What’s so great about oak?

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Got oak?

- Back of dime
- Connecticut quarter
- Wooden buttons
- Tanned Leather
- Mossy oak camo
- Cork
Grapes & Oaks have much in common

- Keystone species
- Inter-species crosses are common
- Widely distributed
- Non-specialized
- Northern Hemisphere natives
- Occupies many ecological niches
- Division between American and European caused by continental drift
- Prized by humans
- Historically significant
- Highly symbolic
- Integral to Western Civilization
Oak Facts

• Oak Genus with 600 species
• Acorns important food source
• Pollen distributed by wind – no bees
• Live hundreds of years
• 20 - 50 years old before produce acorns, depending on species
• Often grow over underground stream – attracts lightening

May 29th
Oak Apple Day
Defunct English Holiday

Between 1660 and 1859, May 29 was English Oak Apple Day.

The day commemorates Charles II hiding in an oak tree (after loosing the battle of Worcester) to escape the Roundheads in 1651.
Oaks in History

• Important component of wood culture in Northern Europe

• Worship Sites
  • Green Man (face of oak leaves) symbolizes rebirth, spring has sprung, etc.
  • Romans worshiped Jupiter in oak groves
  • Oracle oak of Dodona – where Zeus talked to Greeks

• Had magical properties as home to supernatural beings

• Meetings held under tree –
  • promises made under kept for a long time, like the tree
  • Thor / Jupiter would strike liar with thunderbolts
  • Early Christians burned down sacred oak groves
  • Later Christians declared remaining groves holy

• Barrel – container of choice for 2500 years
Prior to 1615 English glass makers melted glass over oak fires.
  • Glass melted poorly, inconsistently
  • Glass contained impurities and bubbles

To save the forests for shipbuilding, James I banned glassmakers from using wood fires
  • Glass flows better in furnace
  • Fewer impurities
  • Fewer bubbles
  • STRONGER GLASS
More than wood oak provides

Edible Mushrooms

- Chantrelle
- Black Trumpet
- Maitake (Sheephead)
- Shitake
- Chicken of the woods
- Morels
- Reishi
- Lions Mane
- Oyster

Home for animals
- furry, feathered, 6-legged

Epiphites
- Spanish Moss
- Bittersweet

Medicine
- Tannins - heal
- Oak Bark Tea
- Oak Leaf Bath
- Oak Moss Oil
- Reishi Mushroom

Ink & dyes
- Crushed wasp galls
- aka oak apples
Why Oak for Barrels?

- Oak has a tight grain
  - permitting a gradual extraction of wood flavors
  - minimizes wine loss through evaporation.

- It is resilient,
  - enabling staves to be bent without breaking
  - has a neutral wood smell.

- Oak is high in tannin,
  - important flavor component
  - Ages wine by gobbling up oxygen
Why Oak for Barrels?

• *Quercus petraea*, *robar*, and *alba* have the lowest in tannins among the 600 plus species of oak
• Heartwood is used for barrels, it has lower tannins than sapwood and bark.
• The more desirable *petraea* oak is tighter grained than any other species
• Tylose blocks flow of liquids

Bottom Line – we use oak because it
  • transfers little flavor
  • Limits evaporation
  • Absorbs undesirable chemicals
  • Smooths tannins
How to Grow Oak

• The spreading oak in the meadow,
• The broad oak of the California countryside

Are not for Barrels

• Oaks for barrels
• Grown in tight groves
• transport issue
• Reduces knot producing stems
• Cut from below first branch
Oak Forests

Map of the United States showing Oak Forests in Oregon (OR), Minnesota (MN), Pennsylvania (PA), and Virginia (VA).

Map of France showing regions L-LIMOUSIN, A-ALLIER, T-TRONÇAIS, N-NEVERS, B-BOURGOGNE, and V-VOSGES.

Map of Central Europe showing Moravian Forest, source of oak for Brno Cooperage in the Czech Republic.

Map indicating Hungary as a region with Budapest and its Hungarian oak sources.
Flavor Characteristics by Forest

The following flavor characteristics can at best be considered generalizations, and are the personal observations of the editor, Roberta Manell Montero.

