The Aroma of Wine

It’s Complicated!

Elizabeth Tomasino, PhD
Associate Professor of Enology
Food Science & Technology
Oregon Wine Research Institute

Oregon State University

Wine aroma

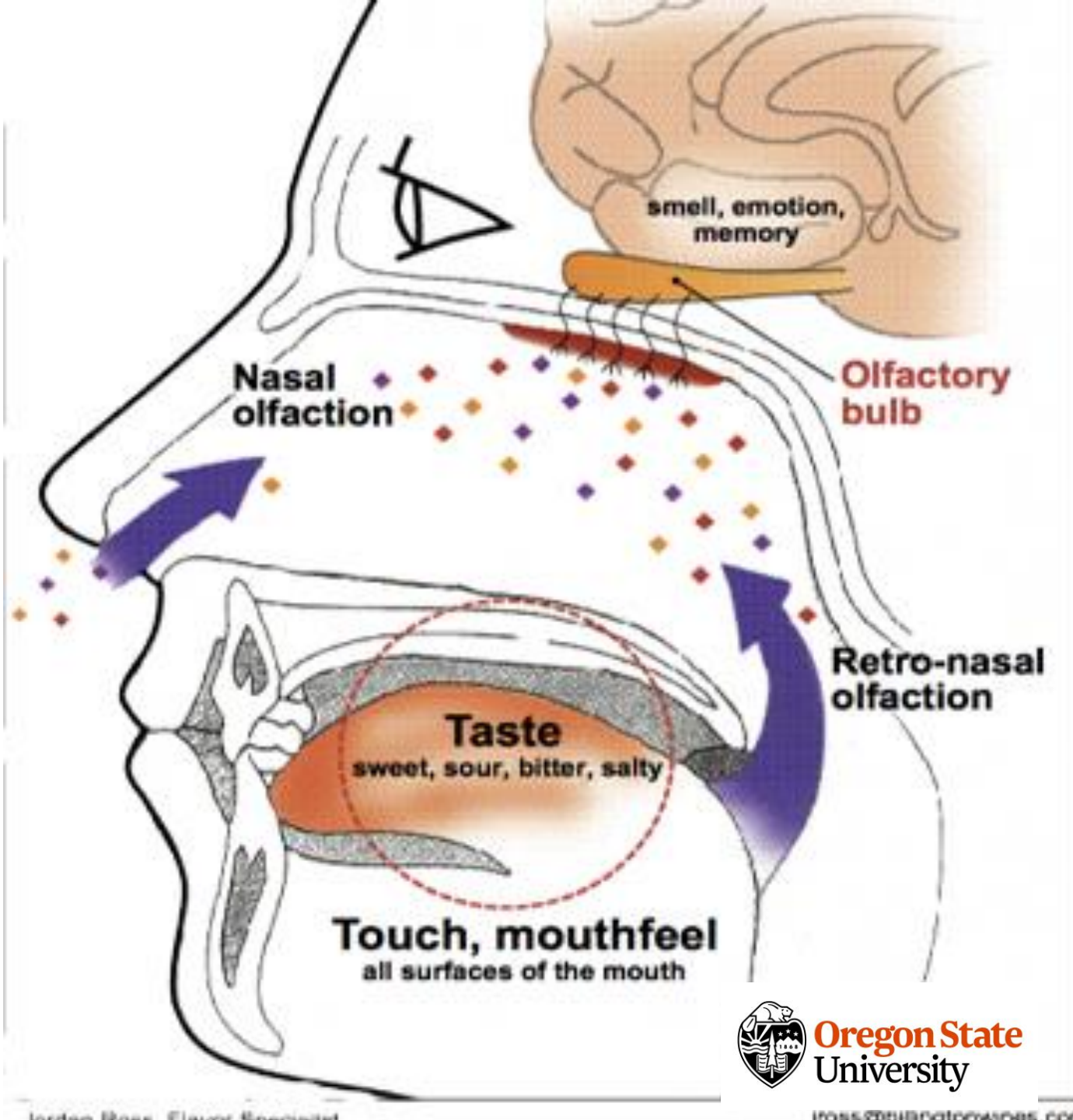
ortho-nasal olfaction

Wine flavor

retronasal olfaction + taste

Wine Mouthfeel

taste + touch + retronasal?



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DIRECT EFFECTS

&

INTERACTIONS

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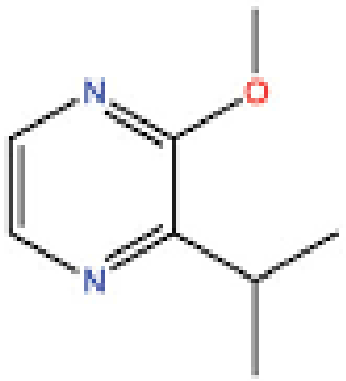
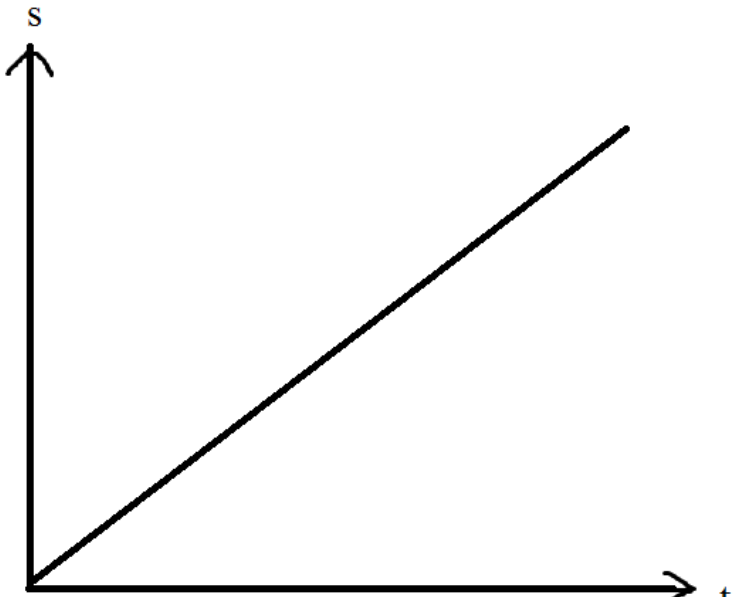
DIRECT EFFECTS

The more of a specific compound the more intense the smell associated with that compound.



