks as it dries it does not shrink equally in all directions.

5. Wood which is drying shrinks most across its ***tangential face***, less across its ***radial face*** and almost not at all along its length. This uneven shrinkage causes the tree to ***crack*** as it dries.

6. To prevent cracking and to hasten drying trees are cut into thin ***boards*** or ***veneer*** prior to drying.

7. ***Air drying*** can take up to one year for every inch of thickness. For example, boards cut two inches thick will take two years to air dry.

8. ***Kiln drying*** can take as little as a few weeks. Kiln drying uses heat and moisture in a controlled environment to quickly and gradually bring the ***moisture content*** of wood down. Some strength, colour, and acoustical qualities of wood are lost through kiln drying.

9. When wood gets wet it ***expands***.

10. When wood expands it does not expand equally in all directions.

11. Wood will always change in dimension as it takes on, or gives off moisture in reaction to changes in ***relative humidity***.

12. Applying a ***finish*** to wood will retard this dimensional movement but will not stop it.

13. Wood from different tree species (e.g., oak, pine, walnut) expand and shrink different amounts in response to changes in moisture content.