The Smell Report

An overview of facts and findings

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The human sense of smell

Although the human sense of smell is feeble compared to that of many animals, it is still very acute. We can recognise thousands of different smells, and we are able to detect odours even in infinitesimal quantities.

Our smelling function is carried out by two small odour-detecting patches - made up of about five or six million yellowish cells - high up in the nasal passages.

For comparison, a rabbit has 100 million of these olfactory receptors, and a dog 220 million. Humans are nonetheless capable of detecting certain substances in dilutions of less than one part in several billion parts of air. We may not be able to match the olfactory feats of bloodhounds, but we can, for example, 'track' a trail of invisible human footprints across clean blotting paper.

The human nose is in fact the main organ of taste as well as smell. The so-called taste-buds on our tongues can only distinguish four qualities - sweet, sour, bitter and salt -all other 'tastes' are detected by the olfactory receptors high up in our nasal passages

Variations

Our smelling ability increases to reach a plateau at about the age of eight, and declines in old age. Some researchers claim that our smell-sensitivity begins to deteriorate long before old age, perhaps even from the early 20s. One experiment claims to indicate a decline in sensitivity to specific odours from the age of 15! But other scientists report that smelling ability depends on the person's state of mental and physical health, with some very healthy 80-year-olds having the same olfactory prowess as young adults.

Women consistently out-perform men on all tests of smelling ability (see *Sex differences*, below).

Schizophrenics, depressives, migraine sufferers and very-low-weight anorexics often experience olfactory deficits or dysfunctions. One group of researchers claims that certain psychiatric disorders are so closely linked to specific olfactory deficits that smell-tests should be part of diagnostic procedures. Zinc supplements have been shown to be successful in treating some smell and taste disorders.

Although smoking does not always affect scores on smell-tests, it is widely believed to reduce sensitivity.

A recent study at the University of Pennsylvania suggests that, contrary to popular belief, blind people do not necessarily have a keener sense of smell than sighted people. In their experiments on blind and sighted people, the top performers on most tests were (sighted) employees of the Philadelphia Water Department who had been trained to serve on the Department's water quality evaluation panel. The researchers conclude that *training* is the factor most likely to enhance performance on smell tests. (University of Pennsylvania researchers are probably fairly clued-up on this subject - they designed the University of Pennsylvania Smell Identification Test (UPSIT) which is the standard test used in almost all experiments.)

The importance of 'training' in the development of smell-sensitivity is confirmed by many other studies. Indeed, this factor can sometimes be a problem for researchers, as subjects in repetitive experiments become increasingly skilled at detecting the odours involved.

Smell-sensitivity researchers have to be very careful about the odours they use in experiments, because a smell is not always a smell. Many odorous substances activate not only the olfactory system but also the 'somatosensory' system -the nerve endings in our noses which are sensitive to temperature, pain etc. This is why 'anosmics' - patients who have completely lost their sense of smell - can still detect menthol, phenylethyl alcohol and many other substances. In a study testing anosmics' ability to perceive odorous substances, it was found that many so-called odours are in fact affecting the pain- and temperature-sensitive nerve-endings, rather than the olfactory receptors. Out of 47 'odorous'

substances, anosmics could detect 45. (Only two substances could not be detected by the anosmic patients: these were decanoic acid and vanillin, which affect only the olfactory receptors, and can thus safely be classified as ‘pure’ odours.) Some unpleasant ‘smells’ do more than just annoy or disgust us, they actually cause us pain.

Children

Although smell-identification ability increases during childhood, even newborn infants are highly sensitive to some important smells: recent research shows that newborn babies locate their mothers’ nipples by smell. In experiments, one breast of each participating mother was washed immediately after the birth. The newborn baby was then placed between the breasts. Of 30 infants, 22 spontaneously selected the unwashed breast.

Other experiments have also shown that babies are responsive to very faint differences in body odour, but it is believed that infants are highly sensitive only to specific smells, rather than a wide range of odours.

In terms of odour *preference*, however, one significant study showed that 3-year-olds have essentially the same likes and dislikes as adults.

Experiments conducted in the early 70s and replicated in 1994 revealed that children do not develop sensitivity to certain odours until they reach puberty. In these studies, 9-year-olds showed a pronounced insensitivity to two musk odours, although their ability to detect other odours was the same as that of postpubescents and adults.

Emotion

The perception of smell consists not only of the sensation of the odours themselves but of the experiences and emotions associated with these sensations. Smells can evoke strong emotional reactions. In surveys on reactions to odours, responses show that many of our olfactory likes and dislikes are based purely on emotional associations.

The association of fragrance and emotion is not an invention of poets or perfume-makers. Our olfactory receptors are directly connected to the limbic system, the most ancient and primitive part of the brain, which is thought to be the seat of emotion. Smell sensations are relayed to the cortex, where 'cognitive' recognition occurs, only *after* the deepest parts of our brains have been stimulated. Thus, by the time we correctly name a particular scent as, for example, 'vanilla' , the scent has already activated the limbic system, triggering more deep-seated emotional responses.

