

Wine Structure

Perceptions = qualia (quale)

sweet

bitter umami

sour salt

astringent

pungent thermal

Posterior Tongue Papillae

Sour H ⁺	Sweet glucose	
Salty Na ⁺	Sweet aspartame	
	Bitter 30 (PTC etc.)	
	Umami glutamate	

Circumvallate

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Stimulants: to a Biologist Flavorants: to a Chemist

Sense	smell	taste	chemesthesis
Sensation	earthy	sweet	astringent
Structure			
Name	geosmin	glucose	Tea cpd

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Dissociation Reaction (weak acids)

sour

$$\begin{array}{l}
 \text{C}_4\text{H}_6\text{O}_6 \xrightleftharpoons[k_2]{k_1} \text{C}_4\text{H}_5\text{O}_6^- + \text{H}^+ \quad 2.98 \\
 \text{tartaric acid} \quad \quad \quad \text{bitartrate ion} \quad \quad \text{hydrogen ion} \\
 \\
 \text{C}_4\text{H}_5\text{O}_6^- \xrightleftharpoons[k_4]{k_3} \text{C}_4\text{H}_4\text{O}_6^{2-} + \text{H}^+ \quad 4.32 \\
 \text{bitartrate ion} \quad \quad \quad \text{tartrate ion} \quad \quad \text{hydrogen ion} \\
 \\
 \text{H}_2\text{T} = \text{HT}^- + \text{H}^+, \quad 2.98 \\
 \text{HT}^- = \text{T}^{2-} + \text{H}^+, \quad 4.32 \\
 \\
 \text{pH} = \text{pKa}_1 + \log\left[\frac{[\text{T}^-]}{[\text{HT}^-]}\right] \\
 \text{Henderson-Hasselbach Equation}
 \end{array}$$

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Total Dissociation in strong Base

tartaric acid	$\text{C}_4\text{H}_6\text{O}_6$	\rightleftharpoons	$\text{C}_4\text{H}_4\text{O}_6^- + 2\text{H}^+$
malic acid	$\text{C}_4\text{H}_6\text{O}_5$	\rightleftharpoons	$\text{C}_4\text{H}_4\text{O}_5^- + 2\text{H}^+$
lactic acid	$\text{C}_3\text{H}_6\text{O}_3$	\rightleftharpoons	$\text{C}_3\text{H}_5\text{O}_3^- + \text{H}^+$
acetic acid	$\text{C}_2\text{H}_4\text{O}_2$	\rightleftharpoons	$\text{C}_2\text{H}_3\text{O}_2^- + \text{H}^+$
citric acid	$\text{C}_6\text{H}_8\text{O}_7$	\rightleftharpoons	$\text{C}_6\text{H}_7\text{O}_7^- + 3\text{H}^+$

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Chemesthesis

ASTRINGENT
HOT/COOL
PUNGENT

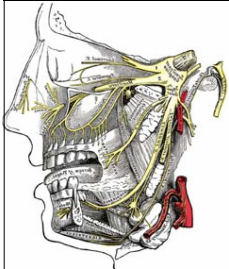
Fig 19-1

Fig 19-2

Lubricating Proteins
Are Precipitated
by
Astringent
chemicals

Alcohol
Tannin
Tartaric acid

Trigeminal Nerve - Chemesthesis Periphery



Ophthalmic
Maxillary
Mandibular
Delwiche 05



"Acid taste" = sour + Astringency

Astringency has a number of components; these have been described as:

drying of the mouth

roughing of the oral tissues

puckering of the cheeks and muscles

Lee and Lawless, 1991

Compounds Producing Astringent Sensations

Ethanol and some other solvents

Polyphenols & tannins

Organic & inorganic acids

Salts of multivalent metal cations

CARBON DIOXIDE

Polyphenol Astringency

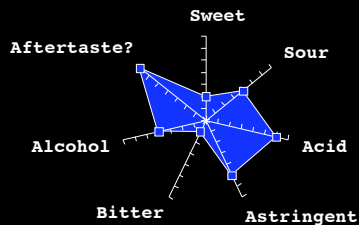
Polyphenol astringency is generally recognized as the result of interactions between proline-rich proteins (PRPs) in saliva and dietary polyphenols.

The PRPs and polyphenols combine to form colloidal particles, and this removes the lubricity provided by the PRPs in solution.

