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The myths and realities of odour psychology

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We exist with odours all around us from the food we prepare, buy and eat, the environment we live within, and the offices, houses, apartments, toilets, animals, and people we come across day in, day out. We make judgements about what we smell, where odour certainly influences the proximity of our relationships with others. Body odours tell us a lot about a person’s disposition. Odour influenced public policy about sewage and rubbish collection and was one of the main reasons the world’s population is no longer subject to great plagues that hit earlier societies through the ages.

The ability to smell was one of our most primal senses, which was important in helping us find food, give warnings of danger, and identify spoiled food, etc. Odour also masked our body odours and gave us a sense of pleasure and sensuality. The importance of odour has declined in our age as most city buildings and homes are relatively sterile or neutral in their odour. The majority of odours we come across in the urban environment are commercially produced in the bakery, from an air freshener, through the air conditioning system, or from a colleague wearing an *eau de toilette*. Relatively few people now directly appreciate the odour of new mown hay, the changing odour of hanging jasmine on a trellis, or the smell of ozone after a thunder storm.

We must first understand some of the basic concepts about the physiology and cognitive aspects of our olfactory architecture to understand the myths and realities about the psychology of smell.

**Our olfactory architecture**

How the olfactory system works has been well explained by other literature and this will only be briefly recanted here. When we sniff something or just breathe in through our nose, we also inhale aromatic molecules with the air. These molecules are bundled together in their millions and diffuse from their concentration according to Graham’s law (the rate of effusion of a gas is inversely proportional to the square root of the mass of particles) towards areas of lesser concentration where the olfactory mucosa, a membrane with a mucous surface contains the olfactory receptors at the top of the nasal cavity. Odour molecules are slightly water soluble and can pass through the lipid rich mucous that immerse the receptors at the epithelium surface and interact with olfactory receptor neurons. The odorants bind with the olfactory receptor neurons and change the shape of proteins, creating ion flows which pass along the axons of the olfactory nerve through the cribriform plate or skull to reach the olfactory bulb (alomeruli) which is an outcropping from the inferior (bottom) side of the pre-frontal cortex of the brain.

The olfactory mucosa also contains another sensory system made up of trigeminal nerve receptors which are able to sense tactile pressure, pain, and temperature variation. They also exist around the mouth and eyes. These receptors can sense hot, cold, tingling, and irritability, in a similar manner to the skin. It is through these receptors that we can sense the coldness of menthol and the warmth of methyl salicylate. Up to 70% of our odour perception travels through this system of receptors.

As mentioned above, aromatic molecules must possess some water solubility characteristics, have a high vapour pressure, and have the ability to dissolve in fat. Molecules above a molecular weight of 300 cannot pass through the mucous membrane, thus our inability to smell any molecule with a molecular weight more than that. Each neuron has only one type of receptor, of which there are about 1,000 different types. Even aromatic molecules with slightly different chemical structures activate different types of receptors, so octanal smells like orange will be differentiated from the similar octanal acids which are sweeter. Larger amounts of aromatic molecules tend to bind a wider variety of receptors than do smaller amounts of the same molecule. This may explain why concentrated amounts of indole tend to smell horrible but lower concentrations smell somewhat sweet and florally. Although the rate of odour flow does not affect the intensity of the odour, a concentrated odour molecule that attaches to most receptors may prevent
the receptors sensing other odour molecules bringing on a condition that a perfumer calls olfactory fatigue, where the sense of smell is lost to other odours for a short period of time until the receptors are free again.

It is estimated that a human can differentiate between 5,000-10,000 odours. This is probably possible through some method of combinational recognition and processing scheme to encode the identities of different odours, and a single odour may be recognisable by a single receptor and different odourants are recognised through different combinations of receptors.

However, just as a person can recognise slurred vowels spoken by someone or read sentences that are spelt incorrectly, the brain through the process of categorical perception simplifies our perception loads into convenient odour groups or categories. As we know, similarly structured molecules do not necessarily smell the same, and differently structured molecules may smell the same, thus it is not easy to relate smell with the physiochemical structure to our sense of smell. Our categorisation of odours actually puts limits and biases upon how we define them through the various classification systems that have been developed over the years. It is only when brilliant innovations are recognised that our restricted vocabularies are expanded. Fragrance was categorised into nicely restrictive compartments until Martin Gras wrote his two seminal papers The Overdose and The Overdose II that we could see beyond the compartmental definitions we devised for ourselves.