3-isopropyl-2-methoxypyrazine
(IPMP)



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Methoxypyrazines

cis-rose oxide

Isoamyl acetate

Ethyl phenols

diacetyl

Volatile thiols

Methyl anthranilate

Acetic acid

Rc

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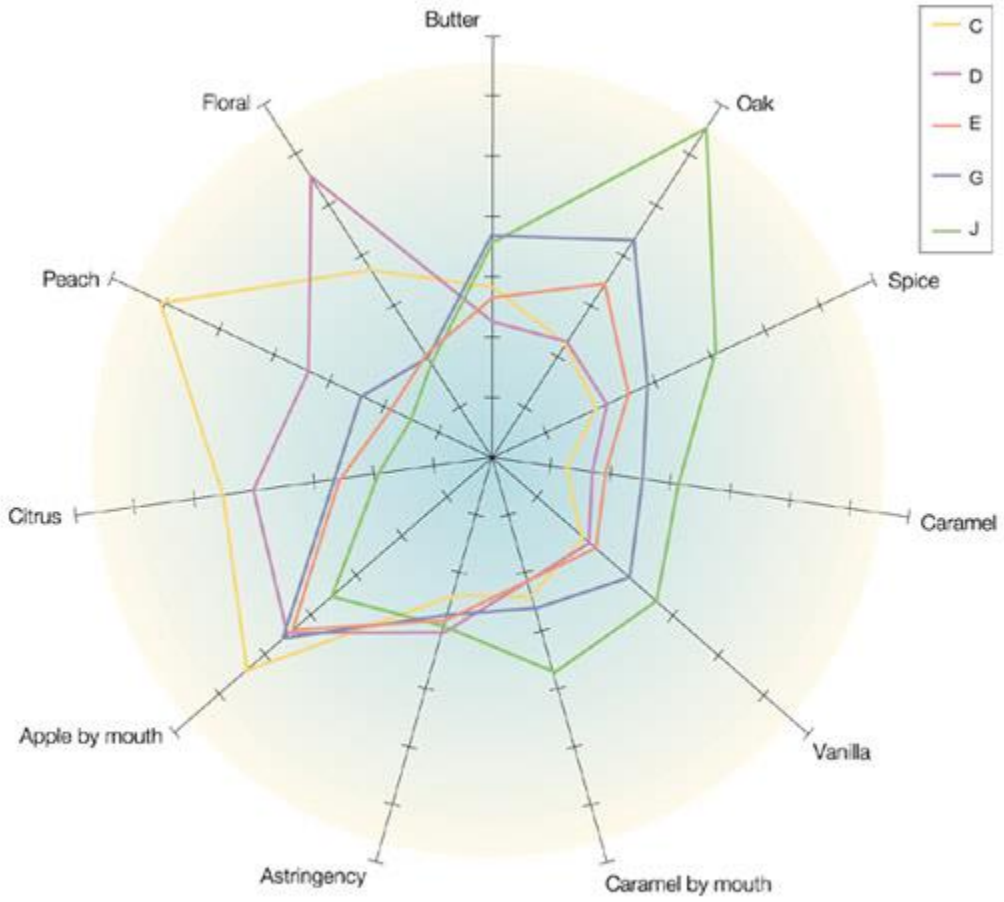
What about all the other aromas, flavors & mouthfeel?



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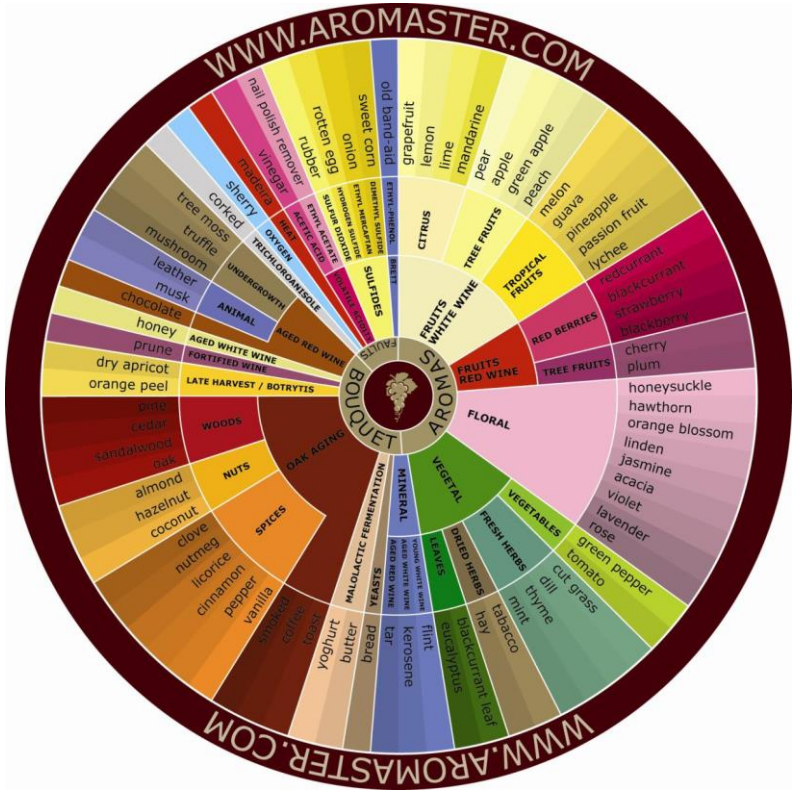

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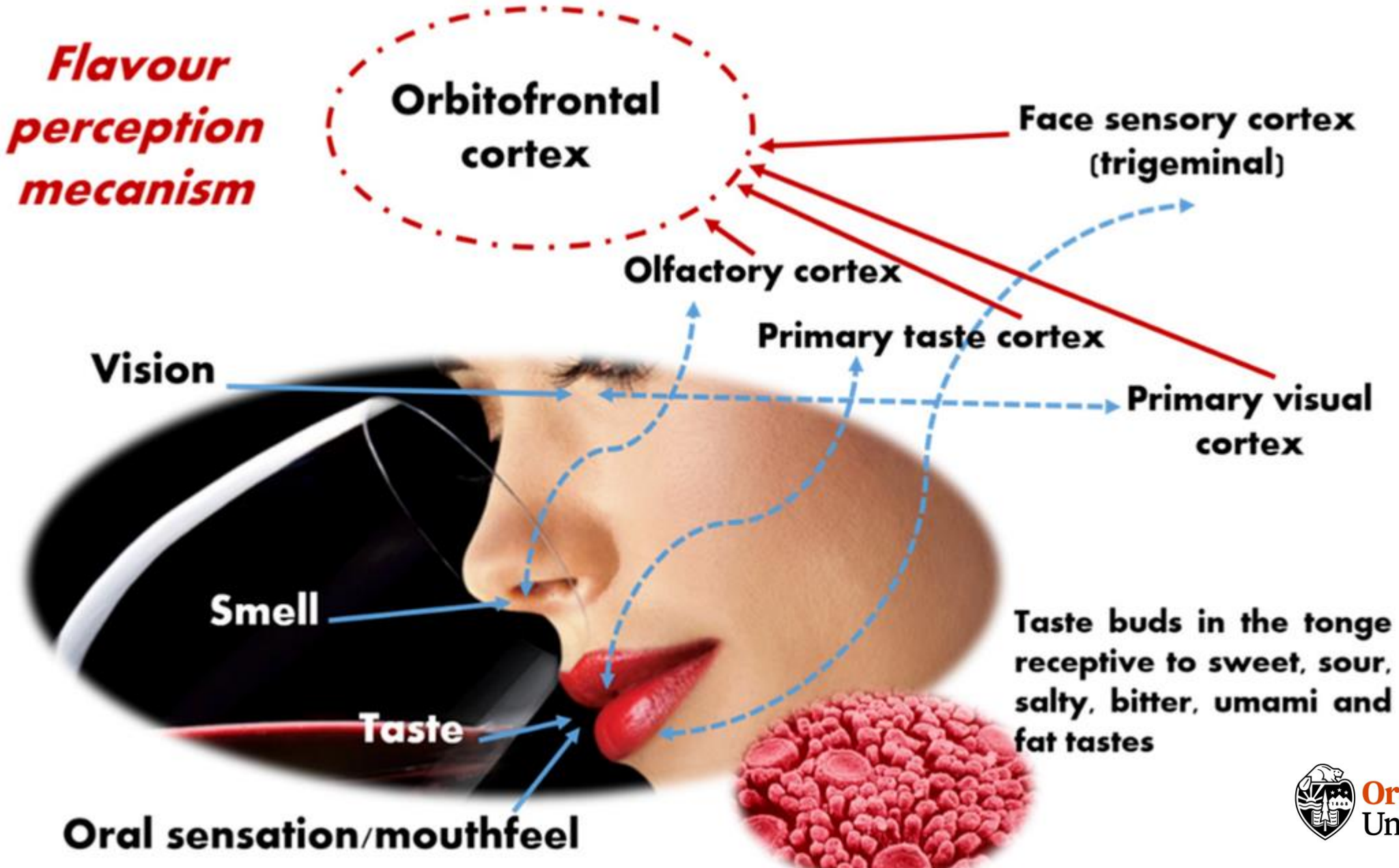
Interactions are likely to be the key to understand many different sensory perceptions!