Mood-effects

Although there is convincing evidence that pleasant fragrances can improve our mood and sense of well-being, some of these findings should be viewed with caution. Recent studies have shown that our *expectations* about an odour, rather than any direct effects of exposure to it, may sometimes be responsible for the mood and health benefits reported. In one experiment, researchers found that just *telling* subjects that a pleasant or unpleasant odour was being administered, which they might not be able to smell, altered their self-reports of mood and well-being. The mere mention of a positive odour reduced reports of symptoms related to poor health and increased reports of positive mood!

More reliable results have been obtained, however, from experiments using placebos (odourless sprays). These studies have demonstrated that although subjects do respond to some extent to odourless placebos which they think are fragrances, the effect of the real thing is significantly greater. The thought of

pleasant fragrances may be enough to make us a bit more cheerful, but the actual smell can have dramatic effects in improving our mood and sense of well-being.

Although olfactory sensitivity generally declines with age, pleasant fragrances have been found to have positive effects on mood in all age groups.

In experiments involving stimulation of the left and right nostrils with pleasant and unpleasant fragrances, researchers have found differences in olfactory cortical neurone activity in the left and right hemispheres of the brain which correlate with the 'pleasantness ratings' of the odorants. These studies are claimed to indicate that positive emotions are predominantly processed by the left hemisphere of the brain, while negative emotions are more often processed by the right hemisphere. (The 'pleasant' odorant used in these experiments, as in many others, was vanillin.)

Perception effects

The positive emotional effects of pleasant fragrances also affect our perceptions of other people. In experiments, subjects exposed to pleasant fragrances tend to give higher 'attractiveness ratings' to people in photographs, although some recent studies have shown that these effects are only significant where there is some ambiguity in the pictures. If a person is clearly outstandingly beautiful, or extremely ugly, fragrance does not affect our judgement. But if the person is just 'average', a pleasant fragrance will tip the balance of our evaluation in his or her favour. So, the beautiful models used to advertise perfume probably have no need of it, but the rest of us ordinary mortals might well benefit from a spray or two of something pleasant. Beauty is in the nose of the beholder.

Unpleasant smells can also affect our perceptions and evaluations. In one study, the presence of an unpleasant odour led subjects not only to give lower ratings to photographed individuals, but also to judge paintings as less professional.

The mood-improving effects of pleasant smells may not always work to our advantage: by enhancing our positive perceptions and emotions, pleasant scents can cloud our judgement. In an experiment in a Las Vegas casino, the amount of money gambled in a slot machine increased by over 45% when the site was odorised with a pleasant aroma!

In another study - a consumer test of shampoos - a shampoo which participants ranked *last* on general performance in an initial test, was ranked *first* in a second test after its fragrance had been altered. In the second test, participants said that the shampoo was easier to rinse out, foamed better and left the hair more glossy. Only the fragrance had been changed.

Scent-preferences

Scent-preferences are often a highly personal matter, to do with specific memories and associations. In one survey, for example, responses to the question 'What are your favourite smells?' included many odours generally regarded as unpleasant (such as gasoline and body perspiration), while some scents usually perceived as pleasant (such as flowers) were violently disliked by certain respondents. These preferences were explained by good and bad experiences associated with particular scents.

Despite these individual peculiarities, we can make some significant generalisations about smell-preference. For example, experiments have shown that we tend to 'like what we know': people give higher pleasantness ratings to smells which they are able to identify correctly. There are also some fragrances which appear to be universally perceived as 'pleasant' - such as vanilla, an increasingly popular ingredient in perfumes which has long been a standard 'pleasant odour' in psychological experiments (see *Vanilla*, below).

A note for perfume-marketers: one of the studies showing our tendency to prefer scents that we can identify correctly also showed that the use of an appropriate *colour* can help us to make the correct identification, thus increasing our liking for the

fragrance. The scent of cherries, for example, was accurately identified more often when presented along with the colour red - and subjects' ability to identify the scent significantly enhanced their rating of its pleasantness.

Vanilla

In the early 1990s, perfume makers began to introduce vanilla as a significant note in their fragrances. Now, vanilla is a dominant ingredient in a large number of perfumes - and the Body Shop have recently launched a pure vanilla fragrance.

Various attempts have been made to explain the current unprecedented popularity of vanilla-based fragrances. Many have tended to focus on the pleasant childhood memories associated with the smell of vanilla, its comforting milky warmth. Others have noted the appropriateness of vanilla scents for the 'softer, more caring' zeitgeist of the 1990s - as opposed to the thrusting, bullish 80s, when the fashion was for perfumes so overpowering that restaurants had to ban them because customers could not taste their food.

Both of these factors have clearly contributed to the vanilla-boom. Scientists have been studying the intimate connection between olfaction and memory for some time - and the power of scents to evoke vivid memories has long been a favourite device of novelists and poets. Proust's *Remembrance of Things Past* opens with the most famous 'olfactory flashback' in literature, when the sweet aroma of a simple little cake releases several hundred pages of childhood memories - or what Proust calls 'the vast structure of recollection'.