Bate-Smith, 1973; Gawel, 1997

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Taste is multivariate with a dozen or so modes



Taste **OFC** **Smell**

Small, Jones-Gothman, Zatorre, Petrides, Evans, 1997, Journal of Neuroscience

Zatorre, Jones-Gothman, Evans, Meyer, 1992, Nature

Amygdala

Taste **Smell**

Zald, Lee, Flugel & Pardo, 1998 Brain

Zald & Pardo, 1997 PNAS



Orbitofrontal cortex

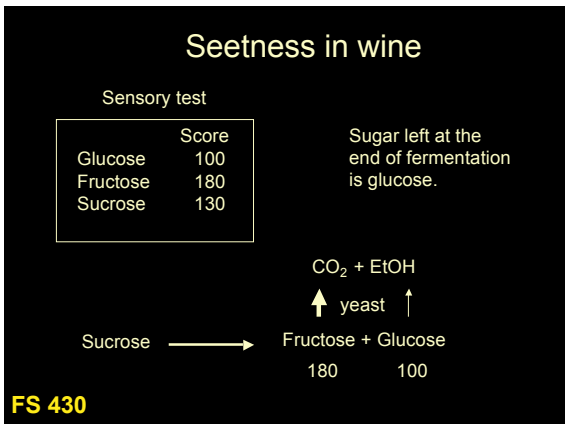
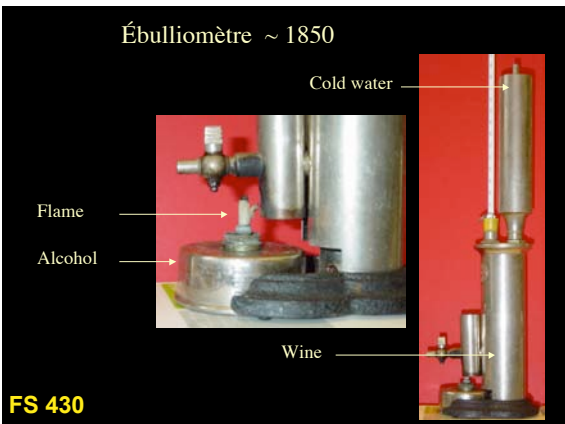
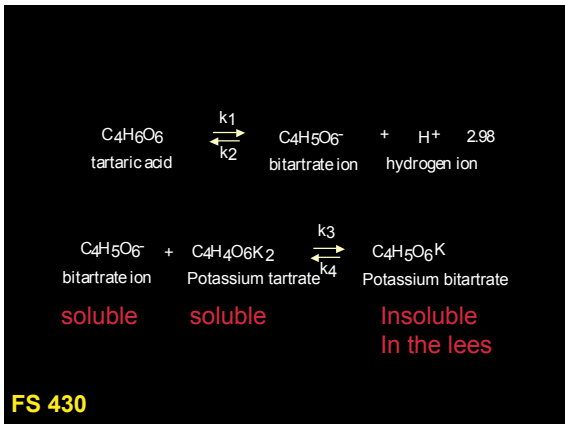
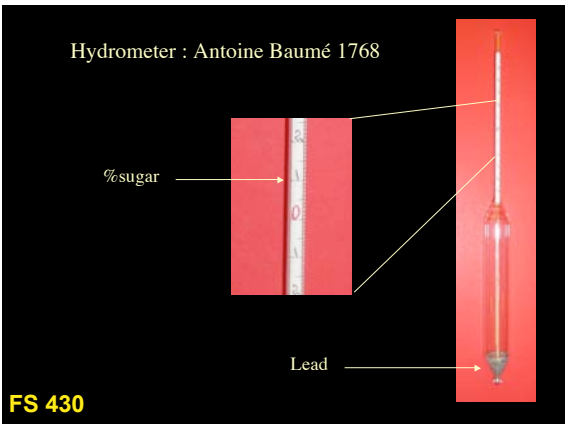
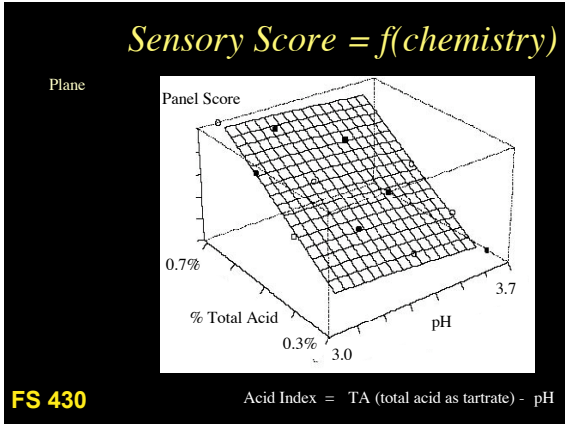
Responses to tastants and to odorants converge in Orbitofrontal cortex and in forebrain regions such as the amygdala

Images provided by Dana M. Small, Northwestern University Feinberg Medical School

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Are there two acid modalities?

	Percept	Stimulant	DOSE
	"astringent" chemesthetic	tartaric malic lactic	strong Solution of weak acid
	"sour" taste	hydrochloric phosphoric citric ?	weak Solution of strong acid





Science never ends

Near Infrared spectra

First 250 years
Univariate Science
Based on one variable

$$y = mx + b$$

Next era
Multivariate Science
Based on many
variables

$$Y = mX + b$$

Y, X are matrices

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1. Atwater Dry Riesling 2006 (apparently it is decent)
2. Kerpen 2006 Wehlener Sonnenuhr Riesling Auslese
3. Domaine St. Michelle Brut
4. Taylor Fladgate Port

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