

Le bouquet du vin: une intégration complexe des perceptions au nez et en bouche

Wine aroma : a complex integration of nose and mouth perceptions

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Wine is a complex beverage, especially in terms of sensory perceptions. The wine bouquet, its specificity and typicality depend on a number of factors (eg grape, terroir, farming conditions). Although hundreds of chemical compounds have been identified in the grape and wine, it has been demonstrated on numerous occasions that only a fraction of these compounds contribute to the flavour of wine. In the field of aroma studies, it is usually considered that the key odorants are those present above their odour threshold. However, in wine, it has been shown that the presence of odorants generated by oak wood at a concentration lower than their threshold values might have an impact on the global flavour of the product. Such effect can be the result of perceptual interactions taking place within the olfactory coding pathway as soon as a mixture of odorants reaches the olfactory mucosa. This presentation will focus on the coding of odour mixture with the aim to underline the role of perceptual integration in wine flavour perception. A series of recent results will be presented to illustrate the importance of odour compounds below their detection threshold as well as differences between the perception of volatile compounds through the nose or through the mouth.

Le vin est une boisson complexe, notamment en termes de perceptions sensorielles. Le bouquet du vin, sa spécificité et sa typicité dépendent d'un certain nombre de facteurs (variété de raisin, terroir, conditions d'élevage). Bien que des centaines de composés chimiques aient été identifiés dans le raisin et le vin, il a été démontré que seule une fraction de ces composés contribue à la saveur du vin. Dans le domaine des études des arômes, il est généralement considéré que les substances odorantes clés sont celles présentes au-dessus de leur seuil de détection. Toutefois, dans le vin, il a été montré que la présence de substances odorantes, issue du bois de chêne, à une concentration inférieure au seuil de détection peuvent avoir une incidence sur le bouquet global du produit. Un tel effet sensoriel peut résulter d'interactions perceptives lors de l'intégration de l'information olfactive, et ce dès qu'un mélange de substances odorantes atteint la muqueuse olfactive. Cette conférence mettra l'accent sur le codage d'un mélange d'odeurs dans le but de souligner le rôle de l'intégration perceptive perception de l'arôme du vin. Une série de résultats récents sera présentée pour illustrer l'importance des composés odorants présents à des concentrations inférieures à leur seuil de détection ainsi que les différences entre la perception des composés volatils par la voie nasale ou la voie rétronasale.

Le bouquet du vin: une intégration complexe des perceptions au nez et en bouche

Wine aroma : a complex integration of in nose and in mouth perceptions



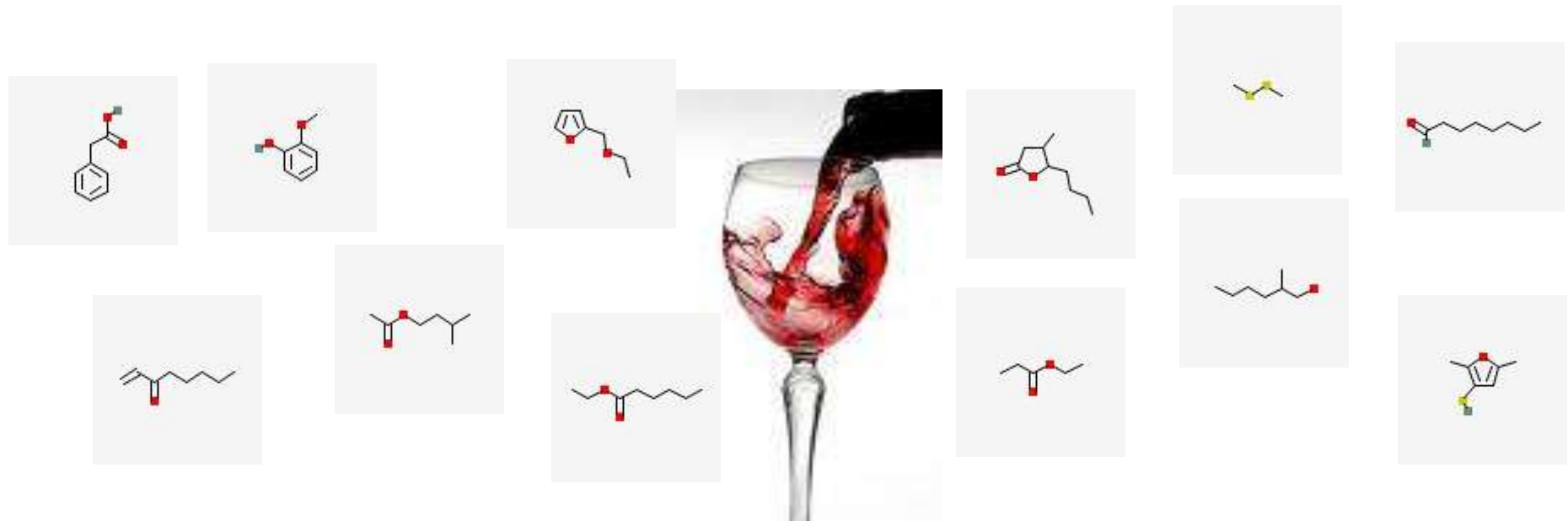
Thierry Thomas-Danguin (INRA Dijon) &
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Chemical complexity of wine headspace