A recent experiment has shown that most of us, unlike Proust, have some difficulty in expressing this vast structure of recollection in words. Subjects were presented with visual (an object), lexical (the name of an object) and olfactory (the odour of an object) stimuli, and asked to write down whatever came into their heads. Written responses to the visual and lexical stimuli were much longer than those for the olfactory mode, but responses to the odours were far more emotive, and all referred to memories.

Not all childhood memories are pleasant, of course, but those associated with vanilla are almost invariably positive - sweet treats and rewards, ice-cream holidays, innocent pleasures, etc. - which certainly helps to explain its popularity.

The 1990s-zeitgeist explanation also has its merits. Vanilla is associated not only with warmth, softness and caring, but also has connotations of purity and simplicity. The term ‘plain vanilla’, used by typesetters and graphic designers, means ‘untouched’ text - text in its natural, basic, original state, before designers have tarted up the headings, adjusted the margins, tinkered with typefaces, etc. This term is now often used outside the publishing world, and anything that is simple, pure, honest and unadulterated may be referred to as ‘plain vanilla’. The Body Shop’s vanilla fragrance, being pure vanilla with no other scents, is perhaps the most faithful expression of 1990s values.

Yet there is hard scientific evidence to indicate that the popularity of vanilla fragrances could be more enduring than these explanations suggest. The scent of vanilla has proven positive and beneficial effects which have nothing to do with current fashion, changing values or even childhood memories.

For example:

- Psychologists and medical researchers were aware of our positive reactions to the scent of vanilla long before perfume makers recognised its potential. In experiments where an odour universally regarded as ‘pleasant’ is required, vanillin has been a standard choice for decades.

- Medical experiments have shown that vanilla fragrance reduces stress and anxiety. Cancer patients undergoing Magnetic Resonance Imaging - a diagnostic procedure known to be stressful - reported a massive 63% less anxiety when heliotropin (a vanilla fragrance) was administered during the procedure.

- Vanilla fragrance makes you calmer. A study at Tubingen University in Germany showed that vanilla fragrance reduced the startle-reflex in both humans and animals. The animal results indicate that the calming effects of vanilla may be due to some more essential

property of the fragrance than the ‘positive childhood associations’ usually invoked to explain its universal popularity with humans.

It is important to remember that these effects have only been documented for pure vanilla fragrance - not perfumes containing a blend of vanilla and other notes.

Sex-differences

On standard tests of smelling ability - including odour detection, discrimination and identification - women consistently score significantly higher than men. One researcher has claimed that the superior olfactory ability of females is evident even in newborn babies.

One study suggests that sex-difference findings may not be entirely reliable, and that sex differences in olfactory prowess may apply to some odours but not others.

It is also possible, however, that many studies have not taken account of the changes in female sensitivity to smell during the menstrual cycle. It is known that female sensitivity to male pheromones (scented sex hormones), for example, is 10,000 times stronger during ovulation than during menstruation. It may be that female smell-sensitivity is also generally more acute during this phase. (It has been shown that other senses such as hearing are more acute around ovulation, when women can also hear slightly higher frequencies than at other times.) These fluctuations may account for some inconsistencies in the findings, although hormone cycles cannot explain why female children score higher than male children.

In an experiment at the Hebrew University, Jerusalem, women without children held an unrelated infant in their arms for one hour and then were tested for infant-smell-recognition. Most were successful. The researchers conclude “This indicates that the ability to identify infants by their odor is a more general human skill than previously realized.” But they didn’t test men, so it may only be a general *female* skill.

Other tests have shown, however, that both men and women are able to recognise *their own* children or spouses by scent. In one well-known experiment, women and men were able to distinguish T-shirts worn by their marriage partners, from among dozens of others, by scent alone.

Women are also significantly more likely than men to suffer from ‘cacosmia’ - feeling ill from the smell of common environmental chemicals such as paint and perfume.

Sexual attraction

The attractive powers of pheromones (scented sex hormones) have often been exaggerated - not least by advertisers trying to sell pheromone-based scents and sprays which they claim will make men irresistible to women.

Widely publicised research findings on female sensitivity to male pheromones have also led some men to believe that the odour of their natural sweat is highly attractive to women.

Women are indeed highly sensitive to male pheromones, particularly around ovulation, but many popular assumptions about the effects of these pheromones are the result of misinterpretation and over-simplification of the research results.

All male pheromones are not equally attractive, and some of the myths stem from an understandable confusion over their names. The male pheromone androste*none* is not the same as androste*nol*. Androste*nol* is the scent produced by *fresh* male sweat, and is attractive to females. Androste*none* is produced by male sweat after exposure to oxygen - i.e. when less fresh - and is perceived as highly unpleasant by females (except during ovulation, when their responses change from 'negative' to 'neutral').

