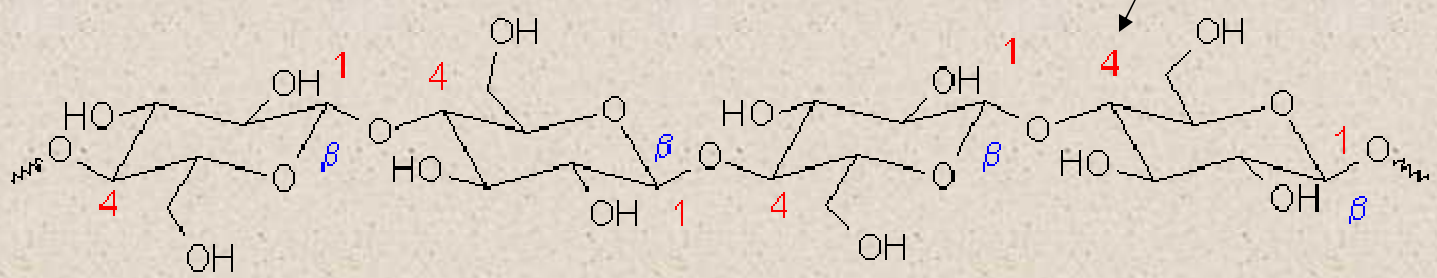
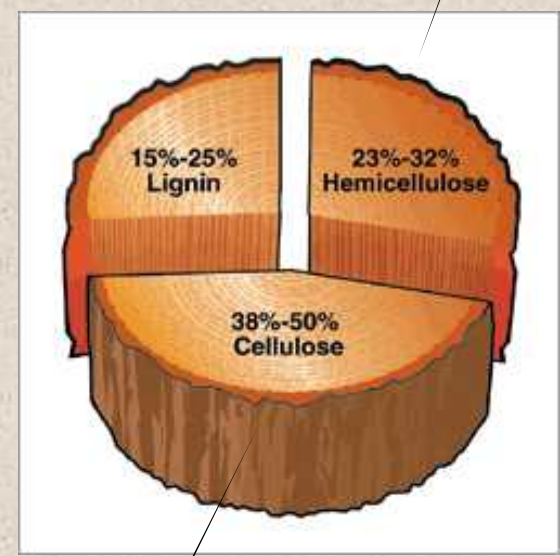
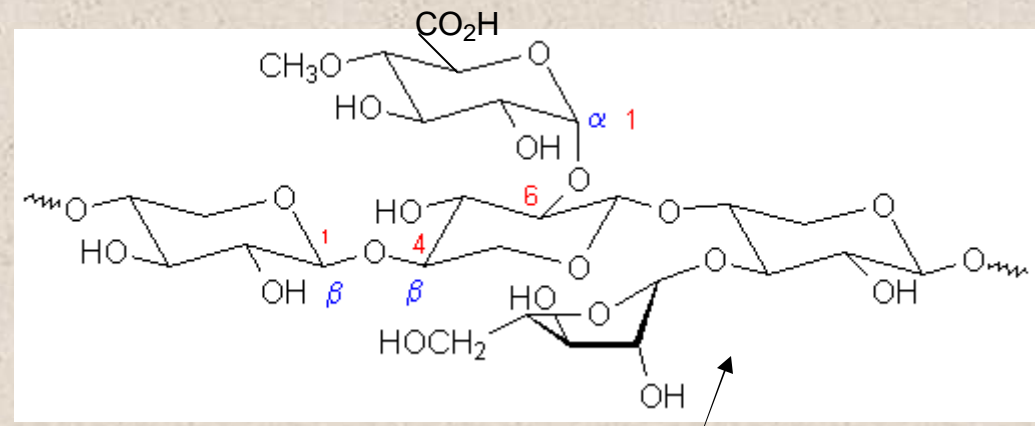
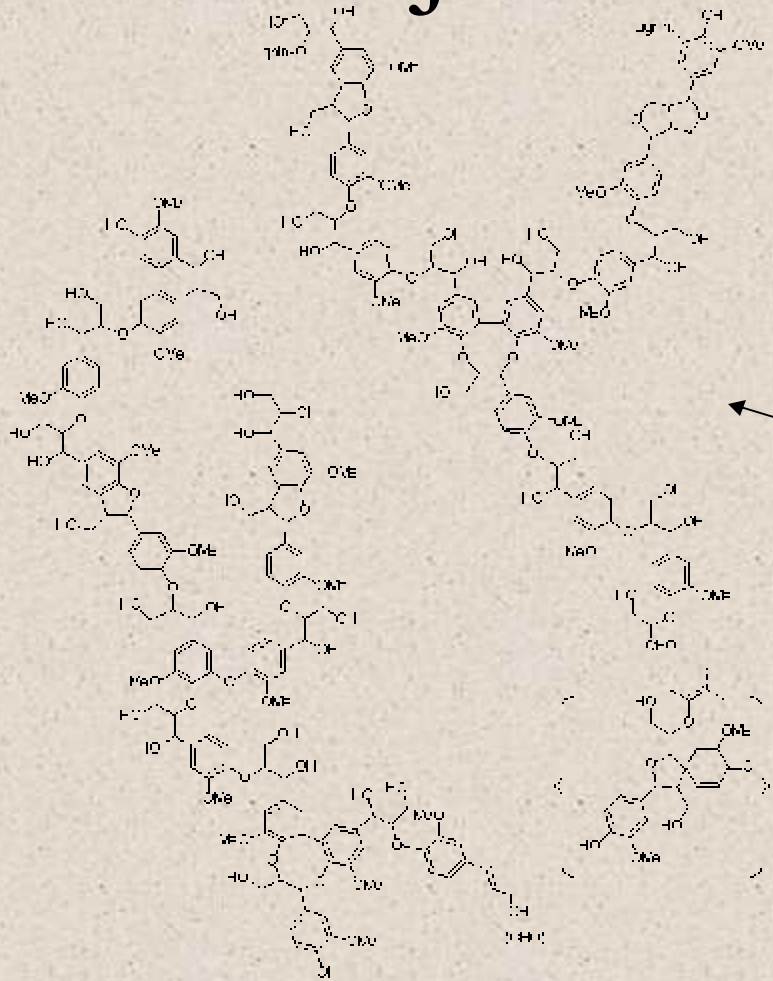