- Hundreds of chemical compounds identified in grapes and wines
- Dozens of odorants in identified wine headspace

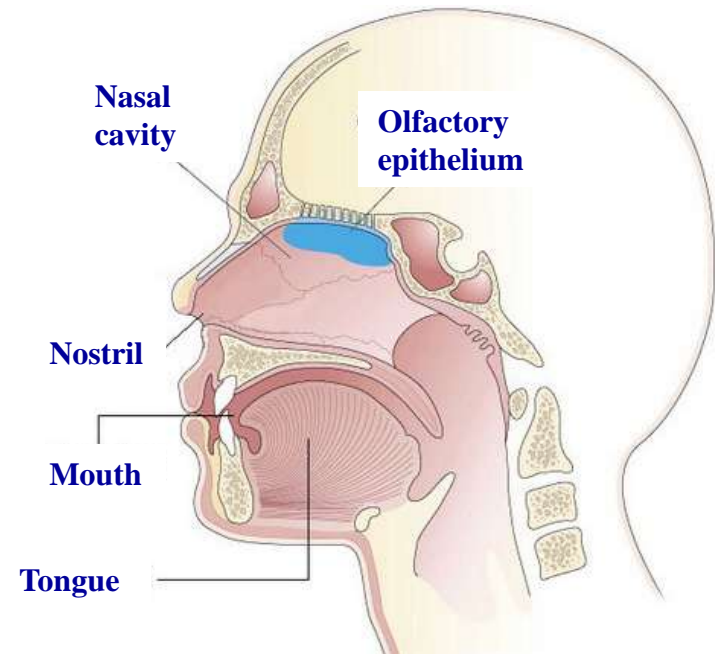


- How is chemical complexity coded in the olfactory system to produce wine bouquet ?

Perception of chemical complexity



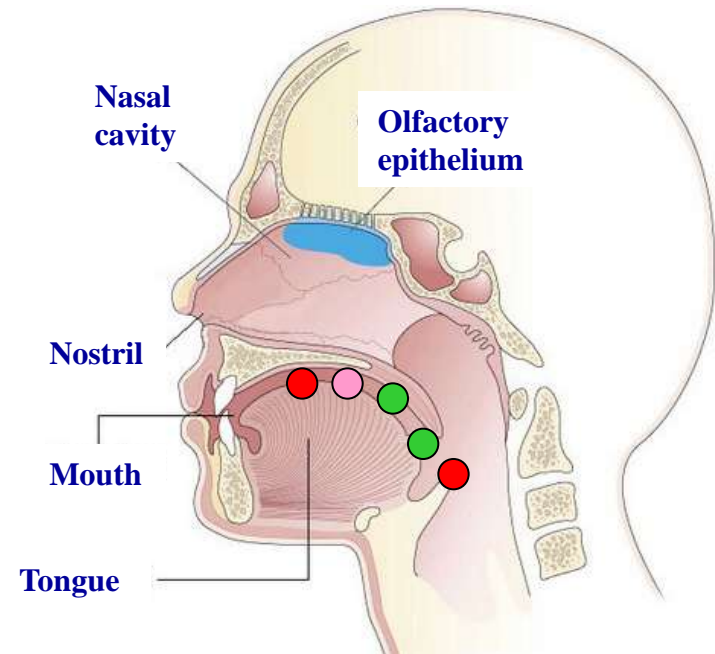
- Perception of odour mixtures = orthonasal / retronasal



