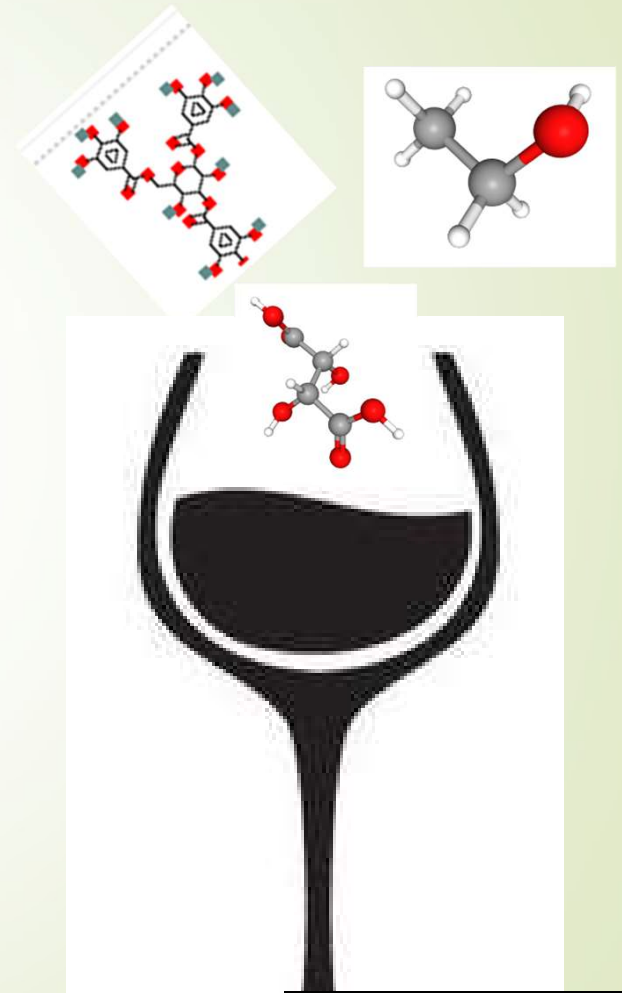


CHEMISTRY OF WINE

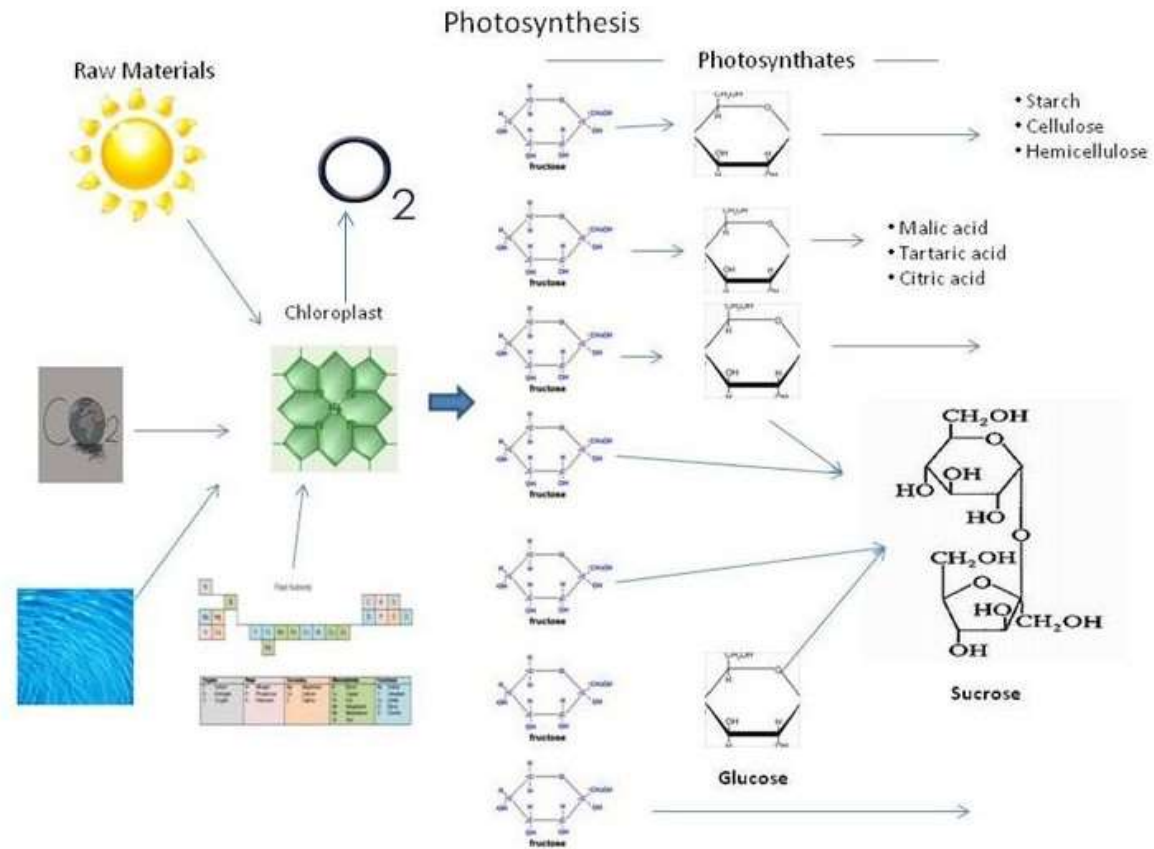