So, men who believe that their 'macho', sweaty body-odour is attractive to women are deluding themselves, unless they are constantly producing fresh sweat and either naked or changing their clothes every 20 minutes to remove any trace of the oxidised sweat. Generally, the female-repelling androstenone is the more prominent male body odour, as the fresh-sweat odour of androstenol disappears very quickly. In terms of scent, the sweaty macho-man is therefore likely to be unattractive to most women, most of the time - at best, he may elicit a grudging 'neutral' response from women who happen to be ovulating (which of course excludes all those taking oral contraceptives).

Although the male pheromone androstenol has been shown to be attractive to women, men's use of pheromone-based scents to attract women may not have the desired effect. An experiment in

which a pheromone-sprayed chair in a dentist's waiting room was most frequently chosen by women is often cited in support of the attractive power of male pheromones. The problem with this conclusion is that the pheromone in question can only be detected at a distance of about 18 inches, so the women would have to have selected the chair and sat down before becoming aware of its scent.

A further difficulty in this context is that although pheromone-based scents may have an arousing effect on women, the women will not be aware of the source of their arousal. A man wearing pheromone scent at a crowded party will still have to compete with the other men present for the attention of the women. Only in a strictly one-to-one, intimate encounter could the arousing effect of the scent actually benefit the man wearing it - and to achieve such an encounter, the man must presumably be capable of attracting the woman by some other means. In the context of social situations, it is perhaps also worth noting that androstenol has been shown to be attractive to *men*, as well as women!

Another experiment showed, however, that daily use of pleasant-smelling colognes significantly improves the mood of middle-aged men, reducing mood disturbances such as tension, depression, anger, fatigue and confusion which are associated with the 'mid-life crisis'. This personal sense of well-being, good humour and confidence, which will inevitably be reflected in behaviour, may be of more help in attracting potential partners than the fickle and unreliable effects of pheromone-sprays.

Similar mood-improvements have been observed in studies of the effects of perfume use on middle-aged women. Women at mid-life, particularly post-menopausal women taking hormone treatments, tend to suffer fewer mood disturbances than middle-aged men. (Contrary to popular opinion, the so-called 'male menopause' seems to involve more pronounced emotional disorders than the female version.) But regular use of pleasant fragrances still had a significant beneficial effect on the emotional well-being of mid-life females, and another study showed that young women experience equally positive effects. Again, the cheering effect of pleasant fragrances may also make women more attractive to potential partners.

Women who believe that the use of ‘sexy’ perfumes will attract men, however, may be misguided. Women’s sensitivity to musk, an ingredient commonly used in perfumes, is 1000 times greater than men’s. ‘Sexy’ perfumes containing musk are therefore much more likely to arouse the woman wearing them than any potential male partners. But by making a woman *feel* more sensual, the perfume may affect her behaviour and thus indirectly increase her attractiveness.

A number of women’s magazines have recently carried good-news reports claiming that the smell of cinnamon buns has been proven to ‘boost male erections’ - some use the more scientific-sounding euphemism ‘increase penile blood-flow’. A few reports also mention lavender.

In fact, the study in question - conducted by the Smell and Taste Research Foundation in Chicago - discovered only that ‘in those with a normal olfactory ability, a variety of odours can increase penile blood-flow’. These odours included pumpkin pie, liquorice, doughnuts and lavender, and various combinations of these, as well as oriental spice and cola. The most effective were a lavender/ pumpkin pie mixture, a doughnut/ black liquorice mixture and a pumpkin pie/doughnut mixture - but the results depended on other factors such as whether the participants’ partners wore cologne and how many times they had had intercourse in the last month.. In short, the only reliable conclusion to be drawn from this is, as the authors themselves admit, that all sorts of smells can increase penile blood flow.

Even this is not very surprising, as any strong odour will have a stimulating effect, which will cause a general increase in blood flow to the extremities - inevitably including the penis. A very powerful odour, such as smelling-salts, can even revive someone from a dead faint. If your partner is actually asleep or unconscious, this old-fashioned remedy may be more effective than the lavender/pumpkin pie mixture - and probably no more offensive.

Work

Experiments have shown that exposure to pleasant fragrances significantly enhances performance on work-related tasks. In particular, 'arousing' fragrances such as peppermint, which increase alertness, have been found to improve performance.

An experiment using the Remote Associations Test - in which subjects must see connections between words that ordinarily do not seem to be related - showed that pleasant odours can enhance performance on creative problem-solving tasks.

One Japanese company uses citrus scent to stimulate its workers at the start of the day, floral scents to boost their concentration in the late morning and early afternoon and woody scents such as cedar and cypress to relieve tiredness at lunchtime and in the evening.

We may not be surprised to find that unpleasant odours adversely affect work performance, but it is interesting to note that some *pleasant* odours can significantly impair performance on tasks requiring concentration, even at levels below the detection threshold. In one experiment, exposure to sub-threshold levels of Galaxolide - a musk-like odorant - *doubled* the average amount of time subjects took to find an object in a visual search task.