Perception of chemical complexity



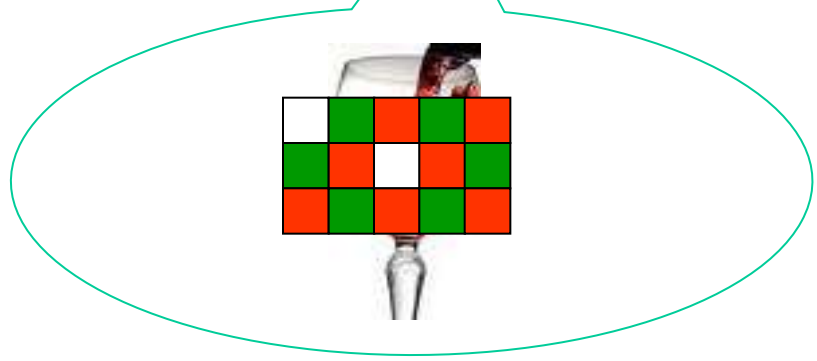
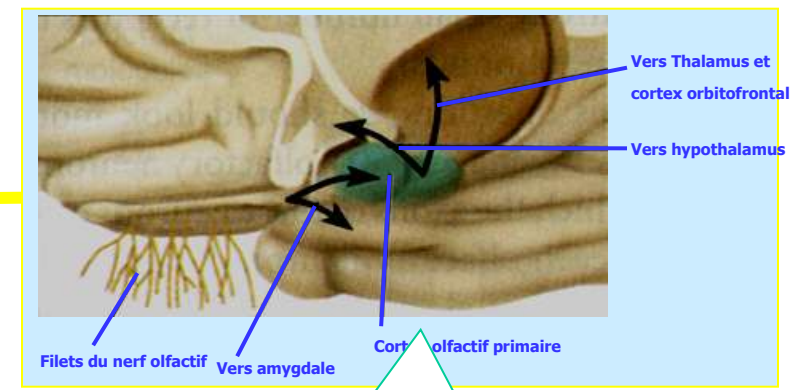
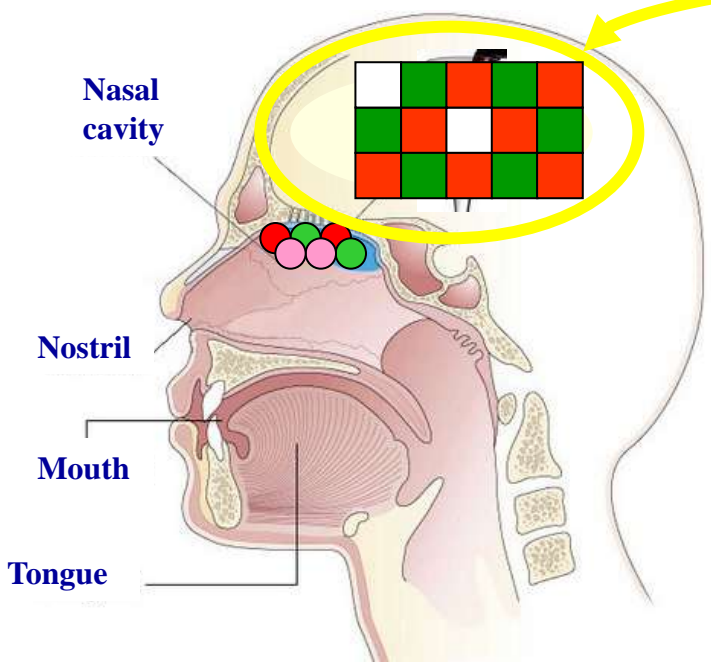
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Perception of chemical complexity