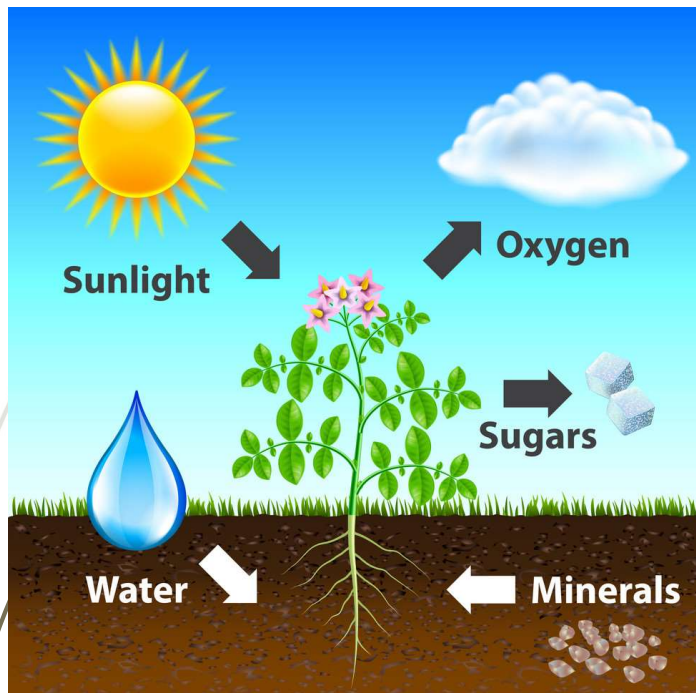
CLUB DEL VINO
Washington DC
January 2021