One scientist has suggested that the fatigue symptoms characteristic of 'sick-building syndrome' are a survival reflex inherited from our evolutionary ancestors. This 'reflex' causes us to feel tired, and therefore to avoid venturing out, when our olfactory receptors signal that the air is contaminated (as it is in poorly ventilated office buildings). For our savannah-dwelling primitive ancestors, contaminated air (caused, for example, by fire) was highly dangerous, as the reduced ability to detect the smell of predators made them vulnerable. Although there may be little risk from predators in modern office buildings, the inherited survival mechanism persists.

This theory is perhaps supported by research on people suffering from 'cacosmia' - feeling ill from low levels of common environmental chemical odours such as paint, perfume and new

carpet. One of the main symptoms of cacosmia, as with sick-building syndrome, is daytime tiredness. The researchers found that cacosmia sufferers tend to be shy, inhibited and novelty-avoiding.

Other studies have shown that shy, introverted people are generally more sensitive to smell than sociable extraverts. If the 'olfactory-survival-reflex' theory is correct, it may be that people with high smell-sensitivity become shy and novelty-avoiding because their olfactory receptors transmit more primeval danger-signals, making them feel more vulnerable. Perhaps further research will show that the key to important personality traits may be found in the little patches of olfactory receptors in our nasal passages. You are what you smell?

Unpleasant odours have their uses in the business world, however, if reports about the findings of researchers at a British company called Bodywise are to be believed. In 1991, Bodywise researchers found that people who receive bills scented with androstenone, a pheromone produced by male sweat which is almost universally perceived as very unpleasant, were 17% more likely to pay up than those who received unscented bills.

The company is said to have patented its androstenone-derived odorant, and put it on the market to debt-collection agencies at about £3000 per gram. Androstenone is reputed to be perceived as 'threatening' rather than merely unpleasant, particularly by men, which might explain its efficacy in prompting bill-payment. It is also worth noting, however, that women's responses to androstenone change during the menstrual cycle, moving from 'negative' to 'neutral' at ovulation. An ovulating woman receiving an androstenone-scented bill might not experience the desired threatening effect. Whatever the sex or hormonal state of the debtor, a solicitor's letter threatening legal action will probably be more effective than a pheromone-scented bill, and compared with Bodywise's prices, even solicitors' fees seem quite reasonable.

Companies (or solicitors) wishing to *minimise* the shock experienced by their customers on receipt of an unexpectedly large bill, however, might want to consider scenting their

unwelcome communications with vanilla, which has been shown to reduce the startle-reflex and to relieve stress and anxiety (see *Vanilla*, above).

High-tech noses

The world of advanced technology, after years of preoccupation with sight and sound, has recently woken up to the importance of smell. The Institute of Olfactory Research at Warwick University developed the first prototype ‘electronic nose’ in the mid-80s, and high-tech companies are now selling commercial versions of the ‘Warwick Nose’.

The potential uses of nose-machines, which essentially mimic the functions of human noses but with more precision, are endless. Perfume makers are already using them to protect their patented smells against fake-fragrance merchants, and US dockside inspectors have used a high-tech snout to resolve disputes with fishermen over the grading of their catch.

More exciting are the possible medical applications -Warwick University scientists are researching the use of electronic noses to diagnose illness by smelling patients’ breath (Chinese doctors have been doing this themselves for centuries), and have recently been awarded an EU grant to investigate the possibility of installing tiny electronic noses in phone receivers, so that patients can simply breathe into the phone and wait for a diagnosis. A similar smell-transmission device may soon allow surfers on the Internet to ‘wake up and smell the coffee’ quite literally

Researchers are investigating the use of breath analysis to identify the stages of the female menstrual cycle: the ability of electronic noses to detect ovulation could benefit both fertility treatment and birth control.

High-tech sniffers may be used not just for breath-smelling but also to detect other subtle changes in body odour that can indicate disease conditions.

Our unique personal body-odour may also become an alternative form of identification, signalling the end of credit-card fraud, forgotten or misappropriated PIN numbers, fake ID cards, etc. The Association for Payment Clearing Services, an organisation set up to find solutions to these problems, is investigating the use

of electronic noses in banks, and companies may soon be able to replace security entry systems involving cards and codes with a device that recognises each employee's personal odour.

So far, the electronic noses available are no more sensitive than the average human nose - although specialist noses are being developed - but electronic noses do have significant advantages over those attached to humans. Electronic noses do not get bored with repetitive smelling tasks, or de-sensitised through habituation to particular odours. Unpleasant smells such as industrial chemicals and sewage do not make electronic sniffers feel sick, and their performance on smelling tasks does not fluctuate according to mood, hormone cycles or other unpredictable human factors.

For most tasks, one of the main advantages of electronic noses is their lack of emotional response to odours, although one writer predicts that future high-tech noses may be developed which "have properties that will mimic human emotions" (perhaps for perfume-makers to test the effects of their products?).