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Aroma compounds
with
Aroma compounds

Aroma compounds
with
Taste/mouthfeel compounds

Taste/mouthfeel compounds
with
Taste/mouthfeel compounds

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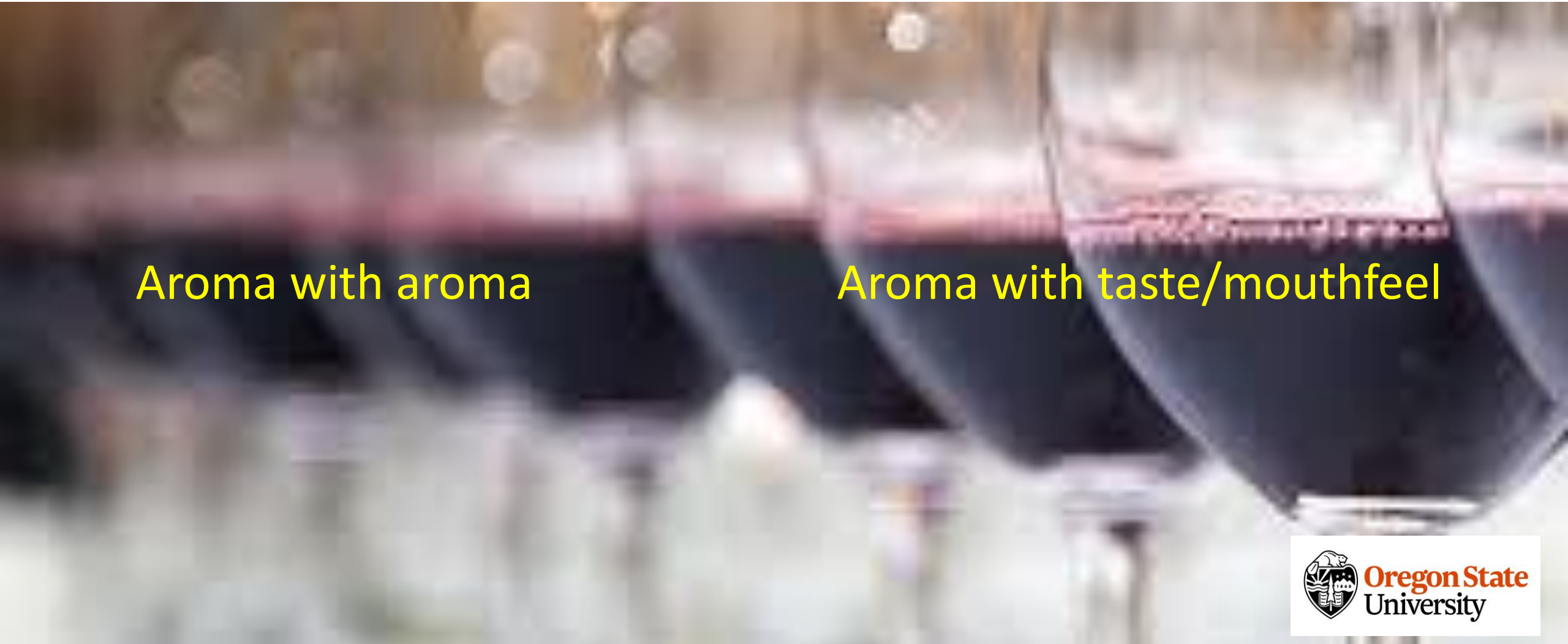
What is the interaction?