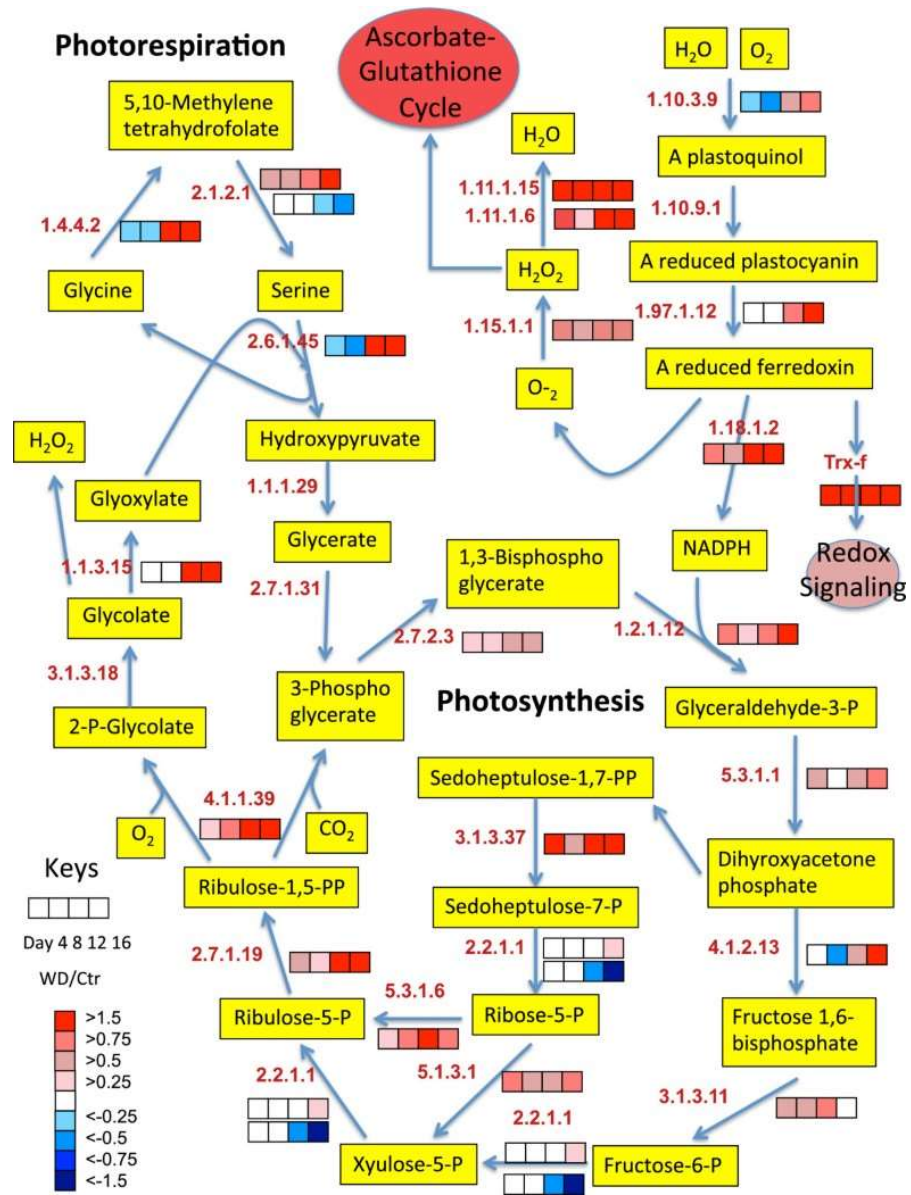
What is wine?

➤ A product of chemical and biological processes is a solution of water, sugar, alcohol, organic and inorganic acids, and numerous other substances contributing to flavor, aroma and color