• Limousin (li-moo-sahn) perfumes and colors the wine (yellow-gold) rapidly with little finesse. Limousin tends to be fairly aggressive and "simple" on the palate, but adds an attractive vanillin note.

• Nevers (ne-ver) contributes a spicy, almost cinnamon-like flavor, although it can initially seem aggressive in tannin if not toasted enough.

• Vosges (voej) offers a sweet, subtle vanillin aroma that complements a fruity character. Above all, it offers a softer texture on the palate.

• Allier (ah-leay) releases its perfume slowly with finesse, and seems to have a spicier oak component. It is well suited to red and white wines.

• Tronçais (tron-say) located in Allier, releases its perfumes even more slowly, and offers a high level of finesse on the palate. It is typically the tightest grained French oak, which explains its slower rate of extraction.

• Hungarian oak offers very similar flavors to French oak, but its most attractive characteristic is a soft, creamy mouth texture (especially early in the wine's development).

• Czech oak has a sweet, nutty flavor with moderate but complex tannins. Most interesting is a floral note, which has been described as similar to mimosa, a sweet flowering tree from southern France.

• Russian oak imparts a more intense flavor than French oak, but with a similar flavor profile, and is perhaps not as sweet on the palate.

• American white oak is more aromatic and obvious in its wood character. Sensory descriptors range from dill and coconut to smoky and sweet vanilla. Q. Alba does offer more weight and intensity on the palate, but its overt character sometimes clashes with more delicate wines.

• Oregon oak is quite different from American oak, and descriptors commonly used include toasty, resinous, caramel, coffee, spicy and herbal. It is slightly more phenolic than French oak.
Composition of Oak

• **Tannin** - Tannins are approximately 1% of American oak and 8% of French oak mass, they play a vital role in aging. Hydrolysable, heat sensitive tannins stored in the tree’s radial rays, are controlled by seasoning regimes, bending techniques, toasting times, and toasting temperatures.

• **Lignin** -- **Vanillin** - A family of compounds, notably vanillin, is released during oak lignin breakdown. Slowly, nature’s elements including precipitation, ultraviolet rays, and fungi, break down lignin. Toasting accelerates the degradation.

• **Cellulose** - cellulose is nearly 50% of white oak, but plays only a small part in aging wine. It is important because it holds the wood together.

• **Hemicellulose** -- **Wood Sugars/Body** - Air seasoning initiates the polymer’s breakdown into simple sugars. As oak climbs through 300 F during toasting, more simple sugars form. Caramelized sugars and sweet-associated aromas then develop. Toasty characters develop as the oak passes 420 F.
<table>
<thead>
<tr>
<th>Common name</th>
<th>%cellulose</th>
<th>%hemicellulose</th>
<th>%lignin</th>
<th>%extractives</th>
<th>%ASH</th>
<th>Common name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q. robur</td>
<td>38</td>
<td>29</td>
<td>25</td>
<td>4.4</td>
<td>0.3</td>
<td>European Oak</td>
</tr>
<tr>
<td>Q. petraea</td>
<td>22-50</td>
<td>17-30</td>
<td>17-30</td>
<td>2-10</td>
<td></td>
<td>Sessile Oak</td>
</tr>
<tr>
<td>Q. alba</td>
<td>44</td>
<td>24</td>
<td>24</td>
<td>5.4</td>
<td>1</td>
<td>Georgia Swamp</td>
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<tr>
<td>Q. alba</td>
<td>42</td>
<td>28</td>
<td>25</td>
<td>5.3</td>
<td>0.2</td>
<td>Tennessee Upland</td>
</tr>
<tr>
<td>Q. prinus</td>
<td>41</td>
<td>30</td>
<td>22</td>
<td>6.6</td>
<td>0.4</td>
<td>Chestnut Oak</td>
</tr>
<tr>
<td>Q. stellata</td>
<td>38</td>
<td>30</td>
<td>26</td>
<td>5.8</td>
<td>0.5</td>
<td>Post Oak</td>
</tr>
</tbody>
</table>
## Oak Flavor and Aroma Compounds

