Enhancing the experience through smell

Prof. Charles Spence of the Experimental Psychology Department at Oxford University explains how olfactory augmentation in food and beverage design influences our enjoyment of the taste.

While estimates vary, the majority of researchers seem to agree that smell contributes the majority of the sensory input when it comes to our experience, not to mention enjoyment, of eating and drinking[1]. While, the taste buds on the tongue provide information about the basic tastes (e.g., sweet, sour, salty, bitter, umami, metallic, fatty acid……and who knows, maybe a few more), it is the olfactory receptors in the nasal mucosa that tell us about fruity, meaty, floral, herbal, burnt aromas, etc.. Ironically, though, most of the time, we are unaware of just how much of the information we think we taste (via the tongue) is actually transduced by the nose, in large part because of the phenomenon of *oral referral* [2]: olfactory stimuli detected at the nasal mucosa are experienced as if coming from the mouth. While scientists used to believe that oral referral resulted from the tactile stimulation of the oral cavity that inevitably occurs whenever we eat and drink, the latest research now shows that the strength of oral referral depends primarily on the congruency between the retronasal olfactory and gustatory inputs.[1] The aroma of vanilla, say, being mislocalised to the oral cavity far more frequently when there is a sweet tastant in the mouth rather than a salty one[2]. In fact, I think it is fair to say that we now know more about the factors modulating oral referral than ever before.

However, it is clear that the majority of our everyday food experiences are not optimised to deliver the best orthonasal aroma hit possible. This is important because sniffing allows us (or rather, our brains) to form flavour expectations concerning both what the experience of tasting will be like and how much we may enjoy the experience[3]. Just take, as an example of poor design, at least from an orthonasal olfactory perspective, all of those millions of plastic lids that are routinely placed over Styrofoam cups of hot coffee and tea each and every day around the world[4]. While they undoubtedly allow consumers to drink their beverages without worrying about spillage, what these lids singly fail to do is to allow consumers to appreciate the orthonasal aroma of the contents. Unfortunate, really, given that the smell of freshly-ground coffee is one of the most liked of smells. The same problem also occurs when we drink direct from the bottle or can (uncouth though it may be). The orthonasal olfactory component is

[1] Retronasal olfaction occurs when volatile odours are pulsed out of the back of the mouth and into the nose when swallowing. Olfaction occurs orthonasally when we sniff external aromas from the environment.

simply missing. So, having identified the problem, what's to be done? In terms of design, simple solutions include reshaping the lid and adding a second opening in order to allow coffee (or tea) lovers to sniff the aroma of their hot beverage, for example the Viora enhanced orthonasal aroma delivery lid or the recently introduced 360 lid from Crown Packaging, in which the top lifts off allowing the drinker to see and orthonasally sniff the contents more easily than with a traditional can.

At the opposite extreme from the plastic lid, bottle or can that resolutely prevents the consumer from orthonasally enjoying the aroma of their drink, consider the traditional pint. Now, back when all beers seemed to taste the same (or when consumers were time-and-again shown to be unable to pick their favourite brand in the blind taste test), the lack of any headspace over the drink in the glass probably did not matter all that much. However, a craft beer revolution has swept the nation in recent decades and so now there are a host of beers that consumers are willing to pay a hefty premium for that really do taste distinctive. Perhaps, then, it is time to think again about the design of the glass in which so many pints are served.

In the case of wine, of course, the empty headspace over the liquid in a glass is meant to help to preserve the aroma and bouquet for the delight of the drinker's nostrils[5]. The better the wine, often, the larger the volume of headspace in the glass. But what of the aroma of craft beer? How much of it is lost to the atmosphere? If we value the flavour and aroma so much maybe it is really time to think a little more seriously about a redesign, ideally to leave room for the development of an aromatic headspace in the glass above the beer itself when it is served. Assuming, that is, that the customer does not immediately start thinking that they are being short-changed by a glass that is anything less than full to overflowing. Now, one might be tempted to argue that this does not really matter. After all, as soon as the drinker has had a few drafts of their beer, they will have created an aromatic headspace in their glass anyway. While this undoubtedly helps, the key point to stress here is that it is so often the first mouthful and even the initial sniff before tasting that sets our expectations about what is to come. It is these

expectations that end up anchoring and hence disproportionately influencing the overall tasting experience (i.e. when compared to the influence of the last mouthful, say). An alternative solution here, of course, would simply be to dust off those old beer glasses, such as the stein, which have a lid to help retain the gases released from beer.