High-tech smells

The development of more sophisticated technology for synthesising or ‘capturing’ previously elusive smells appears to be keeping pace with the advances in high-tech noses to detect the ones we already have.

‘Headspace’ technology now allows accurate analysis and synthetic reproduction of almost any smell. One new fragrance for men allegedly includes both the distinctive odour of a famous New York tobacconist shop and ‘essence of racing car’. Another manufacturer claims to have reproduced the scent of financial newspapers.

A process known as ‘soft extraction’, which has been in use for some time in the food industry, is the latest vogue among perfume manufacturers. By passing a special form of carbon dioxide through an object such as a coffee bean, food technologists have been able to extract coffee flavouring. The procedure is now being used to capture the fragrance of flowers which are resistant to more traditional scent-extraction techniques.

History

The process by which a flower's scent is extracted and preserved using alcohol distillation is believed to have been discovered by Avicenna, the 11th century Arabian alchemist and physician, who stumbled on it while 'trying to isolate for Islam the soul of its holy rose'. Before this, perfumes consisted only of thick resins and gums and gooey unguents.

Medicine

Avicenna also used his sense of smell in the diagnosis of illness - by noting changes in the smell of patients' urine. He was not, however, the first doctor to diagnose diseases by their smell: the Ancient Greek physician Hippocrates, many centuries earlier, recommended sniffing patients' body odour as an effective means of identifying their ailments.

The perceptive and correct observation that body odours can indicate illness may unfortunately have led to the development of the erroneous belief that these odours were the *cause* of disease - resulting in our misguided attempts to protect ourselves against plague and typhus by carrying scented pouches and torches.

Belief in the therapeutic value of perfumes was firmly established much earlier. 17th and 18th century doctors promoting the use of perfumes to combat infection frequently referred to the therapeutic use of fragrances by eminent physicians of the Ancient world such as Hippocrates (who burned scented stakes to combat the plague of Athens), Galen and Crito (whose healing methods were based almost entirely on the use of aromatics).

The plague was not the only malady to be treated with fragrances. In the 17th, 18th and even into the 19th century, perfumes were widely used as remedies for almost any physical or mental disorder - including hysteria, amenorrhea, melancholia, hypochondria, headaches and the common cold - despite growing scepticism about their efficacy among some scientists.

By the early 19th century, the use of aromatics for medicinal purposes had been largely discredited by sceptical scientists, in favour of chemical medicaments. Many traditional practices persisted, including the addition of perfumes to pharmaceutical preparations, but the influence of 'aromaphobic' scientists, philosophers and moralists was widespread.

Aesthetics

Until the late 18th century, the most popular fragrances for aesthetic rather than medical purposes were the powerful, heavy perfumes derived from animals - musk, civet and ambergris. These voluptuous perfumes fell from grace in the late 18th century, when advances in bodily hygiene encouraged a fashion for more subtle and delicate fragrances. Strong perfumes such as musk cast doubt upon the wearer's cleanliness, and their associations with animal reproductive instincts became distasteful to the newly modest and fastidious trend-setters.

The psychologist Havelock Ellis highlights the discrediting of musk as a significant turning point in the history of sexuality. Until the late 18th century, he claims, women used perfume as a means of emphasising, rather than masking, their natural body odour. Animal perfumes such as musk had the same function as the corsets which were used to accentuate and exaggerate the female form. It seems that men, by contrast, have throughout history felt less need to advertise their masculinity with perfumes, or indeed any other devices. Their complacency is eloquently explained by the 13th century Arab poet Sheykh Moslehoddi Sadi:

> *Essence of roses, fragrant aloes, paint, perfume and lust:*
> *All these are ornaments of women.*
> *Take a man; and his testicles are a sufficient ornament.*

The French historian Alain Corbin notes a more general decline in 'olfactory tolerance' associated with the rise of bourgeois

mentality in the late 18th century. According to Corbin, the puritanical bourgeoisie were largely responsible for the growing moralistic denunciation of fragrances. The ephemeral nature of perfumes symbolised waste and extravagance; their use indicated a decadent taste for pleasure antithetical to the work ethic, they had no useful, pragmatic function and were therefore immoral. The heady, animal perfumes were particularly distasteful to the prudish bourgeoisie, because of their blatant sexuality.

It is interesting to note that the current trend away from heavy, musky perfumes and towards lighter, more delicate fragrances is also associated with a moralistic tendency -exemplified by the rise of ‘political correctness’, obsession with ‘healthy’ eating and exercise, the so-called ‘new temperance’ movement and other puritanical elements.

Culture

Smell is not just a biological and psychological experience, it is also a social and cultural phenomenon.

Western cultures

Smell is probably the most undervalued of the senses in modern Western cultures. Yet cultural historians have shown that this was not always so: the current low status of smell in the West is a result of the 'revaluation of the senses' by philosophers and scientists of the 18th and 19th centuries.

The intellectual elite of this period decreed sight to be the all-important, up-market, superior sense, the sense of reason and civilisation, while the sense of smell was deemed to be of a considerably lower order - a primitive, brutish ability associated with savagery and even madness.