Extractive Components of Wood

Barbara Cole
University of Maine

Major Components of Wood



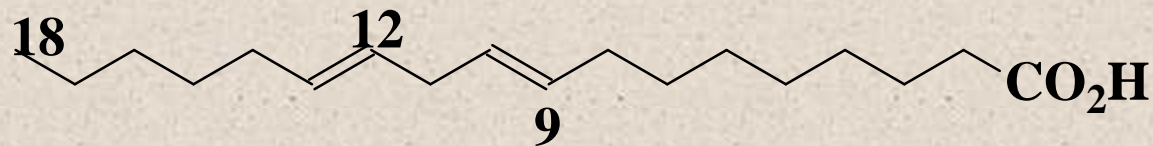
Wood Extractives

- Non-cell wall components
- Can be removed using solvents,
e.g. pet. ether, acetone, ethanol, water
- Relatively small molecules ($< C_{40}$)
- Usually comprise 1-5% of the wood
- Under genetic control \Rightarrow vary by species

Lipid Extractive Components

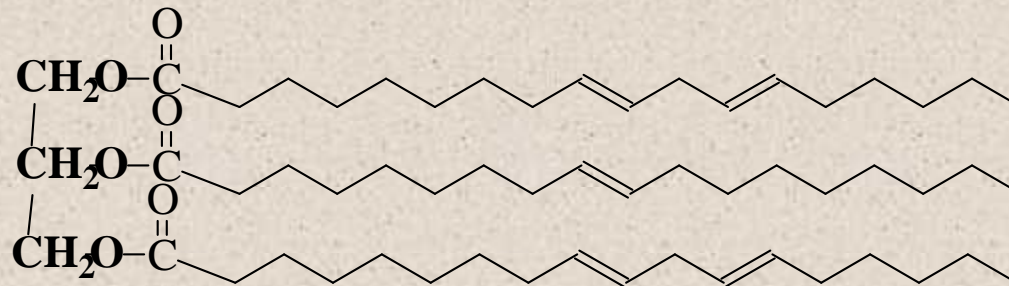
I. Aliphatics

Fatty acids: <0.1%



Linoleic Acid

Fats (fatty acid esters of glycerol): 0.3-0.4%



Fat: Triglyceride

Fatty alcohols (C₁₆-C₂₈):