Enhanced flavour delivery

Many of the world's top modernist chefs and molecular mixologists are currently thinking about how to deliver enhanced multisensory dining and drinking experiences through the more intelligent delivery of aroma and scent[6,7]. At its simplest, some are adding aroma that they hope will be integrated into the flavour of the dish, for example, the use of the atomiser to deliver the aroma of vinegar over the fish and chips dish served at Heston Blumenthal's The Perfectionist's Café at Heathrow's Terminal 2[8]. London-based chef, Jozef Youssef [9], has also been experimenting with the atomiser to deliver aroma to a number of his dishes. Note here, though, that it was most probably the Italian Futurists who deserve the credit for first using atomisers at the dining table. Though, they were more likely to spray perfume (e.g. the smell of carnation) into the diners' faces whenever they looked up from their plate[10]. Quite what effect that had on the flavour of the food has sadly not been recorded for posterity. A growing number of chefs and mixologists are also using smoking guns and dry ice based cloud pourers to deliver smoked or especially concentrated aromas to a dish or drink, often with an added dash of theatricality.

Setting the olfactory scene

It is important to note that aromas that are not necessarily highly desirable in terms of their flavour, are being added to dishes, drinks, tables or even to an entire dining room with the aim of creating a particular atmosphere or mood, or else to trigger a specific memory in the mind of the drinker or diner. For example, Blumenthal's moss-scented dish served at his flagship The Fat Duck restaurant or the hot water poured over the hyacinths at Alinea, when the wild turbot, shellfish, water chestnuts and hyacinth vapour dish is served. Grant Achatz, the head chef there, is also well-known for releasing the scent of burning oak leaves with his pheasant served with shallot and cider gel dish in order to try and trigger pleasant childhood memories of an autumnal day[6,10]. Heston Blumenthal uses the scent of the sweet shop to help extend the dining experience and hopefully trigger positive emotions in the diner's mind[7].

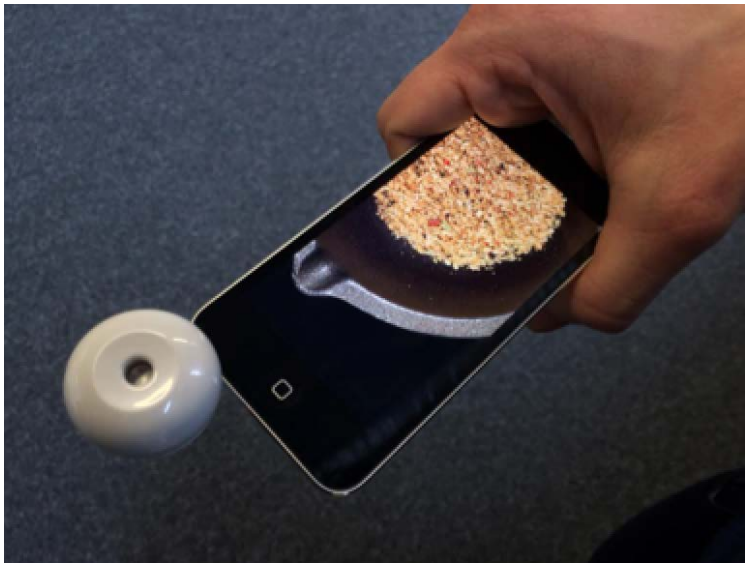
There is a danger for those trying to use both a non-food background scent together with the foreground aroma of the food itself that consumers may not always appreciate the scent and may even find it off-putting. Those working in the cognitive neuroscience study of multisensory perception might well have a few suggestions here for the modernist chef/molecular mixologist concerning how better to segregate the smell of the dish (or setting) from the aroma of the food (assuming that that is the aim).

Top mixologist, Tony Conigliaro, of 69 Colbrooke Row, serves an innovative cocktail going by the name of ‘the rose’. Basically, a sugar cube containing a few drops of rose oil is dropped into a glass of champagne and handed to the customer. The idea here is that the smell of roses transports the customer to a pleasant (not to mention fragrant) summer afternoon somewhere in their memory. Here, one can think of scent and aroma as playing a role just like visual projections or music that one often finds these days accompanying each of the dishes on the tasting menu at top experiential restaurants like Ultraviolet in Shanghai and Sublimotion in Ibiza[7].