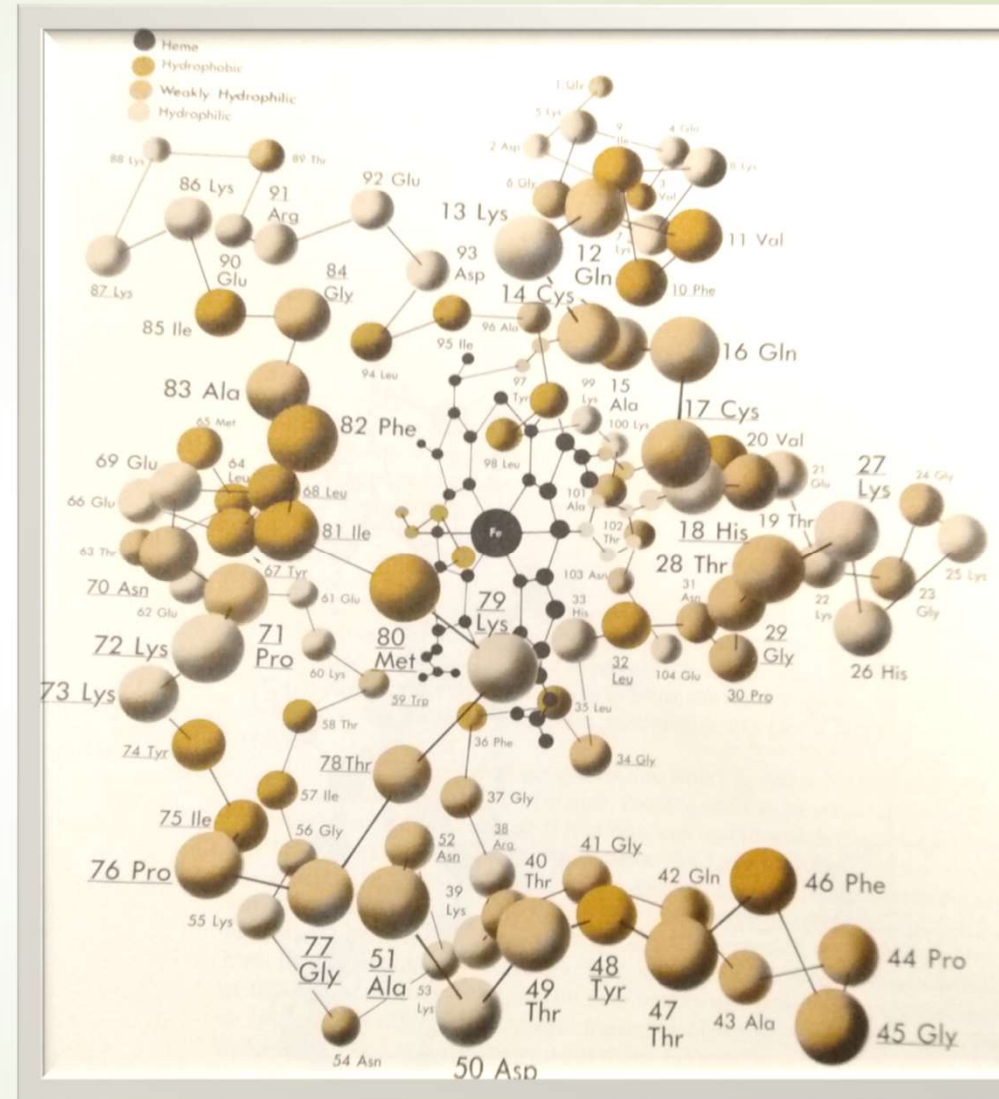
Biological - chemical process





Cytochrome-c

The conformation of this molecule is typical of that of enzymes



硝酸 + 铜 →

硝酸铜 + 二氧化氮

+ 水 .

Looks like Chinese ?