The emotional potency of smell was felt to threaten the impersonal, rational detachment of modern scientific thinking. This demotion of smell has had a lasting effect on academic research, with the result that we know far less about our sense of smell than about more high-status senses such as vision and hearing.

The low status of smell in Western culture is reflected in our language: colloquial terms for 'nose', for example, are almost all derogatory, or at the very least disrespectful (schnozzle, conk, hooter, snoot, snout, etc.) - and large or distinctive noses are considered ugly.

All of the other senses have positive, complimentary associations in everyday language. We may speak of a person as 'visionary', 'keen-eyed', 'having a good ear', 'a good listener'. We praise 'dexterity', 'a light touch' and 'good taste', etc. There are no equivalent terms of approval for smelling ability. In fact, the only common expression which implies olfactory prowess is 'nosy' - a term of abuse rather than commendation.

When we wish to insult people, we often accuse them of deficits in their sense sight, hearing, touch or taste (myopic referees, deaf politicians, cack-handed goalkeepers, and tasteless artists spring to mind). Yet the sense of smell is so unimportant to us that terms for olfactory deficits, such as ‘anosmic’, are not even understood by the majority, let alone used to express disapproval. Outside certain specialist domains such as perfumery and wine-tasting, a keen sense of smell attracts few admiring comments, and there is no stigma attached to the olfactory equivalent of tone-deafness or tunnel vision.

Most Western languages are so impoverished in olfactory terminology that they cannot even distinguish between the perception of odours and the odours themselves: the word ‘smell’ is forced to do double-duty, resulting in considerable confusion and tiresome jokes about dogs with no noses.

As if this were not degradation enough, the verb ‘to smell’, when used descriptively, has a negative meaning unless qualified by a commendatory adjective. If we simply state that something or someone ‘smells’, we mean that they smell bad; to give praise, we must specify that they ‘smell good’ or ‘smell nice’. Smells are guilty until proven innocent.

When we wish to praise, we are far more likely to refer to a person’s effect on our visual sense than to any pleasant olfactory impact. The poor judge who attempted to convey the attractions of a woman by describing her as ‘fragrant’ was subjected to endless ridicule by the press and public.

The Western devaluation of our sense of smell is, in historical terms, a fairly recent phenomenon. From classical times until the Enlightenment, perfumes and aromatics played a central role in European cultures (see *History* above).

It is also possible that the second-class-citizenship of smell will be short-lived. Here are a few preliminary indications of the forthcoming sensory reshuffle:

- The study of olfaction, previously of interest only in specialist medical research and

experimental psychology, is now attracting ever-increasing numbers of anthropologists, sociologists and historians.

- In popular culture, the current aromatherapy-boom indicates a similar revival of interest in the powers of perfume. Once regarded as obscure hippie/new-age mumbo-jumbo, aromatherapy is now respectably 'mainstream'. (Scientists insist that there is still no proof of the benefits of aromatherapy, but the fragrances are undeniably pleasant, which may be enough for most ordinary mortals.)

- The findings of research on olfaction, previously reported only in obscure academic journals, now appear regularly in popular newspapers and glossy magazines.

- Even the world of technology, so long obsessed with audio-visual-tactile processes, has recently turned its attention to the mysteries of olfaction (see *High-tech noses* and *High-tech smells*, above). In the last decade, scientists at Warwick University developed the first electronic nose, and companies with names like 'Aromascan PLC' are now competing for a slice of the lucrative high-tech sniffer market.

If these academic, popular and technological trends continue, perhaps the 21st century will see the restoration of smell to its former prominent position in the Western hierarchy of the senses. (If so, cosmetic surgeons may lose a substantial source of income, as large, distinctive noses, which were considered attractive before the discrediting of the sense of smell in the 18th century, again become the height of fashion!)

Other cultures

In many non-Western cultures, smell has long been established as the emperor of the senses. For the Ongee of the Andaman Islands, the universe and everything in it is defined by smell. Their calendar is constructed on the basis of the odours of flowers which come into bloom at different times of the year. Each season is named after a particular odour, and possesses its own distinctive 'aroma-force'. Personal identity is also defined by smell - to refer to oneself, one touches the tip of one's nose, a gesture meaning both 'me' and 'my odour'.

When greeting someone, the Ongee do not ask 'How are you?', but '*Konyune onorange-tanka*?' meaning 'How is your nose?'. Etiquette requires that if the person responds that he or she feels 'heavy with odour', the greeter must inhale deeply to remove some of the surplus. If the greeted person feels a bit short of odour-energy, it is polite to provide some extra scent by blowing on him or her.

The Bororo of Brazil and the Serer Ndut of Senegal also associate personal identity with smell. For the Bororo, body odour is associated with the life-force of a person, and breath-odour with the soul. The Ndut believe that each individual is animated by two different scent-defined forces. One is physical, associated with body and breath odour; the other, spiritual, scent is claimed to survive the death of an individual to be reincarnated in a descendant. The Ndut can tell which ancestor has been reincarnated in a child by recognising the similarity of the child's scent to that of the deceased person.