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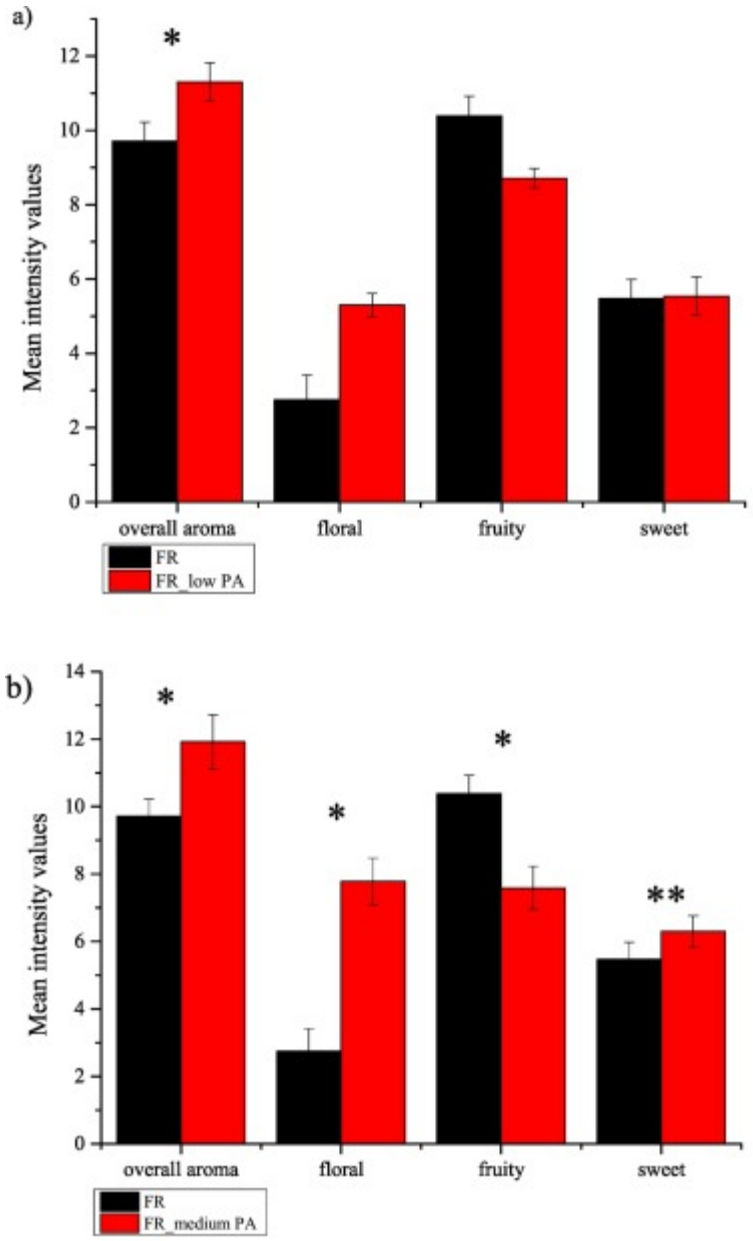
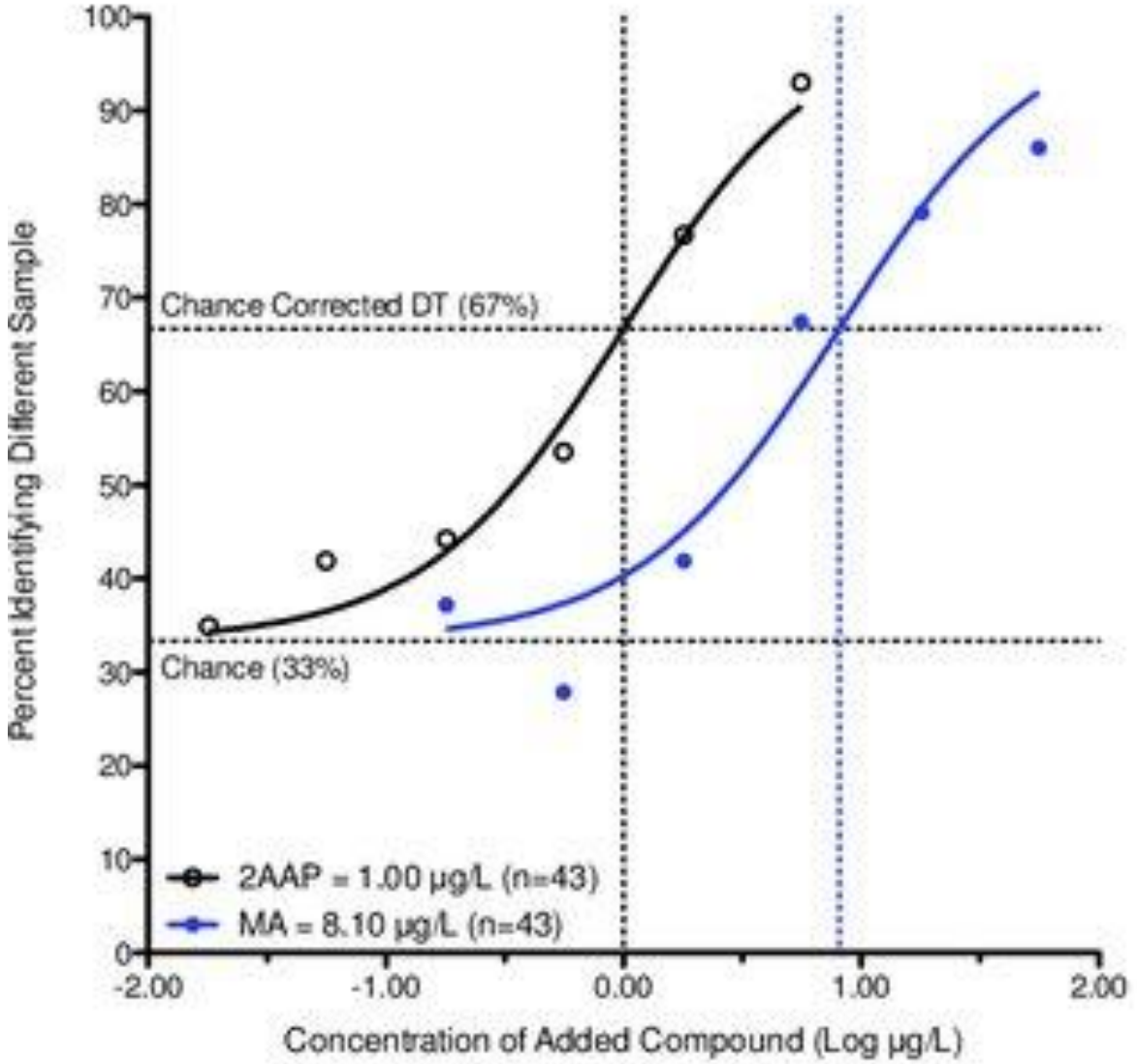
Matrix Interactions





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Masking

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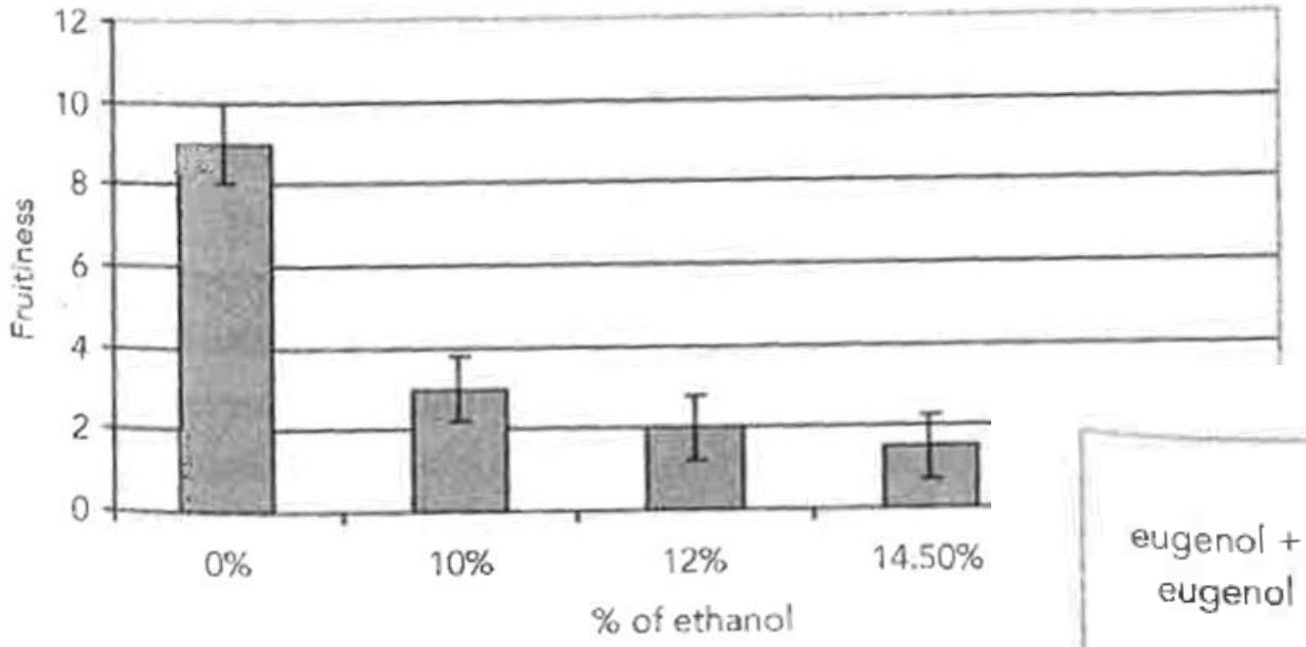

Figure 1. Effect of ethanol on the perceived fruitiness of a mixture of n
(adapted from Escudero et al. 2007)

