AN ANATOMY OF TASTE

Sensory information has only a small part to play in determining our behaviour, because we also unconsciously allow prior experience, marketing messages and memories to shape how the wine in the glass will taste, observes Dr Jamie Goode.

Blind tasting is difficult. And not many people are very good at it. Frequently, competitions based on blind tastings done by a panel come up with surprising and anomalous results. Some people argue that this is because the reputations of some wines are undeserved, and the truth is in the glass. Others wonder how the tasters – who are often experienced members of the wine trade – could have got things so badly wrong. In this article I'm going to touch on results from four scientific studies, one of which has only recently been published, on the perception of wine. As well as being hugely informative, these results shed some light on why blind tasting often gives such different results to tastings where the identity of the wine is known.

The basis of perception

How, exactly, do we perceive wine? Far from being merely an abstract question for academic psychologists, neuroscientists and even philosophers, this is an important topic for the wine trade. Whether you are a journalist, retailer, buyer or winemaker, an informed understanding of the nature of what happens when you taste wine is useful. Conversely, the current model of wine perception that most of the trade seems to hold is inadequate and can lead to confusion and even misunderstanding.

What is the current model? Most people think that as we taste, our taste buds and olfactory receptors detect flavour and aroma chemicals present in the wine, and our brain then gives a 'read out' of the results, much in the way that a scientific measuring device might work. The assumption is that what we sense of the wine as we taste it are the properties of that wine, and given a functioning palate and nose, all tasters are able to 'get' what is in that wine. That is, the experience of the wine by one person is something that can be shared by all people, determined solely by what is in the glass.

However, it now seems clear that such a model of wine perception is inadequate, and what happens is much more complicated. In short, the actual perceptive representation of the wine is something that is prompted by, and based on, the liquid in the glass, but is

» We first decide what sort of wine we are drinking and then enlist the specific vocabulary that we possess for this type of wine. «

Frédéric Brochet, cognitive scientist

constructed by the brain after some fairly serious processing of the basic sensory stimuli. The properties of the wine are the result of the interaction between us, the taster, and the wine.

First, let's deal with a paper published in 2004 in the leading scientific journal *Neuron*. Entitled 'Neural correlates for behavioural preferences for culturally familiar soft drinks', it looked at a phenomenon known as the Pepsi effect. While it is well known that in blind tastings people on average prefer Pepsi over Coke, they state a preference for Coke when they can see what it is they are drinking. This led Read Montague and his colleagues from Baylor College of Medicine in Texas to examine this conundrum using a technique called functional magnetic resonance imaging (fMRI). Functional MRI is a brain scanning technology that allows researchers to look at the brain regions that are activated when people do, watch or experience certain things – in this case, drinking.

It's not all in the glass

First, subjects were asked to state their preference for Pepsi or Coke. Then the researchers performed taste tests to see which the subjects actually preferred. The results showed there was no correlation between their stated and actual preferences. Now the interesting bit: the subjects then tasted the drinks while they were in an MRI scanner. In one instance they weren't told what they were tasting; in the other, they were. The results showed that when the subjects were told what they were drinking, different bits of their brain lit up in the fMRI images, even though they were tasting the same drink.

"Sensory information plays only a part in determining peoples' behaviour," state the authors in the discussion. With the Pepsi challenge, people who state a preference for Coke may prefer Pepsi in blind tasting, but when they know they are tasting Coke they may genuinely prefer it to Pepsi, because as well as the sensory information they get (the taste of the drink), they are also unconsciously

allowing other factors such as prior experience, marketing messages and memories to shape their perception.

The second set of studies that link with this result were performed by cognitive scientist Frédéric Brochet for his doctoral dissertation. Focusing on the way we perceive wine, he grappled with the nature of this perception in an interesting series of experiments. For example, he served a group of experienced tasters a white wine and had them describe it. Then, some time later, he served them the same wine with a neutral red dye, and compared the way they described this wine with the way they had described the first. The tasters used an entirely different set of descriptors for the second wine – the sorts of terms they would use to describe a red wine. Brochet's conclusion was that the way we taste wine is by first deciding what sort of wine it is – he termed this form of tasting 'prototypical' – and then we enlist the specific vocabulary that we possess for this type of wine. For example, when presented with a white wine, we may decide this is a Sauvignon Blanc, and then we will use the sorts of words we have for describing Sauvignon Blanc in our tasting notes.