Waxes (esters of other alcohols):



Alcohol

Fatty acid

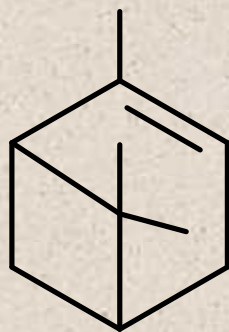
Suberin (polyester):



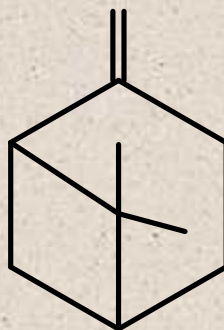
Lipid Extractive Components

II. Terpenoids: primarily in softwood species

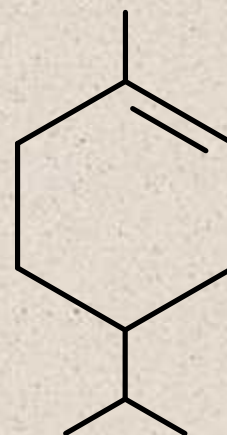
Monoterpenes (C₁₀)



α -Pinene



β -Pinene



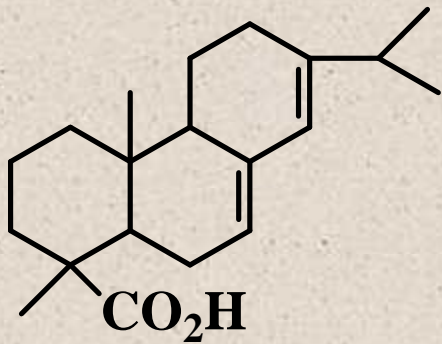
Limonene

Uses: Turpentine, flavor and fragrance chemicals

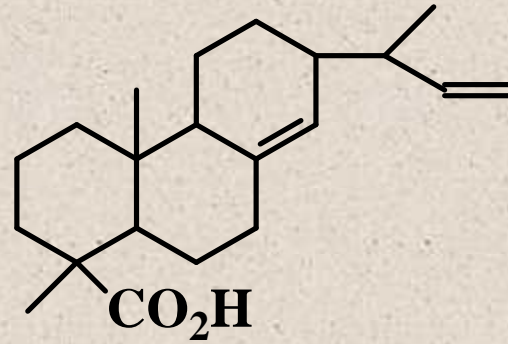
Lipid Extractive Components

II. Terpenoids: primarily in softwood species

Diterpenes (C₂₀) (0.2-0.8% of wood)