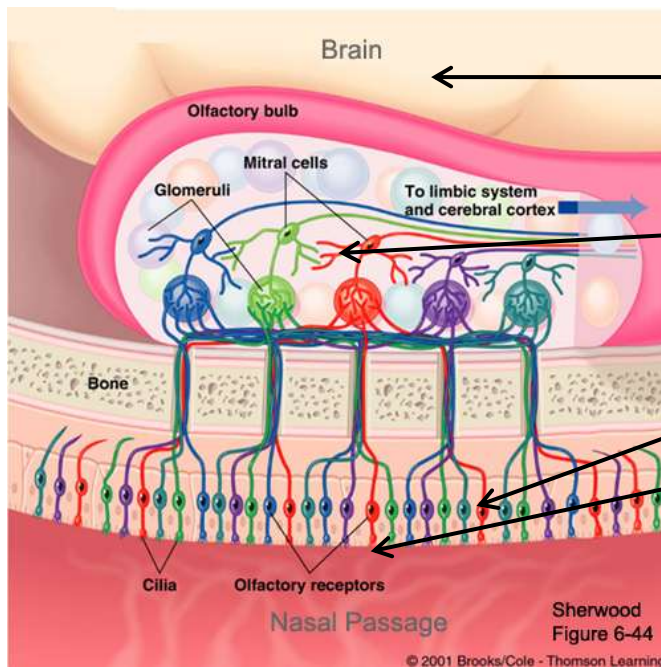
■ Olfactory coding



Perception of chemical complexity



■ Olfactory coding : perceptual interactions



Interactions at cortical level;
Multisensory integration

Interactions at olfactory bulb level

Interactions at sensory neurons level

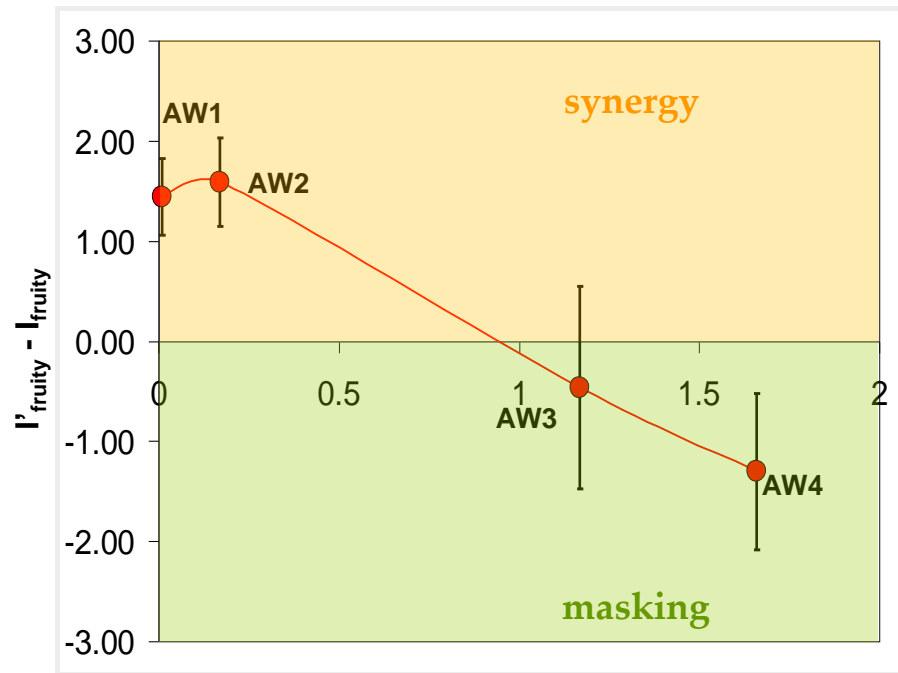
Competition at olfactory receptor level

Consequences of perceptual integration



■ Masking and synergy in odour mixtures

- Binary mixtures of isoamyl acetate (A) and whiskey lactone (W)
- Synergy and masking of the fruity odour within the mixture