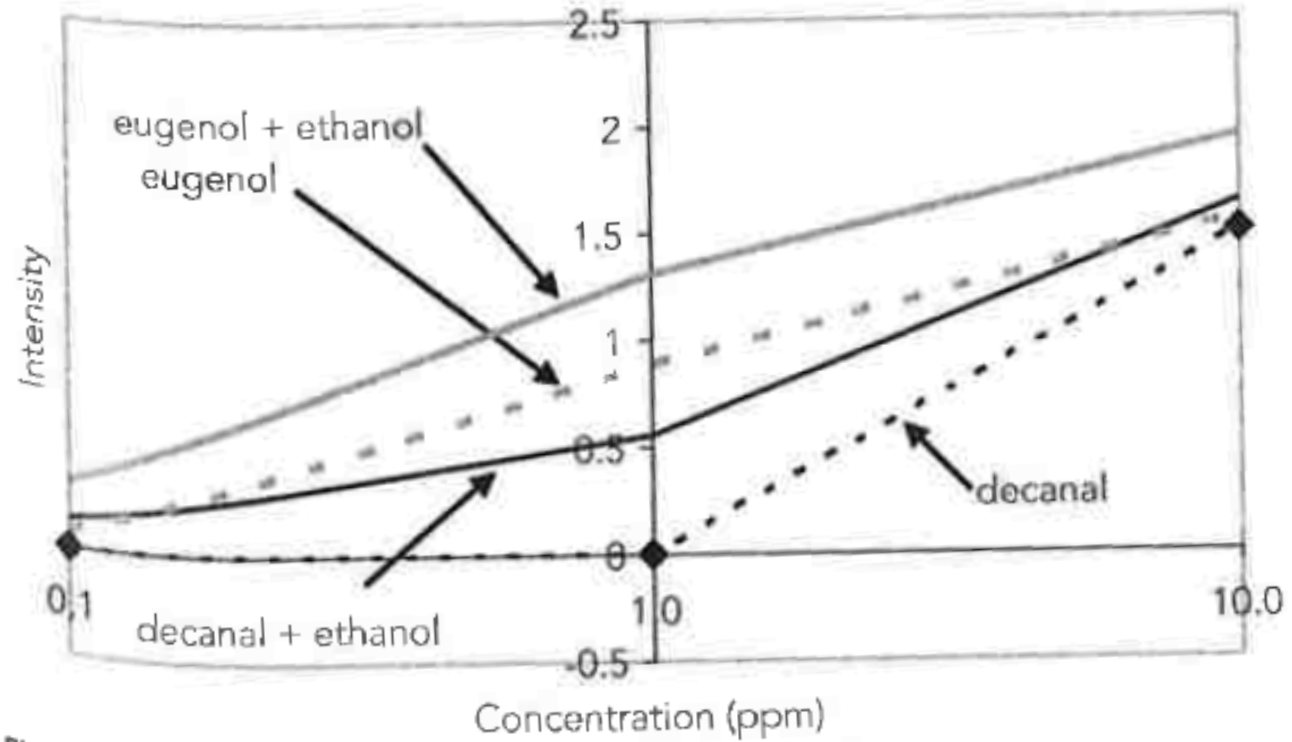

Figure 2. Effect of ethanol on the aroma intensity, measured by Gas
Olfactometry, of solutions containing different concentrations of deca
et al. 2003)

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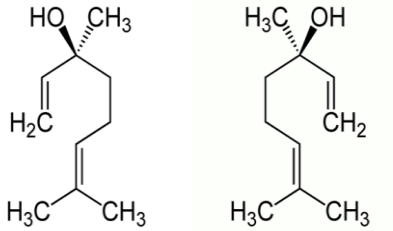
Chiral monoterpenes in Pinot gris

Some of aroma compounds are chiral (stereoisomers)

Stereoisomers can differ either in odor quality or in intensity (odor threshold)

Brenna et al. 2003)



(S)-(+)-Linalool

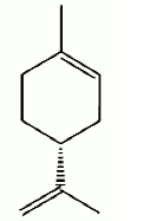
(R)-(−)-Linalool

3-(R)-(-)-Linalool: woody, lavender, 0.8ppb in air

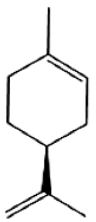
3-(S)-(+)-Linalool: sweet, petigrain, 7.4ppb in air

(R)-(+)-limonene; orange, 200ppb

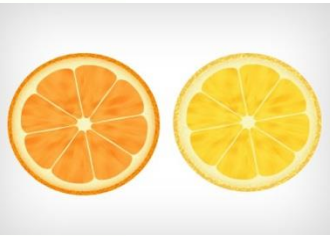
(S)-(-)-limonene: lemon note, 500ppb



(+)-(R)-Limonene



(S)-(-)-Limonene



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Tested sensory influence in three different “matrices”?

Matrix 1
Direct effect

Water, 11% EtOH, pH 3.5

Matrix 2
Aroma with
Taste/mouthfeel

Dearomatized Pinot gris

Matrix 3
Aroma with
Aroma

Wine used to create Matrix 2,
Contains trace levels of terpenes
And all other aroma

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Retro-nasal and taste/mouthfeel interaction

beverages

MDPI

Article

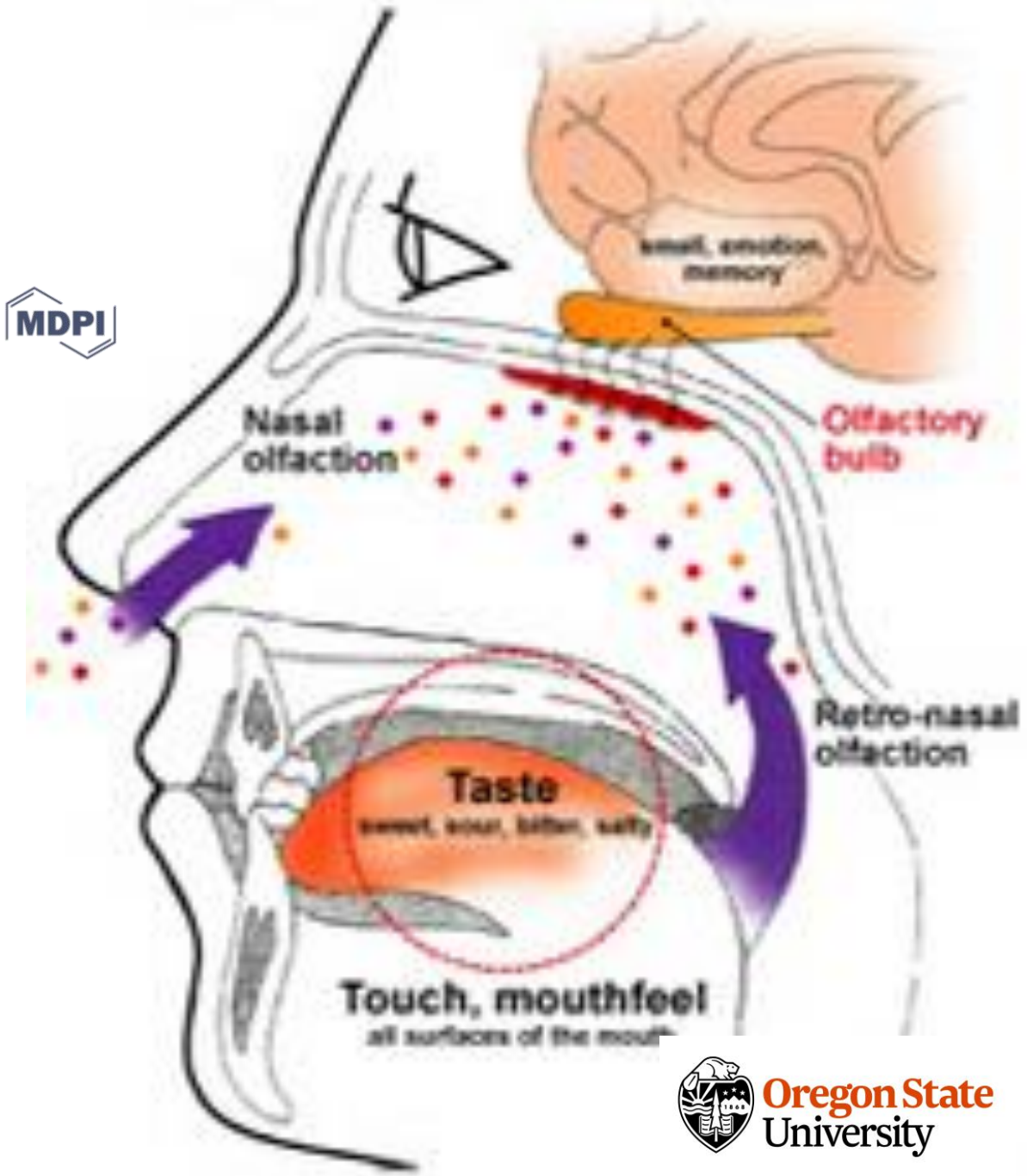
Exploring Retro-Nasal Aroma's Influence on Mouthfeel Perception of Chardonnay Wines