<table>
<thead>
<tr>
<th>Compound</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Eugenol &amp; Isoeugenol</td>
<td>Spice clove aroma. present in raw oak</td>
</tr>
<tr>
<td>Guaiacol and 4-methylguaiacol</td>
<td>Smoky aromas developed by heavy toasting. Guaiacol has more char and 4-methylguaiacol more spice.</td>
</tr>
<tr>
<td>Cis-oak lactone and trans-oak lactone</td>
<td>Main aroma of raw oak</td>
</tr>
<tr>
<td>Furfural and 5-Methylfurfural</td>
<td>Sweet, butterscotch, caramel flavors develop with toasting</td>
</tr>
<tr>
<td>Vanillin</td>
<td>Vanilla present in raw and toasted oak</td>
</tr>
</tbody>
</table>
Parts of a Barrel

French oak: Quercus petraea
American oak: Quercus alba
CT: Convection Toasted
Hoops (galvanized steel)
American barrel: 6; French barrel: 8
Barrel sizes (typical):
Bordeaux type: 225 L / 59.43 Gal.
Cognac type: 300 L / 79.25 Gal.

Toasting levels (typical):
- light
- medium
- medium +
- heavy

- Croze
- Chime
- Branding
- Clevis
- Quarter hoop
- French hoop
- Bilge hoop
- Stave joint
- Bilge (widest part of the barrel)
- Head
- Head or chime hoop
- Rivet
- Stave
- Bung hole
- Bung (white silicone)
Making Staves

Robar and Petraea are split into wedges then split to form staves.

Alba is quarter sawn then sawn again, boards. Perhaps 10’ in length.

Staves are then bent to shape.
## Barrel Sizes and Names

<table>
<thead>
<tr>
<th>Barrel type</th>
<th>Capacity (L)</th>
<th>Capacity (G)</th>
<th>Oak Source</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gorda</td>
<td>700</td>
<td>185</td>
<td>American</td>
<td>Whiskey</td>
</tr>
<tr>
<td>Madeira Drum</td>
<td>650</td>
<td>171</td>
<td>French</td>
<td>Madeira</td>
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<tr>
<td>Port Pipe</td>
<td>522</td>
<td>138</td>
<td>European</td>
<td>Port</td>
</tr>
<tr>
<td>Butt</td>
<td>573</td>
<td>151</td>
<td>European</td>
<td>Sherry</td>
</tr>
<tr>
<td>Sherry Puncheon</td>
<td>500</td>
<td>132</td>
<td>European</td>
<td>Sherry</td>
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<tr>
<td>Barrique</td>
<td>300</td>
<td>79</td>
<td>Varied</td>
<td>Varied</td>
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<tr>
<td>Hogshead</td>
<td>286</td>
<td>76</td>
<td>American</td>
<td>Varied</td>
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<tr>
<td>American Standard</td>
<td>200</td>
<td>53</td>
<td>American</td>
<td>Varied</td>
</tr>
<tr>
<td>Quarter Cask</td>
<td>50</td>
<td>13</td>
<td>Varied</td>
<td>Varied</td>
</tr>
<tr>
<td>Bordeaux</td>
<td>225</td>
<td>59</td>
<td>French</td>
<td>Wine</td>
</tr>
<tr>
<td>Burgundy</td>
<td>228</td>
<td>60</td>
<td>French</td>
<td>Wine</td>
</tr>
</tbody>
</table>
Toasting and Charring

Light – Dull, Sappy, Clove, Spicy
Medium – Clove, Coconut, Sawdust, Woody, Vanilla
Medium+ - Vanilla, Woody, Toffee
Heavy – Toasty, Toffee, Coffee, Smoke
Char – Coffee, Smoke, doused campfire
Barrel Toasting Process

A. Preheating over a fire
B. Soaking in hot water

Bending → Toasting → Finished barrel
Eng’s Content Study of Wine Reviews

• 15,000 wine review evaluated for content.
• 4.1% cited oak as a flavor component of wine
• Most in a negative context

Wine down Wednesday: An amateur’s guide to reviewing wine
By Rachel Eng (@racheleng) October 22nd, 2014
Other woods

- Historically, the type of wood the winemaker chose was a question of tradition, wine variety, economics and personal taste.