GRAPES

CRUSH

MUST

JUICE

JUICE: 80% WATER

SUGARS

GLUCOSE

FRUCTOSE

SACAROSE

ORGANIC ACIDS

ACETIC ACID

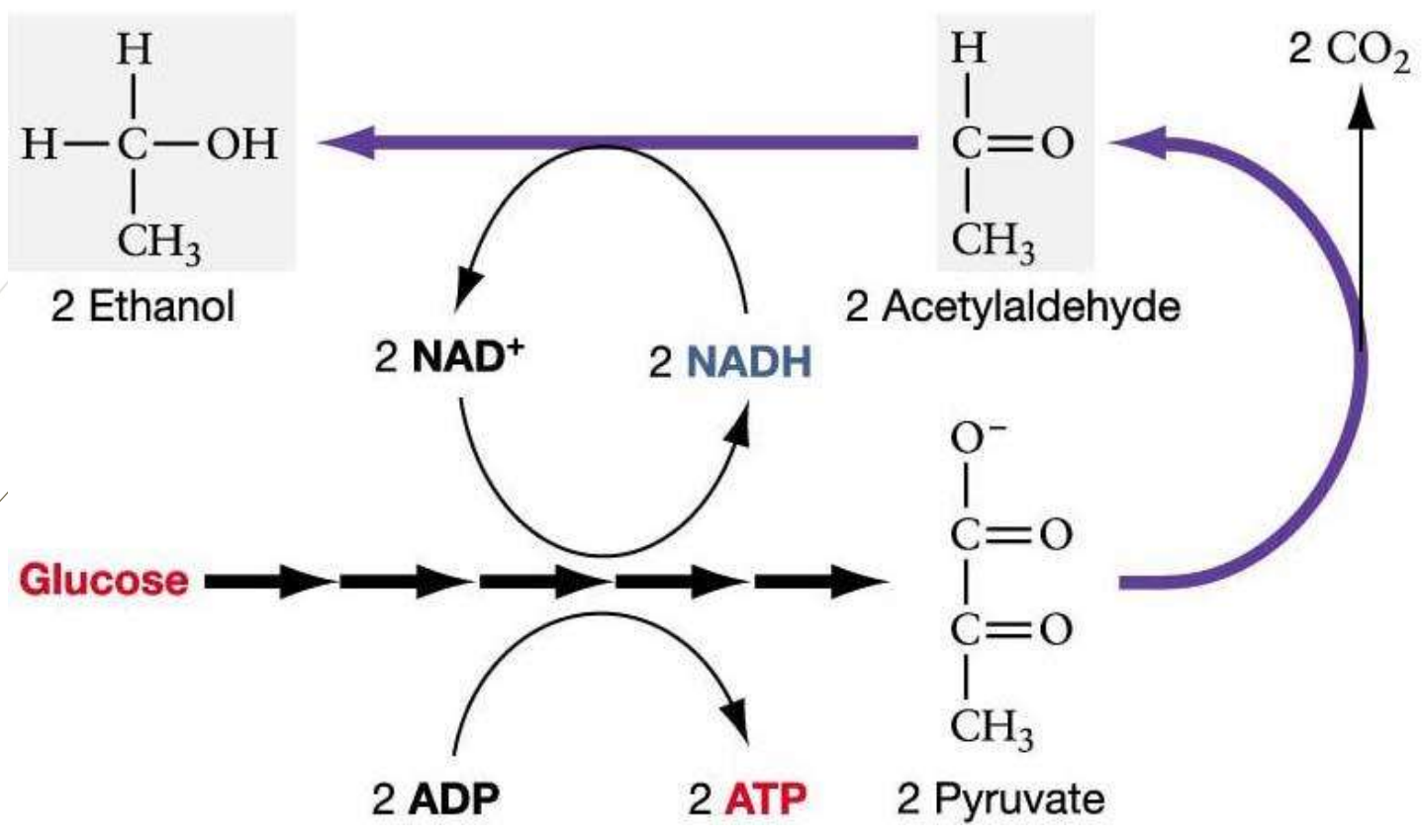
MALIC

LACTIC

TARTARIC

MINERAL SALTS

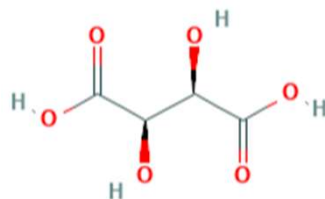
CONTAINING, POTASSIUM (K) SODIUM (Na) Phosphates, Sulfites



FERMENTATION PROCESS

WINE

<u>NAME</u>	<u>FORMULA</u>	<u>ORGANIC FUNCTION</u>
▶ WATER	<u>H₂O</u>	
▶ ETHANOL	CH ₃ CH ₂ OH	ALCOHOL
▶ ACETIC ACID	CH ₃ COOH	ACID
▶ ACETALDEHYDE	CH ₃ CHO	ALDEHYDE
▶ ETHYL ACETATE	CH ₃ COOC ₂ H ₅	ESTER
▶ TARTARIC ACID		ACID





AROMAS AND FLAVORS

➤ ETHYL METHANOATE	RUM
➤ PENTYL ACETATE	BANANA
➤ OCTYL ACETATE	ORANGE
➤ METHYL BUTANOATE	APPLE
➤ ETHYL BUTANOATE	PINEAPPLE
➤ ISOAMYL ACETATE	PEAR
➤ PHENYL OCTALDEHYDE	CHOCOLATE



Where is the Chemistry? Right here!

- ▶ Pinotage can go very wrong because it is so volatile. The wine is not volatile, it doesn't evaporate, acetic acid evaporates
- ▶ This smell is a clue that the wine has high levels of Volatile Acidity (VA) which is caused by a high proportion of a 'bad acid' called acetic acid.
- ▶ Volatile acidity (VA) is associated with the concentration of acetic acid in wine. Acetic acid is a component of wine and vinegar