Unlike the receptors in our sight and hearing, olfactory receptors regenerate.

Cognitive processing

What happens next is much more interesting and relevant to the myths and realities of odour psychology. Sensory information from the olfactory bulb is despatched to two different locations within the brain.

The first is the limbic cortex deep within the middle of the brain, responsible for our emotions, moods, feelings, sexual arousal, and long term memory retrieval. It is also responsible for the feelings of “high” or intoxication we feel from recreational drugs. The limbic cortex is very closely connected to the pre-frontal lobes, which are responsible for our creativity and imagination. Both these areas, the pre-frontal lobes and limbic cortex, play a very important role in our motivations, and thus behaviour.

The second area that signals are sent to is the hypothalamus which is responsible for the restoration of the physical metabolism through balancing hormones, blood glucose, and regulating temperature. In women, the hypothalamus synchronises the levels of oestrous which controls menstruation. In animals, the hypothalamus regulates sexual drive from receiving certain pheromonal stimuli, but to date this process has not been found in humans. Pheromones tend to be odourless chemicals to humans but in animals influence behaviour in powerful ways. It is questionable whether our olfactory system would detect them. The hypothalamus also reacts to blood-borne stimuli, which may be an important issue in aromatherapy, discussed a little later.

Due to the fact that our olfactory system connects directly to the emotional part of our brain, one would expect odour to evoke primal behaviour in humans. This is not the case, in fact the brain does not know what any odour signifies until we learn what it is and through our life experiences connect particular odours to our feelings and emotions. The meaning of fragrance is a socially constructed reality; just like we learn the meanings of words, sounds, and things we see and touch.

Just like everything else, odours are not encoded with any meaning at the perception level. Odours are compared to the “database” of our life experiences within our long term memory to provide meaning. Prior to this socialisation, all odours are inherently neutral in being pleasant or unpleasant and have no attached emotional or other meaning embedded within our memory. Thus, any meaning attached to any odour is the result of our experiences and socialisation, requiring associations between perception, the odour, the event, and our feelings and emotions about it. But due to the fact that odour perception information flows directly to the limbic cortex, odour acts very quickly,
prompting stimuli to retrieve memory and emotions.

The following examples show odour is a cultural phenomenon. First, the odour of chilli; to some this means something delicious to crave for, Thai samtarn for example. To others, the smell of chilli (or maybe more correctly, the associated odours around a chilli based dish) acts as a warning: “Don’t eat this or I will suffer badly”. Again a bakery in a shopping mall gives an Australian a sense of feeling good, but the smell of a good curry will give a South Asian that same sense of feeling good and anticipation (however, with the globalisation and move into cross-cultural fusion cuisines, culinary signals now work across many cultures, rather than the culture that the dish originated from). Chempaka flowers have a deep rich, sweet floral odour reminiscent of one of the finest fragrances, quite popular in the West, but to a Malay it symbolises death, as the tree is common in graveyards. Food and odour are social constructions.

We can see this socialisation in all the things we smell. Lemon did not give the idea of “fresh” until we socially accepted it as so. Remember the heavy advertising idea of “fresh” until we socially accepted it. Odour was not sensual in the beginning: it had to be connected to sensuality. The earliest known use of fragrance for sensual purposes was the use of fragrant plants infused into olive and sesame oils for ointments around 7,000 BC. Around 3,000 BC the Egyptians used myrrh for their pleasure and by 700 BC, Athens was a mercantile trading centre for perfumes. Aristocrats during the first century AD in Rome heavily imported frankincense and myrrh. Nero was famous for his scented parties – as no “orgy” was complete without perfume.

The commercialisation of fragrance

Research into cognitive olfaction dragged behind the other senses until relatively recently. We cannot predict what fragrance will be popular and sell well, as there are no universal rules or secrets that can be employed because the psychological effects depend so much on acquired associations. Remember Lt. Col. Bill Kilgore of the air cavalry in the film Apocalypse Now, played by Robert Duval, where he said in that famous beach landing scene: “Do you smell that son, napalm son... I love the smell of napalm in the morning... it smells... like....victory”. Odour is associated with values and aspirations, dreams and hopes. Odour is our fantasy and brings memories, personal meanings, and feelings to the present.

