Questions on Chemistry and the Flavor of Wine

I was really pleased with the response to my first article here on wine flavour chemistry. Some of the comments raised interesting questions, and to do these justice I thought I'd use them as the basis for this second piece.

‘As amazing as this article is we must not for forget the statement that the interaction between the wine and the taster has a huge influence on the final outcome and ultimately the perception of the wine. At the end of the day you have to ask yourself... Do you like the wine or not?’ (Christopher Hoel)

This is a really important point. Straying into philosophical territory, I think we need to revise the way we approach the practice of wine tasting. Traditionally, the wine trade has regarded the taste of a wine as a property of the wine. That is, the practice of wine tasting is the assessment of the properties of the wine, with the ideal taster behaving like a measuring device. But it’s becoming clear that as tasters we bring something to the wine tasting event: our physiology and our experience of wine will affect the conclusions we come to. What we are actually assessing is our interaction with the wine.

For this reason, wine tasting is quite personal, and as we share a wine together we will be having different experiences. But this doesn’t mean that wine tasting lacks any objectivity. We train our palates and share our tasting notes, and as we do this we do find that there is a strong common experience in wine. While there is always disagreement among a room full of tasters on some wines, there are those bottles that we all seem able to agree on. This whole issue of the subjective and objective issues of wine tasting is a fascinating one—and deserves an article in itself.

‘I know that methoxypyrazine is inherent to certain Bordeaux grapes and that it decreases during ripening through grape exposure to sunlight. I heard from a winery owner recently about perception of rotundone as pepper being associated with cool climate syrah. What is the mechanism for its decrease in warm climates - is it actually temperature or is it also sunlight exposure?’ (Nichole Dishman)

This is a very good comment. Rotundone is a recently discovered compound that gives peppercorns their pepperiness, and has been found in low but significant quantities in some wines, notably Syrah and Grüner Veltliner. A large survey has been carried out of 137 Australian wines: no rotundone was found in 81% of these, and of those that contained it, 62% were Shiraz wines. Those with most rotundone were from cool-climate regions, but no one knows why, yet. It doesn’t seem to diminish through the ripening process in the same way that methoxypyrazines do; the available data suggest that it actually increases. There’s currently very little known about this compound because its discovery in wine is relatively recent (2008). But work is taking place right now that should shed more light on it.

‘Interesting observations regarding the ability (or lack of) smelling all these different compounds. Rotundone? Imagine the consequences when an individual cannot smell this compound and possibly another, which together would help him/her identify the wine as Syrah versus another varietal on a blind tasting? As such, we should consider how we are teaching and/or practicing blind tasting, as it is an essential skill that must be mastered to be successful in the certification process of our chosen profession.’ (Greg Rivera)

‘The last part about everyone having different sensory thresholds for different aromatic chemicals is at the same time
troubling and freeing in regards to blind tasting. Everyone, or almost everyone, on this site is concerned about their ability to blind taste, and it is only natural to worry about your own thresholds in this respect. However, I think it is important to remember that there are plenty of other pieces to the blind evaluation equation, and your mind, your ability to deduce, is just as important as your palate. Also I think the latter part of this article puts the focus, rightfully, on the individual interaction with wine and creating a sensory context over time. I think it is very interesting and often helpful to read through lists of varietal markers, but it is probably far too easy to fall into a trap where studying these lists becomes more important than actual time spent with wine. My own, limited, experience with blind tasting has been frequently uncomfortable and produced very uneven results. Even more frustrating is the conversation afterwards where I seemingly "missed" important markers that other people in the group picked up on. I think these conversations can be important, and certainly everyone feels lost at different points in blind tastings—we shouldn't be fixed on results alone. What is liberating is the knowledge that I need to be working to an extent on "what Syrah tastes like to me," rather than what Syrah tastes like. ’(Patrick Miner)

This is a really important point, and it has implications—as you suggest—for the way that we teach wine, and the way we learn to blind taste. To answer it, I first need to separate out two sources of differences in taste perception. First of all, there is our biological make-up; second, our experience.

Biologically there is good evidence that we each live in our own taste worlds. This is only true to a certain extent, of course—it doesn't make sense to suggest that there can be no shared experience of wine at all. An example of this biological variation is that about a third of people just aren’t very good at detecting ‘bitter’ taste. In sensory science work, those putting together testing panels usually have a screening process where they weed out people who don’t really get bitter. Related to this, but not quite the same (it all gets quite complicated when you delve in more deeply) you may have heard of PROP taster status. This is to do with the ability of individuals to taste PROP (propylthiouracil), an extremely bitter substance to some, but much less bitter or tasteless to others. Those who find it extremely bitter are known as ‘hypertasters’ or ‘supertasters’. And with regard to aromas, it is well known that people differ widely in their detection thresholds. Rotundone is an interesting example, because it seems that some people are ‘smell blind’ to it. But for most aroma compounds, sensitivity will be spread across a continuum. For example, some people can spot TCA (cork taint) at very low levels indeed, and some don’t notice it until the level is a bit higher; most people fall somewhere in the middle.

And then there’s experience. Peoples' tastes change with time. Most people don’t innately enjoy the flavour of beer, strong cheese or coffee, but grow to like these tastes over a period. Sometimes these acquired tastes are more enduring and compelling than the flavours that everyone seems to like innately. In addition, knowledge of what we are eating or drinking changes the way we approach it. Studies comparing sommeliers with novice wine drinkers have shown that the two groups process the flavour of wine in their brains in quite different ways. Experienced or trained wine drinkers taste wines in a different way. The more we learn, the more we seem to appreciate the flavours of what we are eating and drinking. Basically, experience seems to shape perception.