It's all in the brain

Brochet also used fMRI to look at the activation of brain areas during wine tasting in a small number of subjects. He found that as well as chemosensory areas, which would be expected to be activated during wine tasting, other brain areas lit up. Interestingly, these differed among subjects: for one, the 'representation' of wine was more visual; for another it was more verbal. For Brochet, the global nature of the representation of a wine revealed by fMRI, with many areas of the brain involved, reinforced his conclusion that we taste by making 'prototypes'.

"The affirmation of the representation of a wine in its type is, therefore, the foundation of the appreciation of wines," he concludes.

Another study that used fMRI to look at the brain's response to wine was done by some researchers at Italy's Santa Lucia Foundation, headed by Alessandro Castriota-Scanderberg. Published in *Neuroimage* journals in 2005, the paper, entitled 'The appreciation of wine by sommeliers: a functional magnetic resonance study of sensory integration', compared the brain responses of expert sommeliers to those of novices, when tasting the same wine. The conclusions were that the experts and novices were having quite different experiences. Both groups showed activation in the areas that integrate taste and smell sensations. But the experienced sommeliers showed activation in regions implicated in high level cognitive processes such as working memory and selection of behavioural strategies, suggesting that experienced tasters perceive wine in a different way to novices.

The final study, only recently published, is extremely interesting. A group of researchers from California working in the new field of neuroeconomics used fMRI to show that the information people are given about the wine they are tasting can change their actual perception of the wine. Entitled 'Marketing actions can modulate neural representations of experienced pleasantness', the results were published in Proceedings of the National Academy of Sciences USA in January 2008. The authors discuss an economics term called Experienced Utility (EU), and describe how marketing frequently attempts to change the EU of a particular good, without changing its nature.

The researchers chose to use wine as a test case of how price can modify EU. They fed a group of 20 subjects five different Cabernet Sauvignons while they were in an MRI machine. The subjects were told the retail prices of the wines they were tasting, and were told to focus on the flavour of the wine and say how much they liked them. However, there was a clever twist to this experiment: in reality, only three wines were being presented to the subjects, with two of the wines being presented as different wines at different price points. So, the five different wines the subjects tasted were: a $5 wine (wine 1, its real price); a $10 wine (wine 2, which was actually a $90 wine); a $35 wine (wine 3); a $45 wine (wine 1, at a fake price) and a $90 wine (wine 2 at its real price).

Price matters

Unsurprisingly, there was a correlation between price and liking. Significantly, subjects preferred wines 1 and 2 when told they were drinking the higher-priced wines. The brain scans, comparing the response of subjects when tasting the same wines but believing them to be differently priced, showed the parts of the brain that experience pleasure are more active when subjects think the wine is higher priced. The price isn't just affecting perceived quality – it seems to be affecting the actual quality of the wine by changing the nature of the perceptive experience. The importance of these results are that they show that our expectations as we approach wine, perhaps caused by the sight of the label, will actually change the nature of our drinking experience.

What can we conclude from these studies? First, they reinforce the idea that our perception of wine is the result of our interaction with the wine. It isn't just about what it is in the glass; we also bring something to the wine tasting experience. Second, our knowledge of wine, the context of the tasting and our expectations all contribute to the experience we have. Knowledge adds a lot to the whole process of tasting wine, and tasters with lots of experience will taste quite differently to novices. Third, our actual perception of the same liquid will differ when we are tasting blind.

Finally, it seems that there is a lot of room for marketing to change the EU of wine – it is not just what is in the glass that counts. There is perhaps no other food or drink where relatively small differences in 'quality' can have such an important effect on price as wine. Perhaps for that reason the trade would do well to enlist the help of scientists and philosophers to come up with a new theoretical basis for wine tasting that better reflects reality than the current model. ■