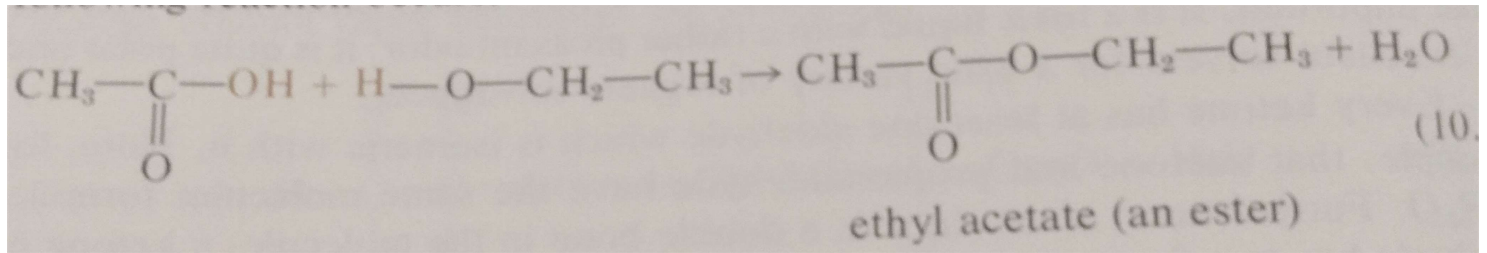
And here!

- Acidity and pH. When a substance is dissolved in water it may interact to make the solution taste acid or alkaline. Chemically this property is associated to the concentration of ions H^+ and is represented by the expression pH. The value of pH for a strong acid is 1, for water the pH is 7 (neutral) and for a strong alkali is 14. Organic acids are mild with a pH between 3 to 5.
- Tartaric acid in grape juice has a pH between 3.1 to 3.7, wine has a pH similar to this. When vintners want to increase acidity they add tartaric acid.
- Besides the sharp smell, some of the wines can become over-extracted which is a process where the wine spends too long on the skins and seeds. Over-extracting Pinotage will make the wine taste like burnt tar.
- Over extracting excess of tannins a process which was used for leather tanning

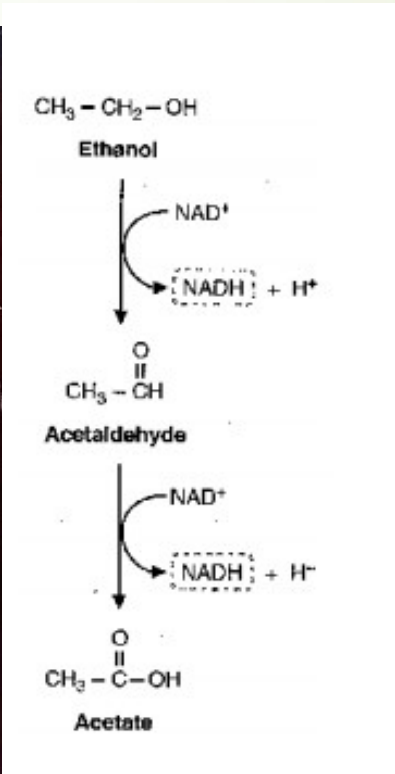


and here!

- When it is bad, it will smell very pungent and sharp, almost like nail polish remover. Acetic acid reacts with ethanol to form ethyl acetate which smells as nail polish remover





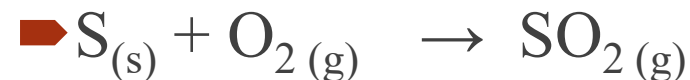




Contiene Sulfitos

Contains Sulfites

- It is easy to confuse the numerous similar-sounding, but chemically distinct terms relating to sulphur in wine. Sulphur is sprayed on vines as a fungicide to prevent powdery mildew. In the past, it was also burnt in winery buildings and casks to destroy unhelpful bacteria and yeasts, a practice that seems to be on the rise again.






Sulphur dioxide (SO₂)

or sulphites – in liquid, gas or powder form – may be added to grapes or wine during winemaking, from harvesting to fermentation and bottling; yeasts also produce natural SO₂ during fermentation.

Sulphites are present, to a greater or lesser degree, in all wine.