Interestingly, the learned component of wine appreciation can be shared. If we study the same syllabus, we can have shared knowledge, and this could offset some of the biological differences in perception, bringing us closer to a common experience as we taste wine together. Other interesting questions concern the language we have for wine. Does having an extended vocabulary for wine flavours and aromas alter the way we perceive the wine? Perhaps.

Your point is brilliantly made, though: we should be working on what Syrah tastes like to us, not what Syrah tastes like. This is a really important message, and could help students a great deal in developing their ability to taste wine blind. This enhanced and more realistic take on how we perceive the wine is just as important as your palate. Also I think the latter part of this article puts the focus, rightfully, on the individual interaction with wine and creating a sensory context over time. I think it is very interesting and often helpful to read through lists of varietal markers, but it is probably far too easy to fall into a trap where studying these lists becomes more important than actual time spent with wine. My own, limited, experience with blind tasting has been frequently uncomfortable and produced very uneven results. Even more frustrating is the conversation afterwards where I seemingly “missed” important markers that other people in the group picked up on. I think these conversations can be important, and certainly everyone feels lost at different points in blind tastings—we shouldn't be fixed on results alone. What is liberating is the knowledge that I need to be working to an extent on "what Syrah tastes like to me," rather than what Syrah tastes like. ’(Patrick Miner)

Our discussions here do suggest that wine education is a little too focused on objective experience. The current expectation is that as tasters develop their expertise, they are able to read a wine correctly, and there is one correct interpretation of the wine. The implication is that if the student disagrees with the examiner’s take on the wine, that the student is wrong.

While I appreciate that this is probably the only way to run tasting exams in the real world, I wonder whether current methods for teaching could be improved on. Would it be possible to acknowledge the subjective elements of wine tasting, and that we bring a good deal to the tasting experience, within the educational syllabus? It would certainly make for a more complicated picture, but the current method of teaching results in a lot of confusion on the part of students who simply don’t get the wine in the same way as their examiners, and it doesn’t correlate with the reality of our interaction with wine, which by its nature is complex.
With regard to biological differences, a common misunderstanding is that it is beneficial to be a PROP hypertaster or supertaster if you want to be a great wine taster. This may not be the case. Hypertasters may well find tannins in red wine objectionable, to the point that they avoid tannic red wines or are unable to evaluate them fairly. [I should add here that there remains some controversy about the importance of PROP taster status.] On the other end of the spectrum, those who are unable to spot bitterness might be similarly compromised in their tasting. Of course, if you are a consumer, it is not a problem: you just avoid the wines you don’t like. But as a professional, you want to be able to assess all wines without some biological hindrance to your tasting. Of course, taste is adaptable: you can learn to appreciate certain flavours, and to some degree biological preferences can be compensated for. But given a choice, as a professional it helps a lot to be somewhere in the middle, without any blind spots (I certainly wouldn’t follow Syrah recommendations from a taster who can’t smell rotundone).

Finally, let’s consider how we can bring together wine flavour chemistry with our actual perception of a wine. Is it possible to link, with a degree of certainty, descriptors in a tasting note with chemical entities in the wine? It’s made tricky by the fact that sensations described by single descriptors might be a result of the combination of several chemicals. But let’s try with a couple of tasting notes taken from my recent blog postings. [Perhaps I might have success with more analytic tasting notes; these are written in a journalistic style. It might be interesting to explore this idea further.]

**Kirnbauer Blaufrankisch Classic 2009 Mittburgenland, Austria**

13% alcohol. Fresh with lovely raspberry and blackberry fruit to the fore. Vivid with hints of meat and some green notes. Lovely definition to the ripe black fruits with a hint of pepperiness. The green notes here are really attractive.

The raspberry and blackberry fruit are likely to be from fruit esters. The hints of meat? Could this be a little bit of brettanomyces? I don’t think so in this case, but it’s hard to rule out. The pepperiness may be our good friend rotundone. Green notes? Most likely methoxypyrazines, or maybe hexenal. In small doses, greenness can be attractive in a red wine.

**Hidalgo La Gitana Manzanilla La Gitana En Rama NV**
15% alcohol. Very bracing and aromatic with some salty, nutty savoury characters leading to a tangy palate with fresh, intense, nutty, savoury notes. There are complex flavours of hazelnut, citrus pith and a salty tanginess here. A really impressive, bracing expression of sherry that’s highly food compatible.

So this is a Manzanilla, and the nutty, savoury notes come from ethanal (acetaldehyde), which is formed by the contact between the flor and oxygen (it’s an oxidation product of alcohol). Ethanal has a nutty, appley taste, and it also affects the mouthfeel of the wine. The salty tanginess? Hard to say; perhaps this is a character that’s a result of the combination of the acidity (tartaric and malic acid). Or could it be the traditional explanation, that the proximity of the sea is giving Manzanilla its saltiness?

**Jamie Goode is a London-based wine writer with a scientific background. After completing a PhD in plant biology he worked as a science editor. Smitten by the wine bug, he began consumer-focused website www.wineanorak.com in 2000. The success of this site led to more work, and in 2005 he landed a national newspaper column and a book deal. Now he devotes all his energies to wine, and his second book, Authentic Wine, was published by University of California Press in September 2011, authored in conjunction with consultant winemaker Sam Harrop.**