Abietic Acid



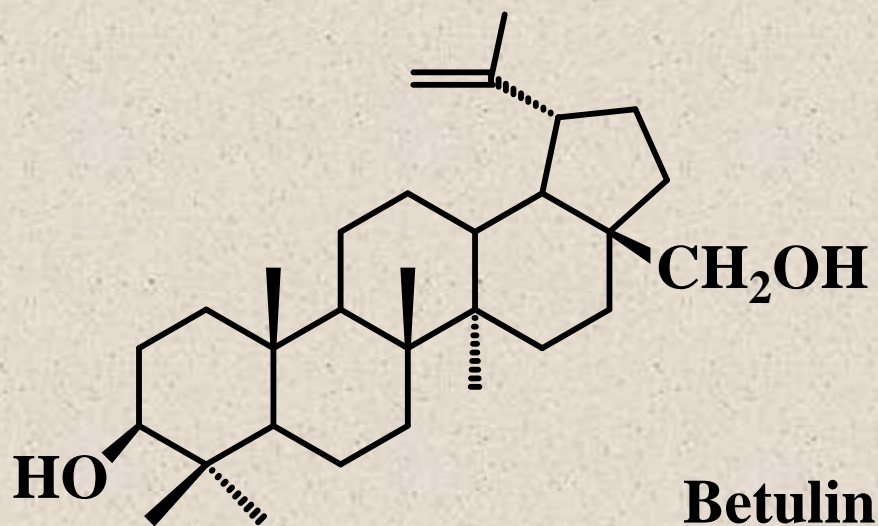
Pimaric Acid

Uses: Rosin, sizing agents

Lipid Extractive Components

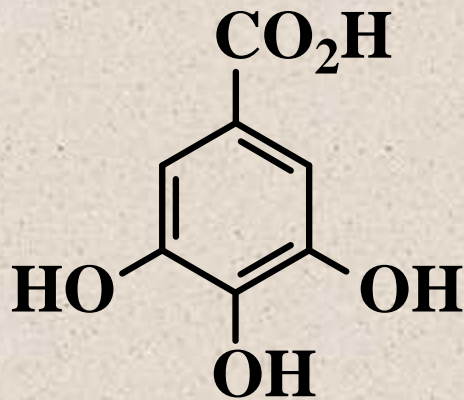
II. Terpenoids:

Triterpenes (C_{30}) (5-30% in birch bark)

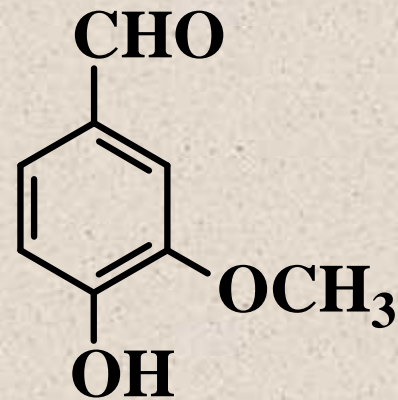


Phenolic Extractive Components

I. Simple Phenolics



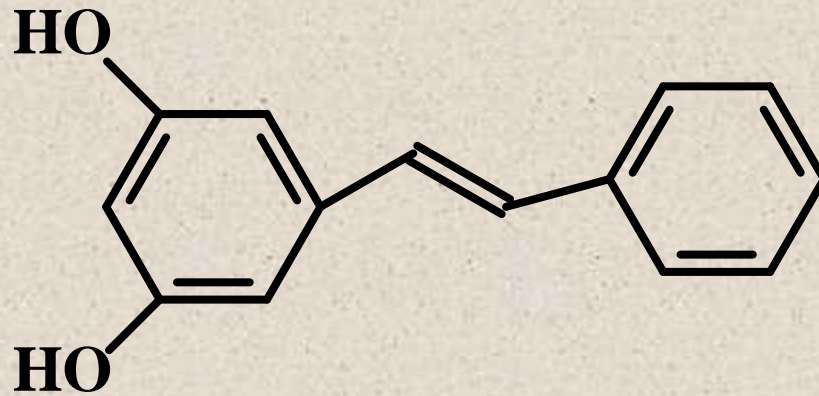
Gallic acid



Vanillin

Phenolic Extractive Components

II. Stilbenes

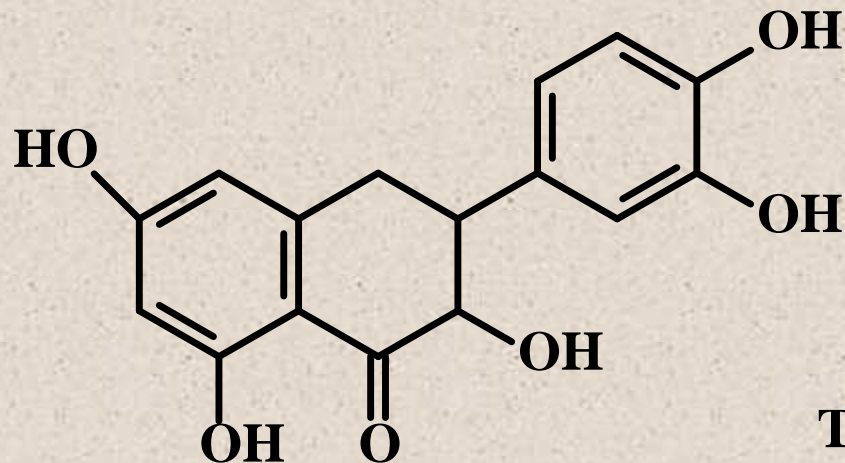


Pinosylvin

Stilbenes are generally very toxic!
Primarily in the heartwood of conifers.