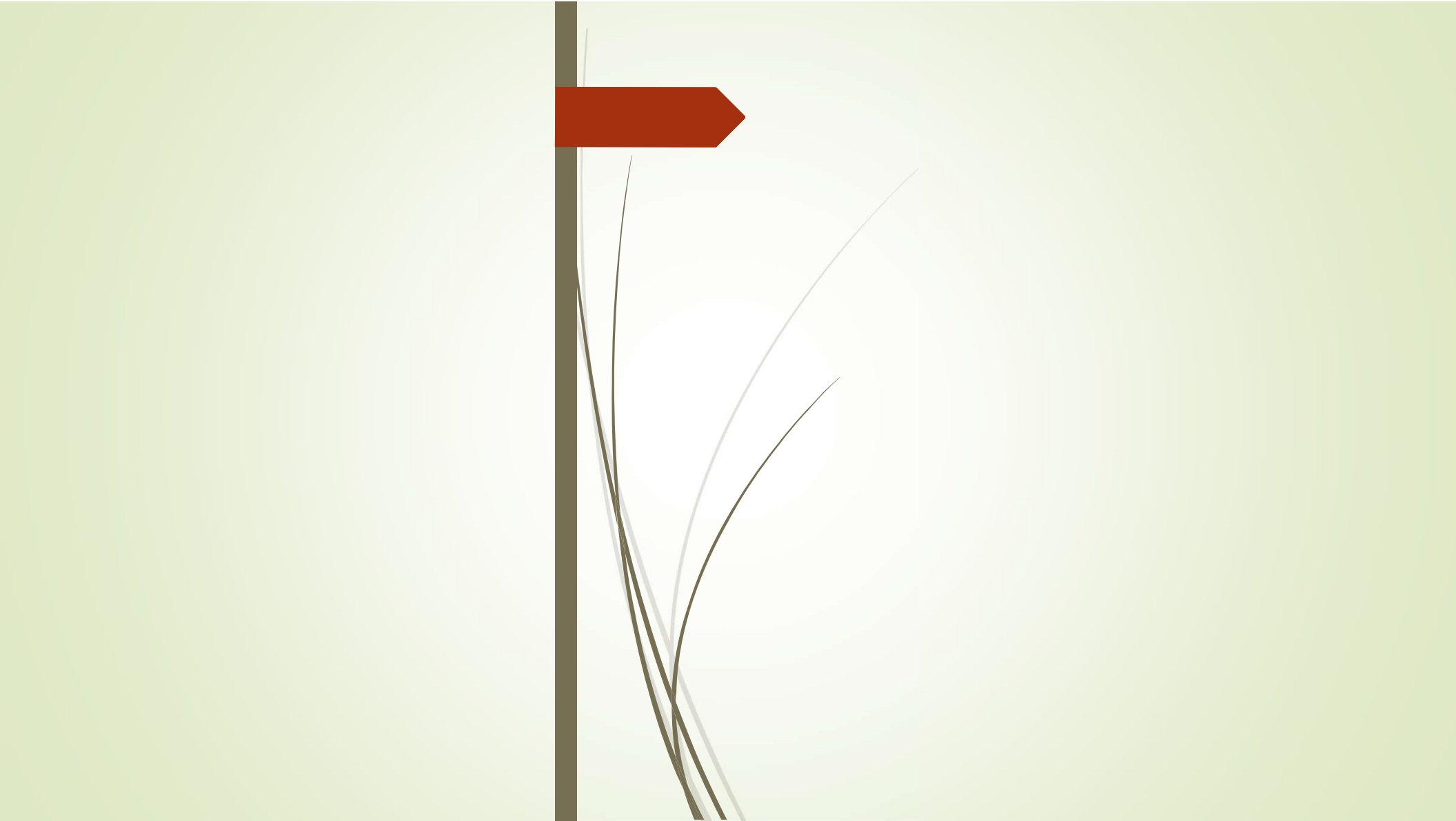
Sulphides are volatile sulphur compounds (hydrogen sulphide, mercaptans and disulphides) that, when present at high levels in wine, are associated with wine faults such as reduction and rotten egg or rotten vegetable smells.

H_2S Hydrogen disulfide

SCS / CS_2 Carbon disulfide

R-S-S-R disulfide

$\text{C}_2\text{H}_5\text{SH} / \text{CH}_3\text{CH}_2\text{SH}$ Ethanethiol, Ethyl mercaptane





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