Anthony Sereni †, James Osborne and Elizabeth Tomasino *,†

Department of Food Science & Technology, Oregon State University, Corvallis, OR 97331, USA; Anthony.sereni@oregonstate.edu (A.S.); james.osborne@oregonstate.edu (J.O.)

* Correspondence: Elizabeth.tomasino@oregonstate.edu; Tel.: +1-541-737-4866

† These authors contributed equally to this work.



http://www.mdpi.com/2306-5710/2/1/7

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Same analysis done with and without noseclips

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Retro-nasal aroma was found to influence mouthfeel perception of Chardonnay wines.

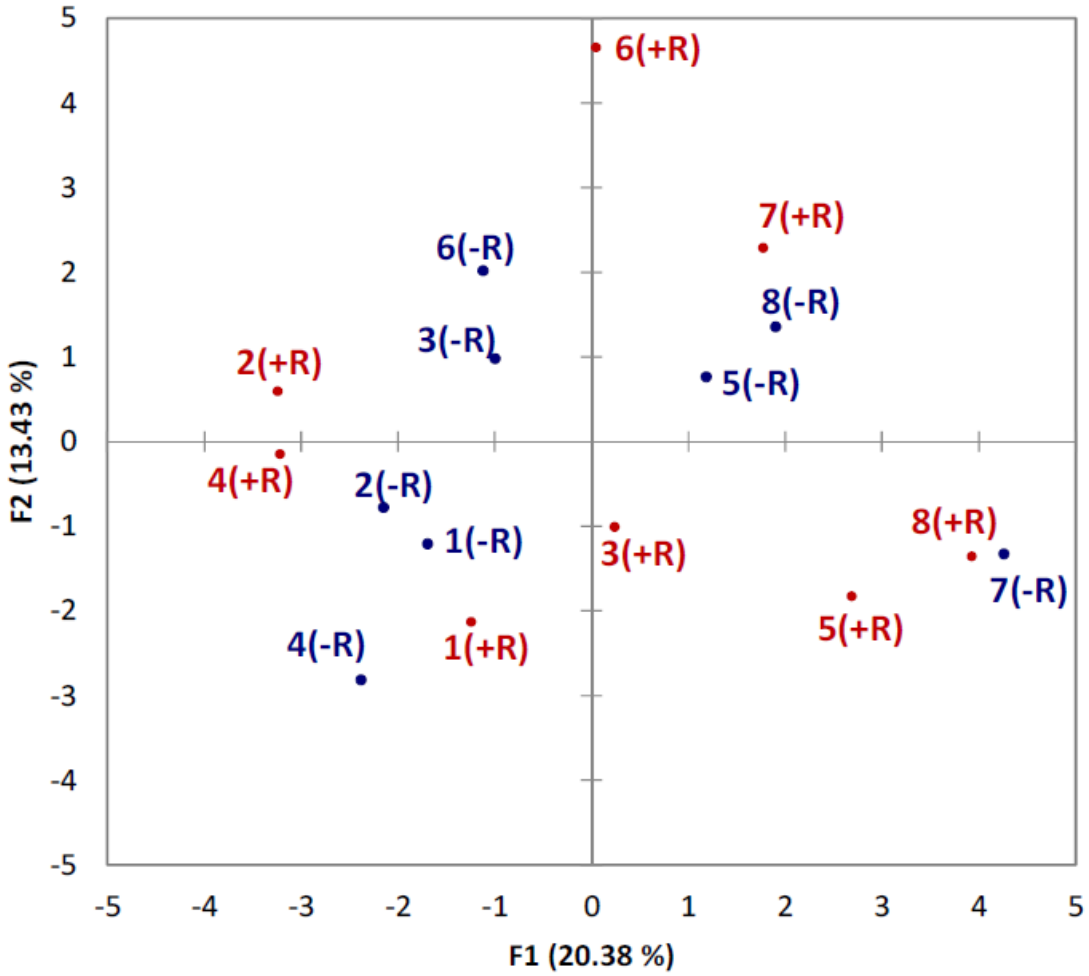

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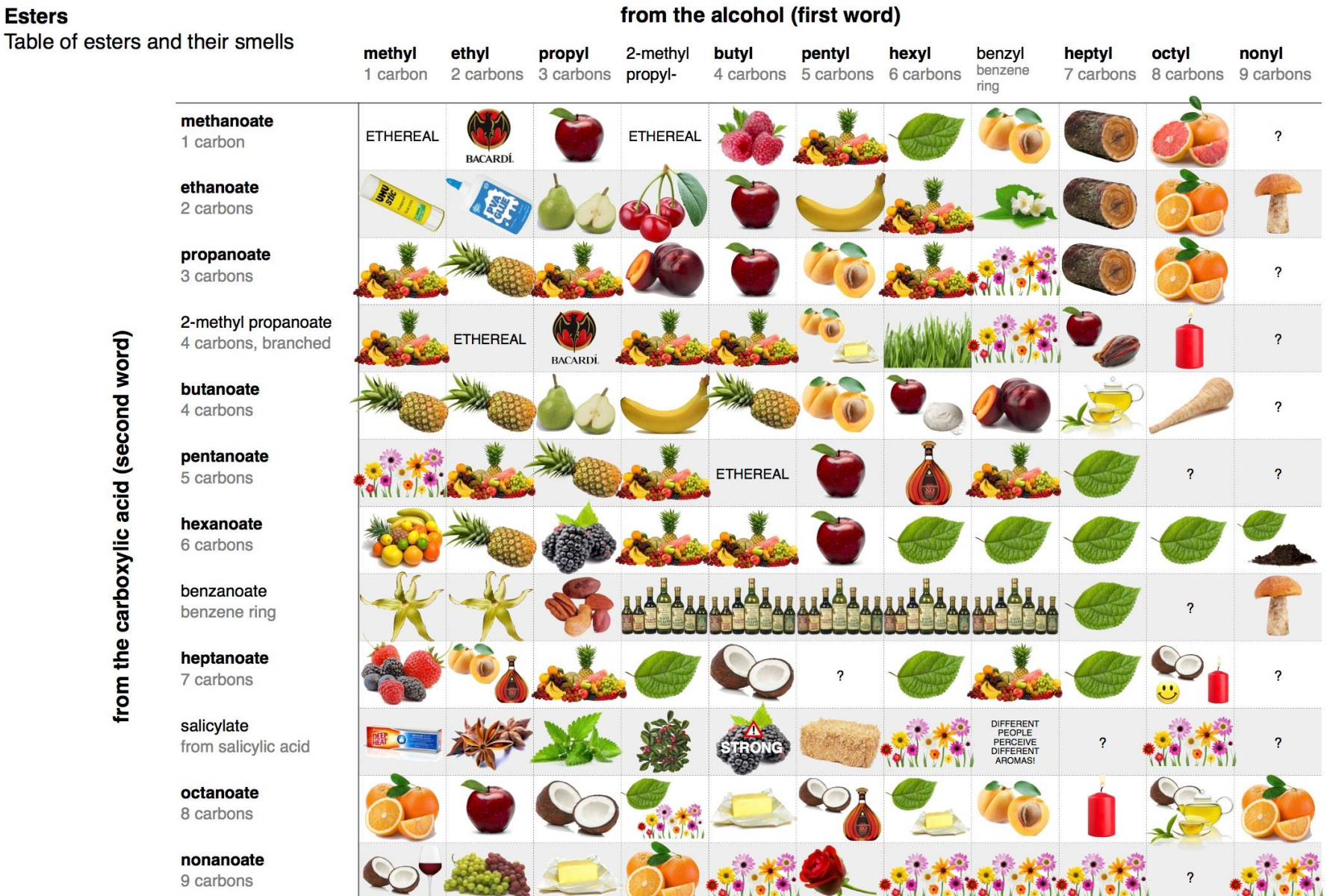
Figure 1. Multiple factor analysis of Napping® results of Chardonnay wines analyzed +R (**red**) and −R (**blue**).

Mouthfeel terms used when only retronasal aroma was present

Flabby Fresh Smooth Soft Prickly

High mouthfeel Salty Sting

Fruity aromas in Red and White Wine



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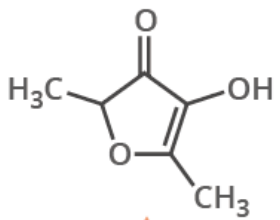
THE CHEMISTRY OF MANGOES

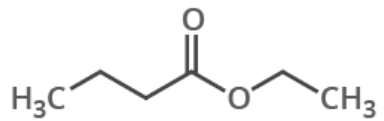
MANGO FLAVOUR & AROMA COMPOUNDS