Conigliaro’s innovative cocktail design is in some sense analogous to Blumenthal’s use of sound in his ‘Sound of the Sea’ seafood dish to transport the diner to reminisce about a pleasant childhood holiday. In a way, all of these culinary design solutions can be seen as attempts to capture the essence of the Provencal Rosé paradox – the name given to the experience that every one of us has likely had of wines that tasted better on the shores of the Mediterranean on a summer holiday than when the same bottle is tasted back at home on a cold winter’s night[7]. The advantage of scent, though, being that it is meant to have a closer, more direct, connection with the emotional and memory circuits in the brain than any of the other senses.

Using scent to extend the interaction

More futuristically, chef Andoni from Mugaritz in San Sebastian, which was recently voted one of the world's top 50 restaurants, has been using the Scentee, a scent-enabled plug-in for mobile devices, to allow diners, who have made a booking at his 2 Michelin-starred restaurant, to experience the actions, aromas and sounds that accompany one of the dishes on the tasting menu by downloading the appropriate app[11]. If smell is indeed such an important part of what we taste then any one of the innovations outlined here could certainly make sense from the gastrophysics perspective.



Aroma-enhanced design for the mass-market

Where the modernist chefs, molecular mixologists and culinary designers lead, though, food and beverage manufacturers are never far behind. Interesting in this regard are those companies which are starting to deliver aroma to the food and drink they provide through commercial packaging, glassware and cutlery. In 2013, for instance, PepsiCo submitted a patent application for the use of encapsulated aroma in the opening of its products[12] and later this year, the Drink Right cup will be launched. This glass drinking vessel contains a colourful aromatic sleeve that gives off the aroma of apple, orange or lemon. The idea is that consumers pour water into the cup and have a tasting experience that approximates what might be expected when drinking fruit juice, or at least fruit-flavoured water. It will be interesting to see just how important the

colour cues provided by the sleeve are to the tasting experience. Meanwhile, Molecule-R has developed an aroma fork, which aims to deliver flavour with every mouthful.

There is a danger with these developments that the experience can end up feeling too synthetic. This is not to say that we can always distinguish synthetic from natural aromas, mostly we cannot. But the aromas included in some of these new devices can tend to smell cheap and artificial.

The chances of such augmented aroma approaches succeeding in the long-term is obviously going to depend on the delivery of quality aromas at a reasonable price point. Aromas that are indistinguishable from the real thing, or at least what the consumer perceives as such. As soon as the consumer realises that the aroma that they are sniffing orthonasally does not originate from the food or beverage that they are tasting, but instead comes from the cutlery, glassware or packaging, they may be primed to think synthetic/artificial. It is that belief, as much as the evidence before their senses (i.e., nose), that will likely lead to reduced hedonic ratings (similar responses may result from beliefs regarding organic food, low-fat food, branding, etc.), despite the undoubted novelty of these approaches.

It is interesting to note how often the modernist chefs stress, either explicitly or otherwise, the ‘natural’ origins of their off-the-plate aromas. For example, the aroma released when hot water is poured over the all-too-real hyacinths in which the food sits at Alinea or the recently deceased Homaro Cantu’s use of fresh sprigs of herbs in the curly handles of his cutlery at Moto restaurant in Chicago. The natural source of the off-the-plate aroma is clear for all to see.

Ultimately, we are just going to have to wait and see how the consumer of tomorrow responds to this all new world of olfactorily-enhanced food and beverage packaging, not to mention multisensory experiential dining, drinking and cutlery. If anything, the chances of success in

this space will likely be enhanced by the growing trend toward 'sensploration' that has apparently gripped many high-end consumers recently[13]. The food and beverage companies, together with the flavour houses, need to take a leaf out of the chefs' and mixologists' book and figure out exactly how to stress the naturalness of their novel olfactorily-enhanced design propositions.

Conclusions

While it is altogether appropriate that the space of olfactory augmentation in food and beverage design is explored first by those wishing to deliver unusual/enhanced multisensory tasting experiences (i.e., by the modernist chefs, molecular mixologists and culinary artists and designers), the hope, looking forward, has to be that these approaches can be used to help promote healthier eating behaviours as well. Could the enhanced delivery of aroma through food and beverage packaging or cutlery lead not only to greater enjoyment, for example, but also help the consumer to reach satiety sooner?

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