AW1 : WL under detection threshold
AW2 : WL at detection threshold
AW3 : WL above detection threshold
AW4 : WL above detection threshold



Consequences of perceptual integration



- Masking and synergy in odour mixtures orthonasal vs. retronasal
 - Binary mixtures of isoamyl acetate (F) and whiskey lactone (W)
 - Synergy and masking of the fruity odour within the mixture
 - Orthonasal vs. retronasal perception

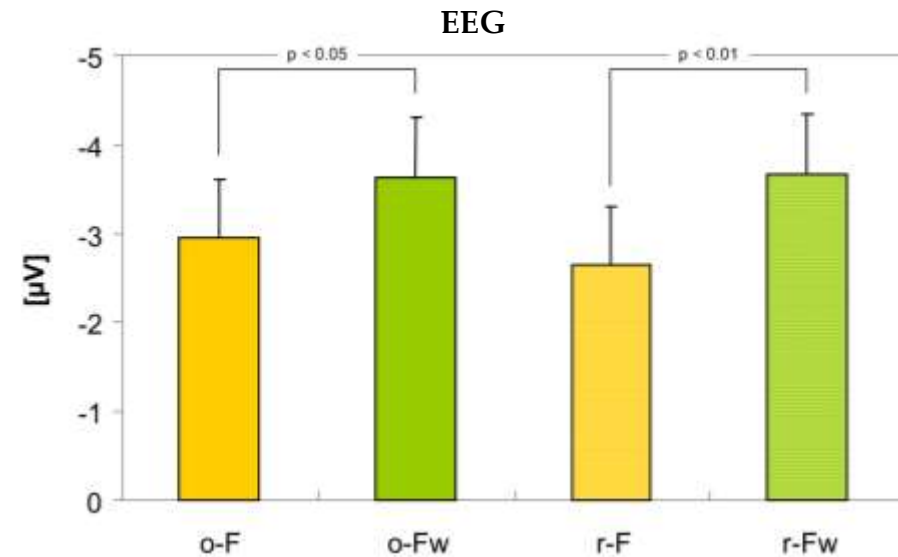
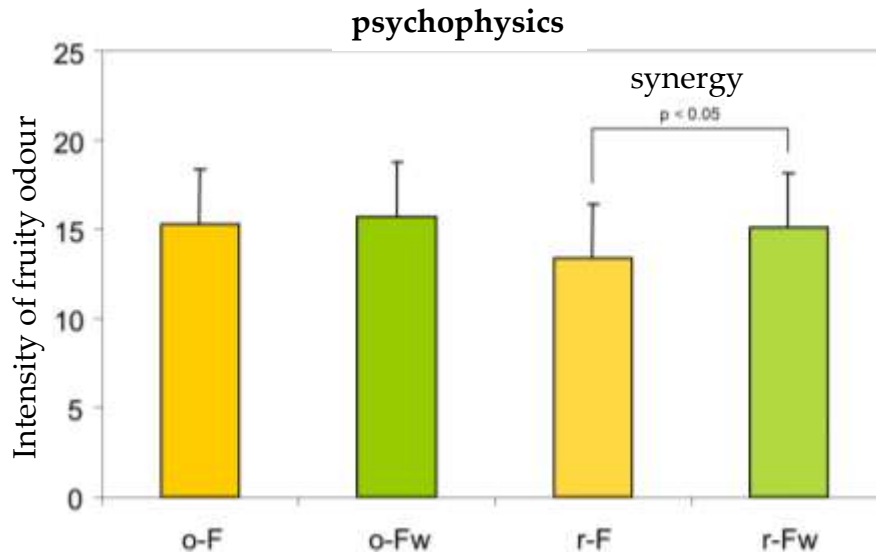