A large number of compounds contribute to the flavour and the aroma of mangoes. The cultivar, maturity, and geographical origin of the mango all influence the compounds present.

270+ VOLATILE COMPOUNDS DETECTED IN MANGOES

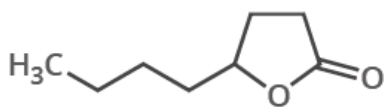


HDMF



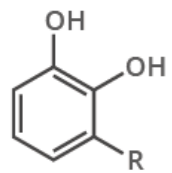
ETHYL BUTANOATE

γ-OCTALACTONE



Esters such as ethyl butanoate account for fruity notes in mango aroma. A major contributor to sweet notes is HDMF (4-hydroxy-2,5-dimethyl-3(2H)-furanone). Lactones such as γ-octalactone can lend a coconut-like aroma, while terpenes are also found in significant quantities and make minor contributions.

MANGOES & CONTACT DERMATITIS



Possible R groups

$(CH_2)_{14}CH_3$

$(CH_2)_7CH{=}CH(CH_2)_5CH_3$

$(CH_2)_7CH{=}CHCH_2CH{=}CH(CH_2)_2CH_3$

and others...

URUSHIOL

Mangoes belong to the same family of plants as poison ivy. Urushiol, a mix of similar organic compounds which are found in poison ivy and can cause a rash to develop on contact with the skin, can also be found in mango skin. This means that some people who are sensitive to urushiol get contact dermatitis when chopping or eating mangoes.

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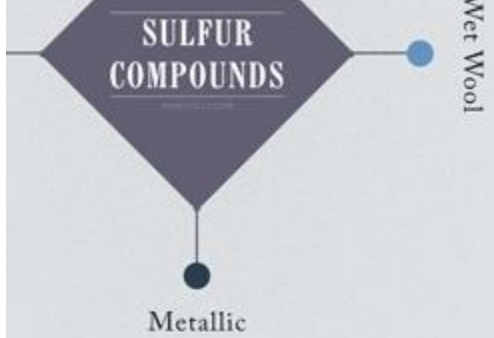