Why is this so important? Because we are influenced by our internal cognitive processes, our memory and the outside world. Product creation requires imagination to construct the customer orientations necessary. But the essence of opportunity also requires consumers to be imaginative, by bringing the external internally; to imagine what it would be like to live at Sanctuary Cove on the Gold Cost of Queensland, Australia, to imagine what it would be like consuming a Ferrero Rocher Chocolate, to imagine climbing the Eiffel Tower in Paris, France, to imagine skiing at Boulder, Colorado during the winter holidays, to imagine owning an Apple iPhone, to imagine wearing Beyonce Perume, to imagine the benefits to the community a cup of Starbucks Coffee would have, and how that raffle ticket would assist the fight against cancer. Imagination is an aid to practical thinking and opens the door to making purchasing decisions. All our hopes, enlightenment, fears, and desires come from imagination. Brands are able to give consumers a sense of identity and enrich their life experiences, a shared imagination or fantasy. Together the internal and external determine our behaviour, which is what marketing is about. Figure 1 schematises the olfactory interpretation process from input to response, highlighting the role of fragrance in the marketing picture.

Internally we are influenced by our selectivity, what we put our attention upon, which is influenced by our motivations, emotions, curiosity, values, cognitive, style, experience, personality, and interests. Externally, we are attracted/distracted by the symbols, meaning, peer acceptances, messages aimed at various characteristics of our ego like “satisfying needs and wants”, “sensual pleasure”, “status symbols”, “feeling good”, “being attractive to others”, “gaining admiration from others”, “power”, “fun”, “happiness”, etc. Product promoters try to create the images and symbols that we will connect to our alter ego and stimulate our imagination that has emotional strength to influence our behaviour. And it is when companies...
The art of science

Multifunctional Cosmetic Additives

Successfully develop a shared imagination stimulated by the themes, images, symbols, and personalities they project into their products, that are supported by the attributes of the product, market success is within the firm’s grasp. Fragrance is one of the most powerful of these attributes. Try walking past a Dunkin Donut store when they are making a fresh batch of donuts. Fragrance combined with the shop layout, position, colours used, combine to create an influence that is hard to resist. Fragrance, when combined with the other senses, is extremely powerful, and companies know that. They create the images and symbols and try to embed them within us.

So is it the odour that sells the product, or other factors? Somewhere, one hopes, the answer lies within the continuum of these factors. Without the other factors a fragrance is not immediately meaningful. The role of fragrance is to help differentiate the product from its competitors. Fragrance in cosmetics and personal care products helps to render a product distinguishable to the consumer in the vast array of products on the shelf. In highly developed markets, cosmetics, toiletries and household products have reached a stage where differentiation of primary product image builders (advertising, promotion, price, packaging) have become difficult to develop as a source of competitive advantage over competing products. Secondary image builders (fragrance, colour, types of ingredients used in the product) took on more importance in the 80s and 90s. Now themes are the great product differentiators, of which fragrance is the prompting mechanism. Figure 2 shows a product/strategy attribute profile where both primary and secondary product attributes are merged to create the product’s image with consumers. If all the product attributes together can successfully espouse a theme, then a very powerful product identity will be created. Look at fine fragrance marketing campaigns we discussed above as an example.

We have been socially conditioned to associate odour to particular emotions, stimulation of intense pleasure, efficacy, freshness, sensuality, gentleness, and success, etc. This link between odour and emotion is so powerful that very old memories and vivid emotions can be evoked instantaneously like experiences that occurred yesterday. Fragrances are signals which can communicate messages to consumers.

Thus the product message must be converted into an odour. The perfumer must be aware of the issues involved, where various fragrance families can aid in suggesting gentleness, freshness, strength, and efficacy in a product. For example some citrus notes can convey the concept of fresh, which is important in dishwashing liquids, while laundry products may require gentle, efficacy or freshness-efficacy, depending upon the target consumer. A shampoo may require fresh and gentle or fresh and efficacy depending upon the message the perfumer wants to get across.

