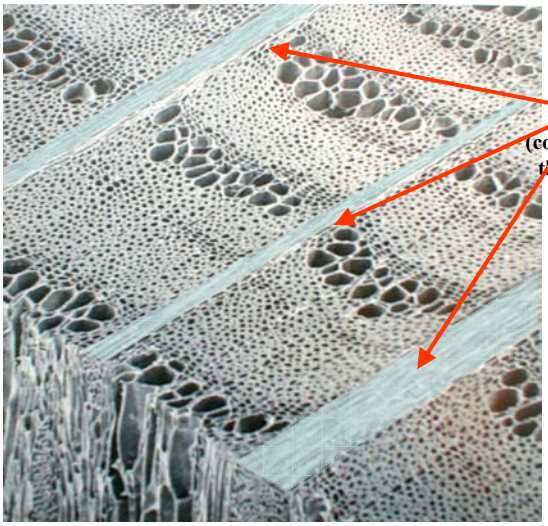
OAK SOLUTIONS GROUP

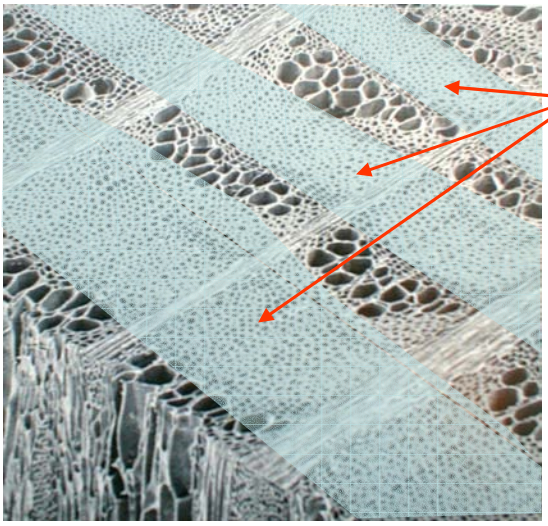


The Radial Rays

(correctly multiseriate parenchyma rays)
their large size is almost unique to oak

the tree's food storage area
they are packed with tannin

OAK SOLUTIONS GROUP

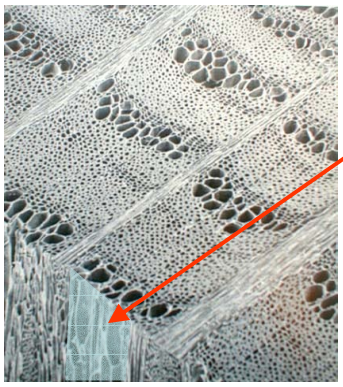


The latewood rings

(grow in summer, always larger than the earlywood rings)

high in fibres, a major source of lactones, tannins are harsher than in the earlywood because of limited penetration of the wood by fungi during seasoning

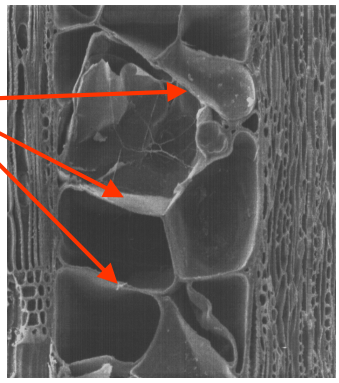
OAK SOLUTIONS GROUP



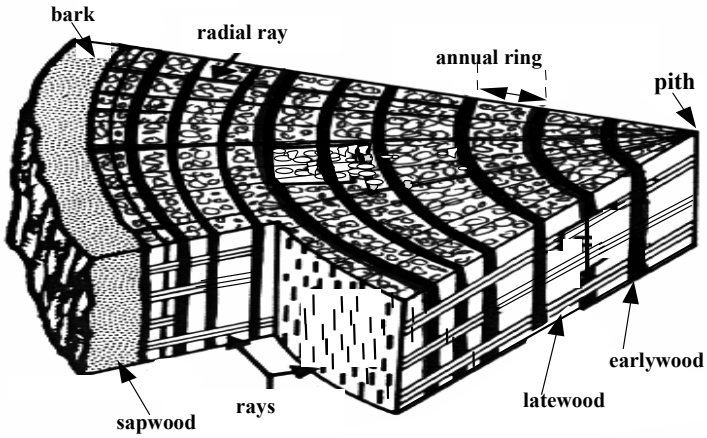
Tyloses

stop the stave from leaking – not relevant in alternatives!