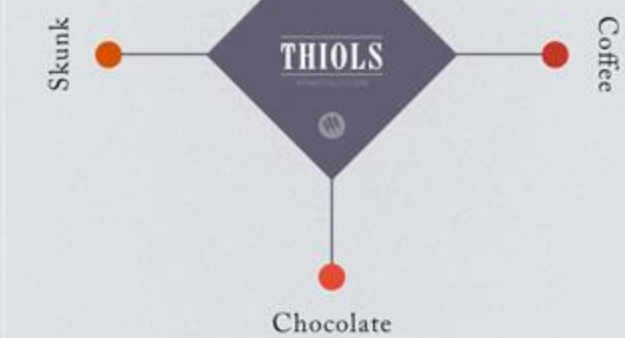

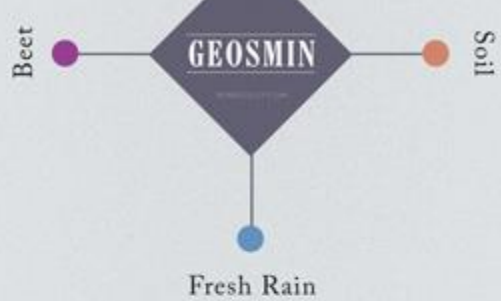

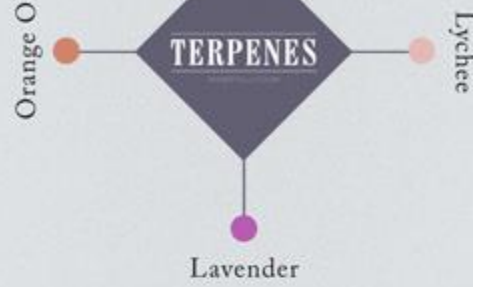

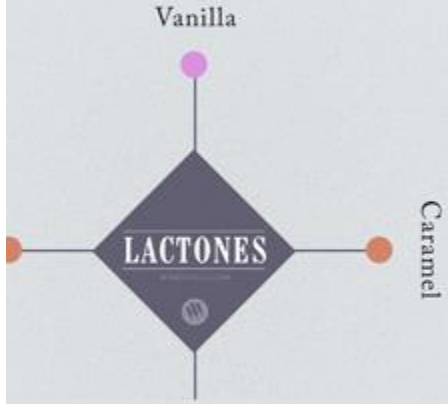

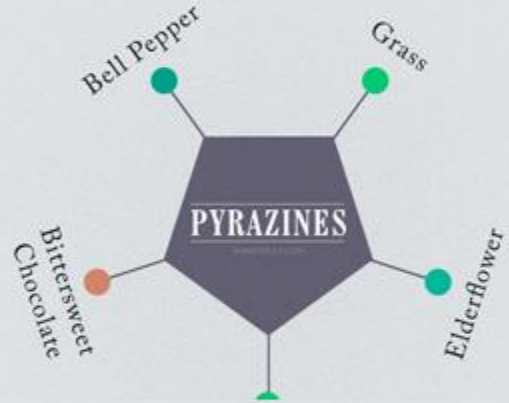

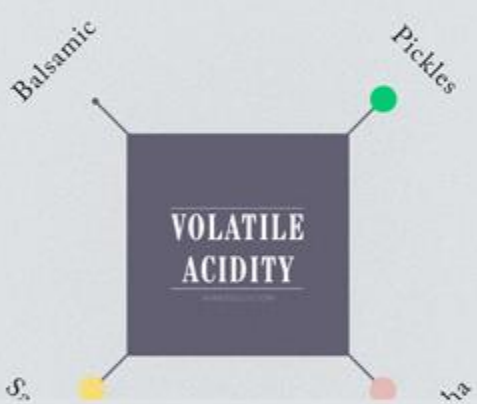

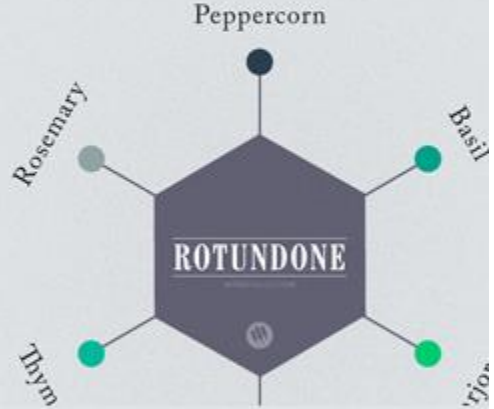

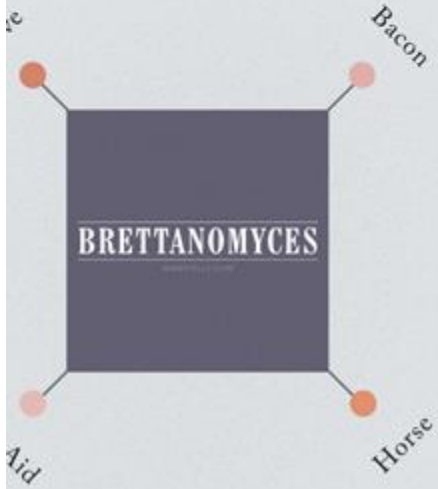

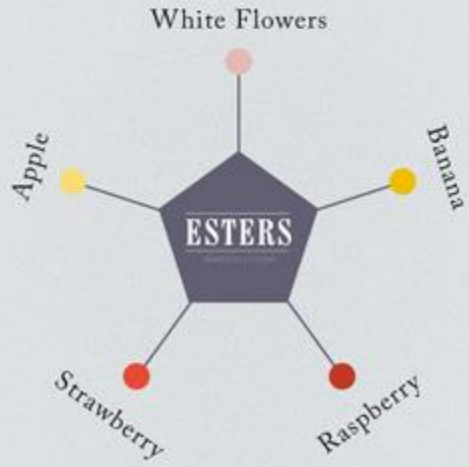

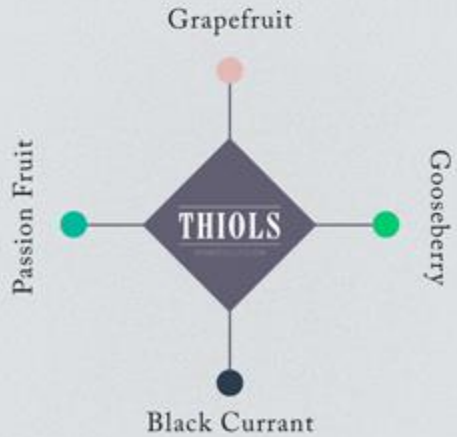

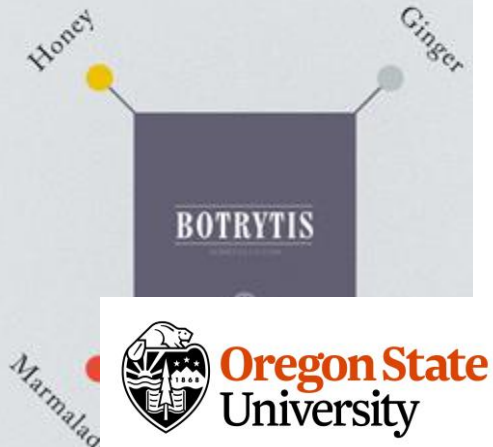

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Red Fruit Necessary Condition – low concentrations of DMS (10 µg/L or less)

Red fruit solution set #1 = High NI + Low F + Low esters2 + Low Lactones + Low DMS,
(Esters1 concentration does not matter in this solution)

Red fruit solution set #2 = High NI + Low F + Low esters1 + Low Lactones + Low DMS
(Esters2 concentration does not matter in this solution)

Red fruit solution set #3 = High NI + Low F + low esters1 + low esters2 + Low DMS
(Lactones concentration does not matter in this solution)

Red fruit solution #4 = Low NI + High F + low esters2 + low lactones + low DMS
(esters1 does not matter in this solution)

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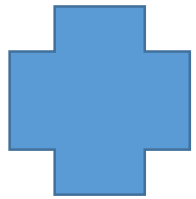

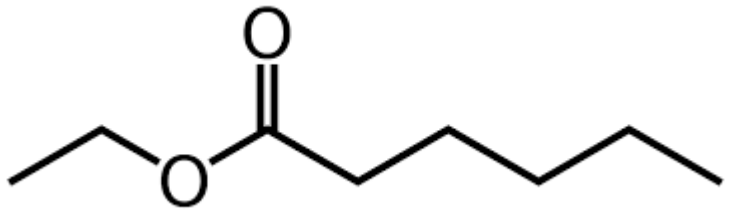

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For many positive sensory qualities in wine, interactions are important.

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Thanks to all those we were involved in these projects…

James Osborne & Nadine Skyllingstad

Chiral terpenes
Mei Song, Doctoral Candidate
Athena Loos, undergraduate research assistant

Chardonnay Mouthfeel
Anthony Sereni, Masters candidate

β-damascenone in Pinot noir
Shiloh Bolman, undergraduate research assistant, (grad 2015)
Kiyomei Ide, undergraduate research assistant

All consumer and winemaker participants in the many sensory studies and/or donated wines

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