**Figure 3: Psychological grid of fragrance interpretation.**

- **Citrus Family**: Orange, Lemon, Grapefruit
- **Mint**: Peppermint, Spearmint
- **Floral Family**: Rose, Jasmine, Lily
- **Ambergris**: Sandalwood, Vanilla
- **Coniferous**: Pine, Fir
- **Spicy**: Ginger, Cinnamon
- **Metallic**: Chrome, Silver
- **Woody**: Cedar, Oak
- **Ozonic**: Sea spray, Freshness
- **Powdery**: Musk, Softness
- **Balsamic**: Patchouli, Citrus
- **Green**: Grass, Garden
- **Peppery**: Tomato, Pepper

to the consumer. These are supported by, and also support the other product attributes the company associates with its product. Figure 3 shows a grid where different fragrance families are plotted within the four sectors denoting gentleness, freshness, strength and efficacy. Some individual notes from within a family can differ in their message from the rest of the family, as is the example in the floral family where some are gentle, others fresh, and others signifying strength and efficacy. These are all subjective classifications which are culturally sensitive.

Myths and realities

So what are the myths and realities of odour psychology? What does it mean to the industry and the future of fragrance as an integral part of the product attributes? How does what we know about cognitive olfactory processing alter what we believe about odour psychology? Some of these questions are answered by merging the disciplines of human physiology, cognitive science, aromatic chemistry, psychology, and marketing as we have in this paper, which are summarised in Table 1.

Note: A version of this article was first published by the Australian Society of Cosmetic Chemists.

References


Table 1: What are the myths and realities of odour psychology?

<table>
<thead>
<tr>
<th>Myth</th>
<th>Reality</th>
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<tbody>
<tr>
<td>To our present knowledge there are no aromatic materials that act as pheromones on humans. Human pheromones are considered a myth. Fragrance does not physiologically sexualy arouse people; rather any effects are from emotional association and suggestion based on society’s current set of behaviours. The most important sexual aid we have is our imagination.</td>
<td>Just like any language is limited by its vocabulary, fragrance novelty is limited by the fragrance vocabulary and classification systems of the day. Novelty only increases its bounds when perfumers go beyond current classifications and create the need for new classifications. In probability with the commercial orientations of the industry, breaking the bounds will be a truly rare occurrence that will happen only a couple of times each century.</td>
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<td>Any fragrance creation will not be deemed novel without reference to the acceptance of peers and customers. Commercial success rather than the beauty of the product itself is the criteria by which any odour is deemed novel in the fragrance industry. Therefore fragrance creativity has a competitive streak through it in commerciality, taking it further away from the concept of art. This is contrary to what the “new age” natural perfumers aspire.</td>
<td>Aromatherapy efficacy through inhaling odours depends upon the ability of the odour to connect with moods and emotions to be effective. As we are aware, the connection of odours to emotions is a social construction and the way aromatherapy through inhalation works is through the beliefs of the user. There is nothing wrong with that because it is what one believes that is reality, and the correlation between moods and wellbeing is a strong one. The relationship between odour and the hypothalamus is still unexplored territory at this point of time. Aromatherapy through infusion and massage has the ability to push more essential oils into the body through digestion and skin absorption respectively.</td>
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<td>Odour does stimulate behaviour through our emotions but in specific situational ways that may be unique to every individual, remember the Killgrove example. Due to olfactory signals going directly to the limbic cortex which also controls emotions, fragrance will always have an important influence on humans that fragrance and cosmetic companies will continue to try to exploit. Perfumery will remain a multi-billion dollar commercially orientated industry.</td>
<td>Our olfactory receptors cannot distinguish between natural and synthetic odours because, to all intents and purposes, the molecule is exactly the same, except for some isomer differences. The appreciation of something natural is a value rather than being something physiologically different. There is nothing wrong with having values about things, because without values the human species would not survive.</td>
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<td>Odour is situational to people, places, and contexts. Due to the influences upon (air conditions, fatigue, concentrations, etc.), and architecture of the olfactory system, different people in different circumstances will smell an odour differently. This is also cultural specific, and contextual to different situations, i.e., camphor is medicinal to Australians but used to embalm corpses in Malaysia, thus creating different imagery in people.</td>
<td>Finally, a great perfumer must have imagination, curiosity, the emotions of interest and passion, olfactory sensitivity, a prior knowledge of odorous materials and their characteristics, knowledge of outstanding fragrance creations, practical experience, time, patience and perseverance, be an artist, psychologist, and marketing practitioner, all in one.</td>
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