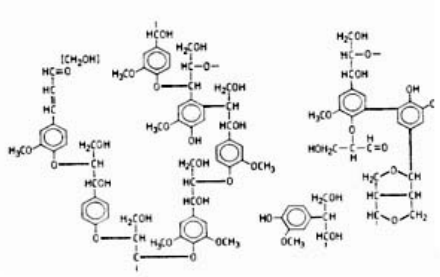
a major source of vanillin; easily toasted



OAK SOLUTIONS GROUP



OAK SOLUTIONS GROUP



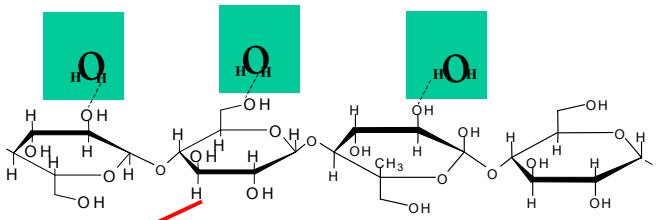
closer look at oak

OAK SOLUTIONS GROUP

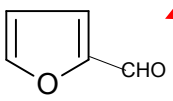
The building blocks of oak

1. Cellulose (about 45%)

transport of polar molecules



heat (toasting)



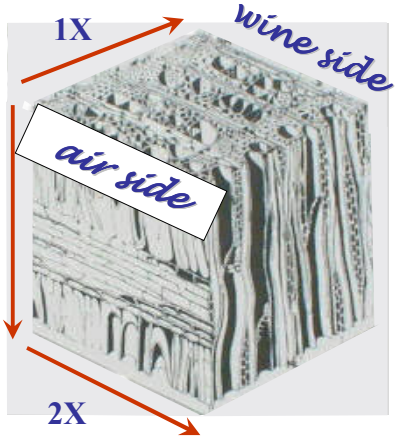
furfural

Oak is 'water-loving', naturally swelling & shrinking with the uptake and loss of water (and alcohol)……

OAK SOLUTIONS GROUP

Fast flavour transport is one of the strong points of *Alternatives*

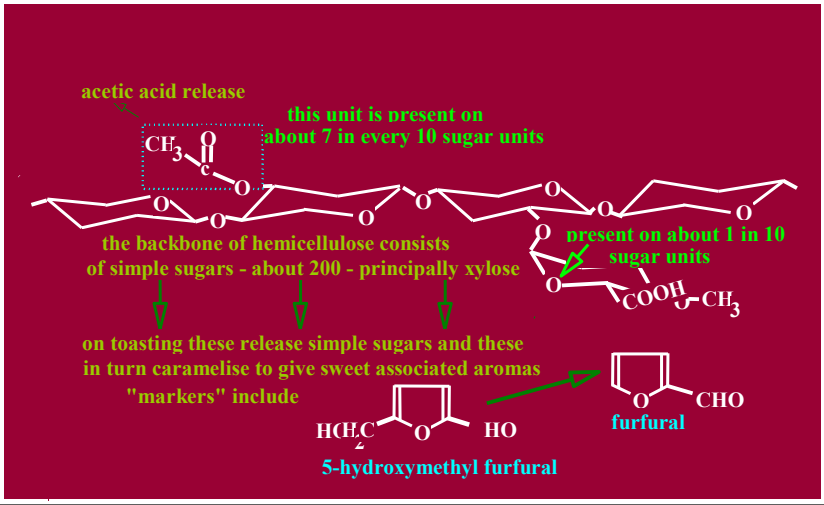
Ring porous oak



OAK SOLUTIONS GROUP

The building blocks of oak

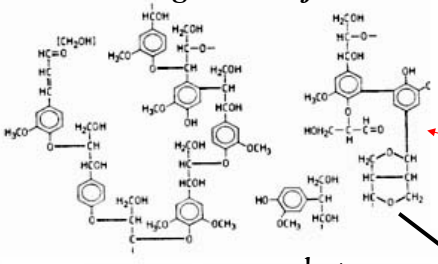
2. Hemicellulose (about 22%)



OAK SOLUTIONS GROUP

The building blocks of oak

3. Lignin (about 25%)

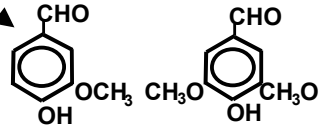


Oak contains many lignins,
Some more useful to us than others
And some that is wine soluble

G:S ratio in untreated oak lignin = 1:1

G:S ratio in toasted oak lignin = 1:2 – 1:4
depending mainly upon the toasting process

heat energy



Vanillin is the most desirable of all flavourings to emerge from Oak during maturation

Vanillin
from "Guaiacyl" lignin
(G)

Syringaldehyde
from "Syringyl" lignin
(S)