Consequences of perceptual integration



- Masking and synergy in odour mixtures orthonasal vs. retronasal
 - Synergy of the fruity odour within the mixture
 - Orthonasal vs. retronasal perception

o: orthonasal
r: retronasal
F: fruity odour
w: woody odour low intensity

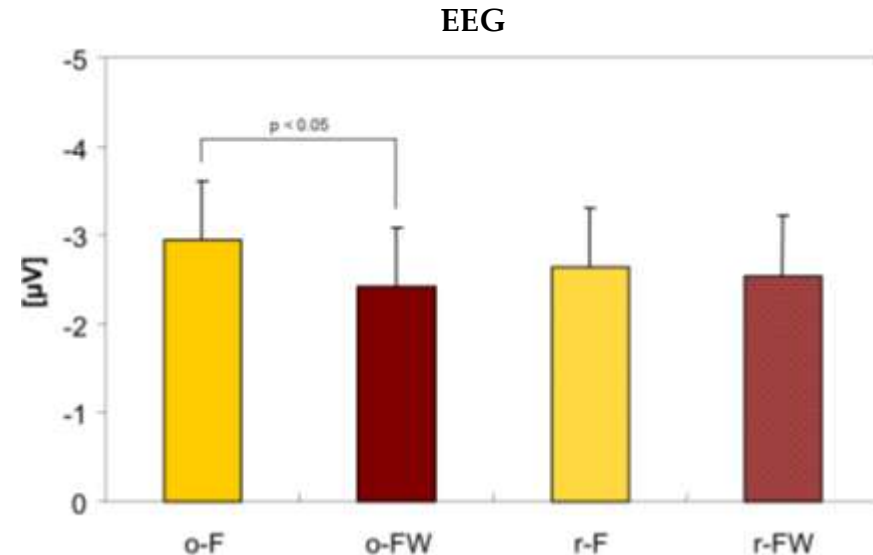
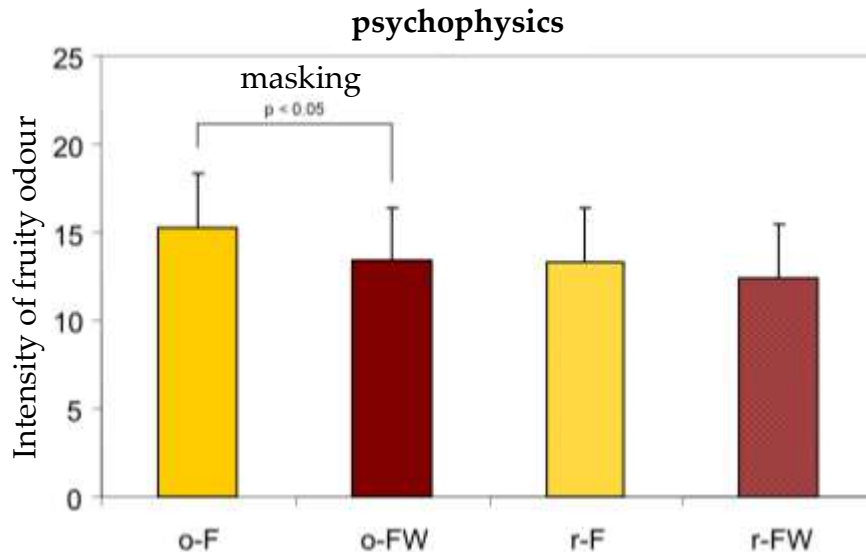


Consequences of perceptual integration



- Masking and synergy in odour mixtures orthonasal vs. retronasal
 - Masking of the fruity odour within the mixture
 - Orthonasal vs. retronasal perception