- **California Redwood** was commonly used for tanks.
  - Too rigid to allow bending of the staves
  - It imparts a yellow tint to the wine.

- **Chestnut**
  - Is too porous
  - Must be coated with paraffin to prevent evaporation.
Barrel Alternatives
**Barrel Insert Sticks**

Using the same quality of American and French Oak, we offer a practical alternative for the renovation of your barrels.

- A simplified Method of Infusion
- Available in American & French Oak
- Available in 4 Toast Levels:
  - Light - Medium - Medium Plus - Heavy
- Air-Seasoned 18-21 Months
- Inserts directly through the Bung hole
- Recommended Usage: One set of sticks per barrel. One-half set of sticks may also be used, depending on how much flavor you desire.
- Includes American and French
  - 13” long x 1-1/8” & 1-1/4” wide x 3/8” thick
  - 16 sets (32 pieces)

**Oak Wood Toasting Levels**

- light
- medium
- medium+
- heavy
Excellence in Wood for Your Wine

OCI ensures that every product has a toast level consistent in color and roasted evenly throughout. We also offer a variety of sizes and toast levels that is unmatched by anyone!

**Oak Chips**
- Available in American & French Oak
- Available in 4 Toast Levels: Light - Medium - Medium Plus - Heavy
- Available in 3 different sizes: Powder - Small - Large
- Air Seasoned 18-24 Months
- Package in 50 pound (22.7 Kg) Poly Bags
- Available in 15 or 20 pound Nylon Mesh Infusion Bags
- Available in 24 different types of chips to ensure your specific needs in the production of your wines

**Oak Cubes**
- Available in American & French Oak
- Available in 4 Toast Levels: Light - Medium - Medium Plus - Heavy
- Air Seasoned 18-24 Months
- American Oak - Approx. 1/2" x 1/2"
- French Oak - Approx. 3/8" x 3/8"

**Oak Segments**
- Available in American & French Oak
- Available in 4 Toast Levels: Light - Medium - Medium Plus - Heavy
- Air Seasoned 18-24 Months
- Package in 15 or 20 pound Nylon Infusion Bags
- American Oak 2" long x 3" wide x 3/8" thick
- French Oak 2" long x 3" wide x 5/16" thick

**Tank & Barrel Inserts**
- Available in American and French Oak
- Available in 4 Toast Levels: Light - Medium - Medium Plus - Heavy
- Air Seasoned 18-24 Months
- American Oak Approx. size 38" to 40" long x 2-1/2" to 3" x 3/8" wide
- French Oak Approx. size 38" to 40" long x 2-1/2" to 3" x 5/16" wide
- Inserts can be custom cut and drilled to accommodate your specific system, upon request

**Shavings**
- Toasted and Un-toasted
- Available in American & French Oak

Oak Chips Inc. (OCI)
www.oakchipsinc.com
Ingredients

- Neutral Grain Spirits @ 192°
- Distilled water
- Wood cubes
  - added 3/7/126
  - Removed 4/11/16

Served at 60°

Welcome to my lab!

Now let me perform an experiment on you
Wood Used

- American Oak
  - Medium Toast
  - Medium Toast Plus
  - Heavy Toast

- French Oak
  - Medium Toast
  - Medium Toast Plus
  - Heavy Toast

- Shagbark Hickory – raw
- Pecan – raw
- Mesquite -- Raw
Tasting Notes

• Control
• French Oak Medium Toast
• French Oak Medium + Toast
• French Oak Heavy Toast
• American Oak Medium Toast
• American Oak Medium + Toast
• American Oak Heavy Toast
• Pecan no toast
• Shagbark Hickory no toast
• Mesquite no toast

General Observations

• French is more in your fact
• French has higher color transfer
• Lower toast more color transfer
• Lower toast more wood
• Higher toast smoke

Consider what happens when cooking a steak. Place it in a cold pan and juices run out. Place it in a hot pan searing the side and juices are retained, the searing creates a barrier to flow from the wood.
Notes

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Notes

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