Phenolic Extractive Components

III. Flavonoids

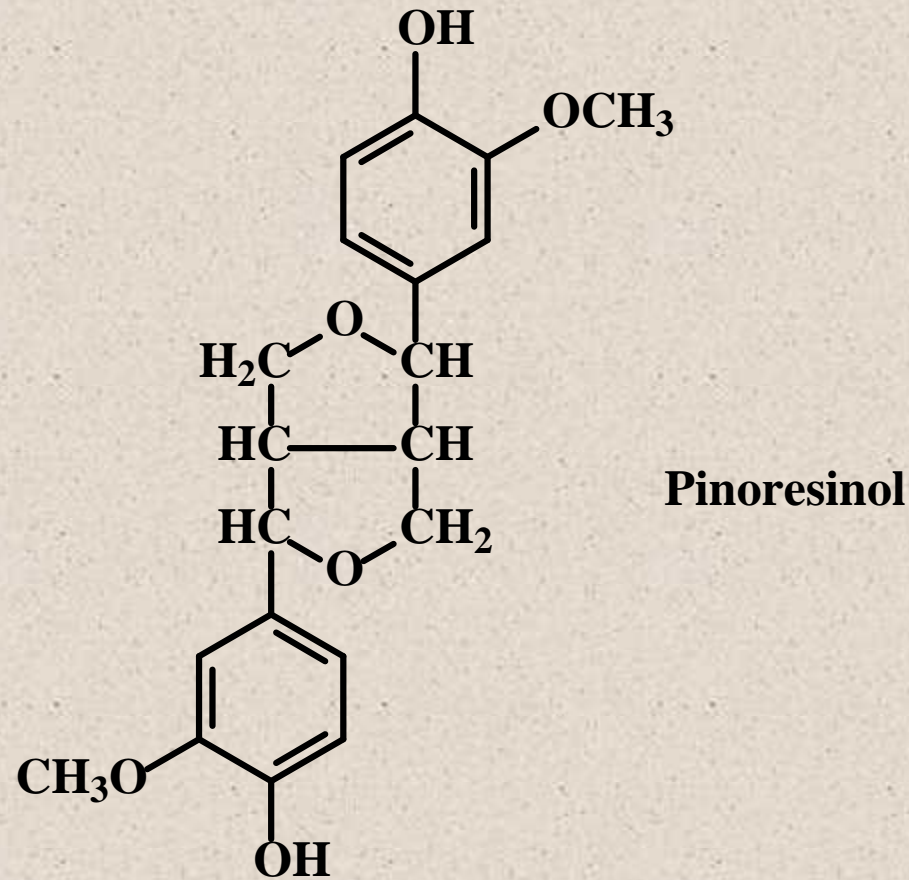


Taxifolin

- **Flavonoids are the most abundant phenolics.**
- **Coloration in foliage and flowers, astringent taste in unripe fruits.**
- **Condensed tannins: tanning agents, adhesives**

Phenolic Extractive Components

IV. Lignans



Generally non-toxic and are very good antioxidants.

Other Extractive Components

I. Alkanes

II. Proteins

III. Monosaccharides and derivatives

Summary

- **Extractive components are “small” molecules that can be extracted with a solvent from wood, bark, or foliage.**
- **Generally, extractives are present in small amounts.**
- **Extractives vary tremendously within species, between species, and within trees.**
- **There are thousands of different extractives present in wood.**

Softwoods vs. Hardwoods

Softwoods:

- **Resin acids: 40-45% of extractives**
- **Fatty acids: 40-60%**
- **Monoterpenes (turpentine)**
- **Phenolics**

Hardwoods:

- **No resin acids or monoterpenes**
- **Fatty acids: 60-90%**
- **Phenolics**