o: orthonasal
r: retronasal
F: fruity odour
W: woody odour high intensity

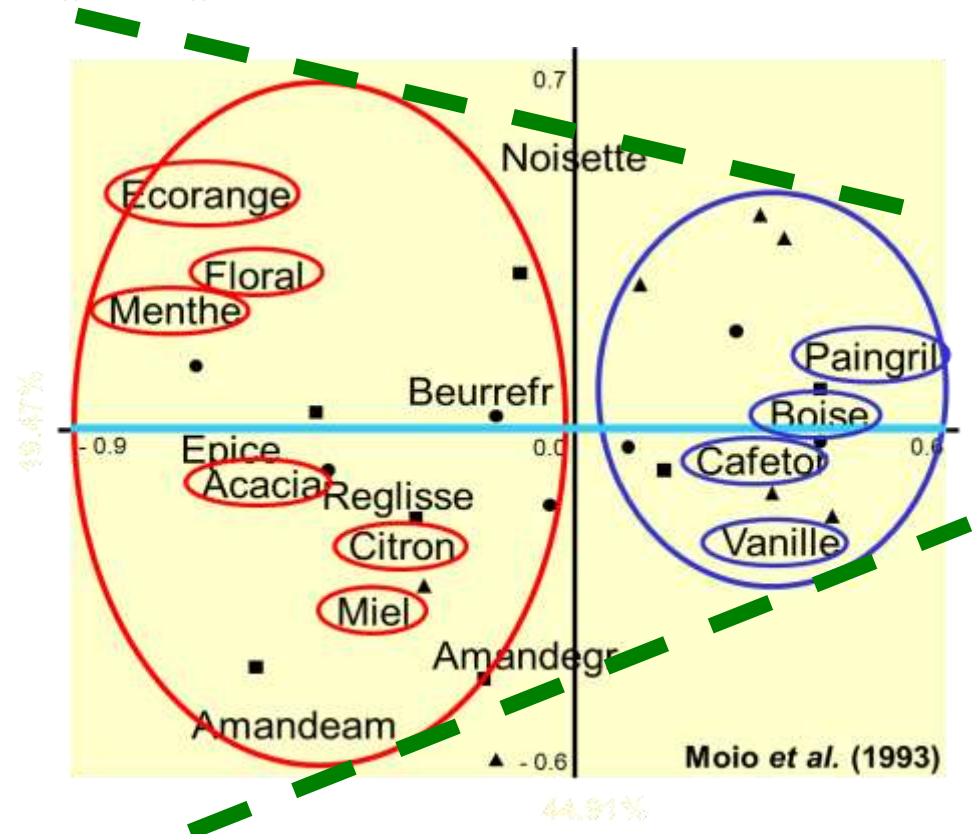


Ishii et al., 2008

Consequences of perceptual integration



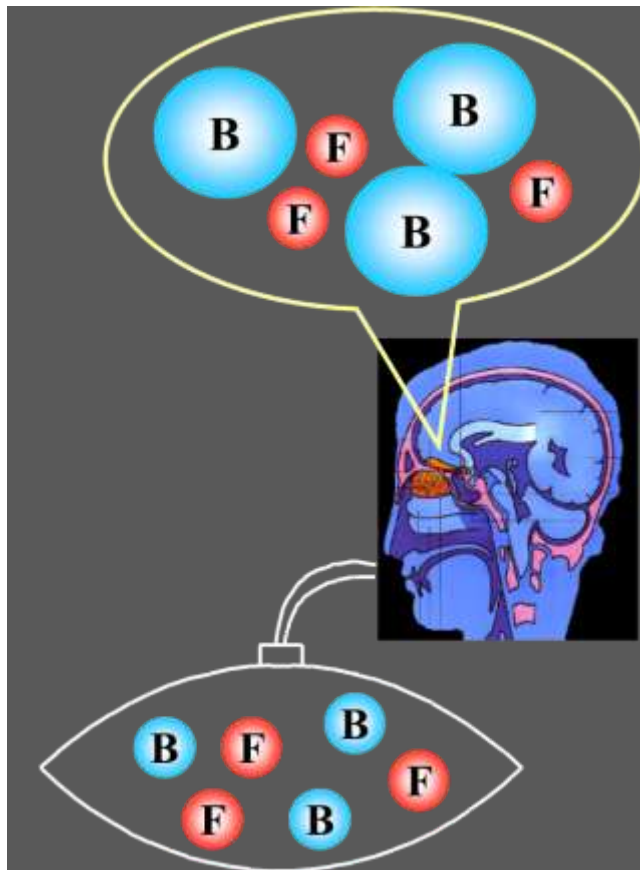
- Perceptual interactions between fruity and woody odours
- Depend on orthonasal vs. retronasal perception
- In line with observations in wine



Conclusions



- Perceptual interactions between fruity and woody odours



- interactions at receptor level ?
- interactions at bulbar level ?
- interactions at higher cortical level ?