OAK SOLUTIONS GROUP

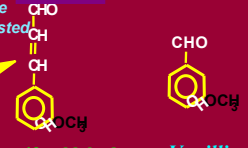
The building blocks of oak

3. Lignin (about 25%)

"relative" amounts of coniferaldehyde increase as barrel becomes exhausted

0.87 ppm

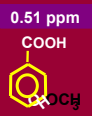
The Phenolic aldehydes



coniferaldehyde

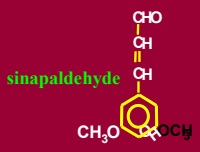
Vanillin

0.51 ppm



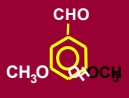
vanillic acid

vanillin is the only phenolic aldehyde with a low odour threshold - ca 0.02ppm and a "jnd" ca 0.5 ppm



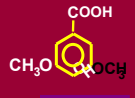
sinapaldehyde

syringaldehyde



0.26ppm

syringic acid

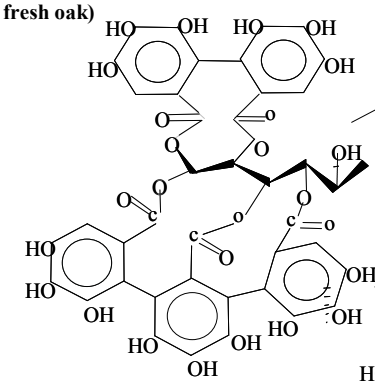


3.53 ppm

OAK SOLUTIONS GROUP

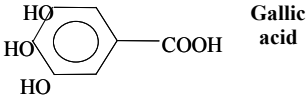
The building blocks of oak

Vescalagin / Castalagin (56% of total in fresh oak)

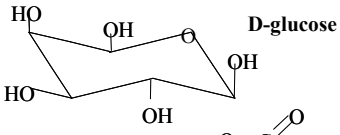


changes on seasoning and toasting

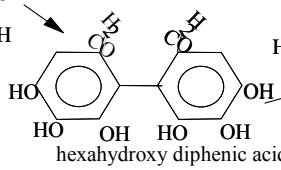
4. Tannins (0.8 – 10%



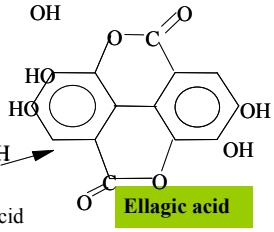
Gallic acid



D-glucose



hexahydroxy diphenic acid



Ellagic acid

OAK SOLUTIONS GROUP

The Influence of Oak Wood on Barrel Maturation

Cellulose → **no direct effect**

Hemicellulose → **wood sugars ("body")**; **caramelisation products**; **color**

Lignin → **increase in blended complexity**; **production of vanilla**; **promotion of oxidation products**

Oak Tannins → **production of astringency**; **removal of off-notes (e.g. rubbery)**

OAK SOLUTIONS GROUP

Our Standard Oak Analysis (not wine, that's a little different)

	FO MT	FO HT
Total tannin (FC method	< 8%	< 8%
Tannin & tannin breakdown		
Gallic Acid	1190.09	2755.52
Vescalagin	24564.65	53.25836
Castalagin	9404.88	7986.89
Ellagic acid	1855.42	2099.69
Hemicellulose caramelisation		
HMF	727.69	1662.19
5-Methyl furfural	28.21	15.7
Furfural	17.77	31.23
Lignin degradation compounds		
Vanillic acid	89.27	278.99
Syringic acid	531.55	1425.07
Vanillin	172.72	482.6
Syringaldehyde	249.27	1076.03
G:S	1.4	2.2
Coniferaldehyde	425.57	1327.16
Sinapaldehyde	600.81	3597.94

	FO MT	FO HT
'smoke phenols		
phenol	138.08	218.6
guaiacol	364.18	323.69
m/p-cresol	13.36	7.89
o-cresol	0.57	0.11
4-methyl guaiacol	7.38	29.68
4-ethyl phenol	22.71	5.82
4-ethyl guaiacol	7.33	9.2
Oak lactones		
trans lactone	87.712	35.615
cis lactone	184.815	198.611
Ratio	2.1	5.6

in milligrams per Kg at 12% MC

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moderate tannin breakdown

extensive tannin breakdown

light creamy toastiness

the best toastiness marker

"vanilla" & complexity

tells us about the amount of heat used to toast

OAK SOLUTIONS GROUP

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not smoky (too much heat)

the best smokiness marker

very undesirable smokiness

attractive spicy cloves

coconut, sun-tan lotion smell

high ratio suggests American oak