In India, the traditional affectionate greeting - equivalent of the Western hug or kiss - was to smell someone's head. An ancient Indian text declares "I will smell thee on the head, that is the greatest sign of tender love".

Similar practices are found in Arab countries, where breathing on people as you speak to them signals friendship and goodwill - and to 'deny' someone your breath-smell conveys a shameful avoidance of involvement.

In cultures where the sense of smell is highly valued, and odour is considered to be the essence of personal identity, interpersonal ‘exchanges’ or ‘mixing’ of odours is often carefully regulated. Many of these olfactory regulations serve important social functions, such as preventing sexual intercourse between close relatives.

Among the Amazonian Desana, for example, all members of a tribal group a believed to share a similar odour. Marriage is only allowed between persons of different odours, so spouses must be chosen from other tribal groups. This belief is expressed in rituals involving the exchanges of goods with different odours: one group will present the other with a gift of meat, for example, and receive fish in return. Some rituals involve the exchange of differently scented ants.

The Batek Negrito of the Malay Peninsula take the same taboo on the odour-mixing of close relatives a stage further: not only is sexual intercourse between those of similar odour prohibited, but even sitting too close to one another for too long is considered dangerous. Any prolonged mixing of similar personal odours is believed to cause disease in the people involved and in any children they may conceive.

The dangers of odour-mixing are even more extreme for another Malay Peninsula people, the Temiar. The Temiar believe that each person has an odour-soul, located in the lower back. If you pass too closely behind a person, the odour-soul is disturbed and mingles with your body, causing disease. This must be prevented by calling out ‘odour, odour’ whenever you approach a person from behind, so that the odour-soul is forewarned of the intrusion.

For the Dogon people of Mali, odour and sound are believed to be intrinsically related because both travel on air - the Dogon speak of ‘hearing’ a smell. In addition, speech itself is believed to be scented: good speech - with appropriate grammar and pronunciation - smells pleasant (in Dogon terms, this means an odour of oil and cooking, which are highly valued), while nasal, indistinct or ungrammatical speech has an unpleasant, stagnant odour. Ten-year-old children who persist in making mistakes of

grammar or pronunciation will have their noses pierced as a corrective. (One cannot help wondering, however, whether anthropologists sometimes mistake the metaphorical expressions of the peoples they study for literal beliefs. After all, a Desana visiting us might just as easily conclude that we believe ideas to posses odours - some of them 'stink' - and that we believe washing a child's mouth out with soap to be an effective means of driving away 'bad words'!)

Scent preferences

Western notions of aesthetically pleasing fragrances are by no means universal. For the cattle-raising Dassanetch of Ethiopia, no scent is more beautiful than the odour of cows. The association of this scent with social status and fertility is such that the men wash their hands in cattle urine and smear their bodies with manure, while the women rub butter into their heads, shoulders and breasts to make themselves smell more attractive.

The Dogon of Mali would find these customs incomprehensible. For the Dogon, the scent of onion is by far the most attractive fragrance a young man or woman can wear. They rub fried onions all over their bodies as a highly desirable perfume.

The most complex aesthetics of scent are to be found in Arab countries, where women use a wide range of scents to perfume different parts of their bodies. In the United Arab Emirates, musk, rose and saffron are first rubbed over the entire body (which must be scrupulously clean). Hair is perfumed with a blend of walnut or sesame oil and ambergris or jasmine. The ears are scented with *mkhammariyah*,a blend of aloewood, saffron, rose, musk and civet. Ambergris and narcissus are among the scents used on the neck, sandalwood in the armpits and aloewood on the nostrils. Perfumes are only used, however, in private situations, when a woman is in the company of other women, or of her husband and close family. To wear perfume in public or in the company of men is to be 'like an adulteress'.

Arab men may also wear perfumes: they use rose and aloewood behind their ears, on their nostrils, in their beards and in the palms of their hands.

The African Bushmen would probably regard the olfactory preferences of almost all other cultures, including our supposedly sophisticated Western tastes, as distinctly lacking in subtlety. For the Bushmen, the loveliest fragrance is that of rain.

Smell rituals

In Arab countries, a person whose perfumes smell particularly pleasant may well be asked ‘who have you been visiting?’. This is because a perfuming ritual marks the end of every social meal.

After the food-trays have been removed and coffee has been served, the host or hostess (men and women eat separately) will bring out the perfume box. For women, this contains four to eight bottles of perfume and an incense burner. The bottles are passed around and each guest anoints herself with the different scents on different parts of her body or clothing, using a glass applicator. Then the incense burner is passed around, allowing each guest to perfume herself with the fragrant fumes.

The appearance of the perfume-box signals the end of the visit, and the guests depart as soon as the perfume ritual is completed. The ritual serves several important social functions. Guests arrive wearing their best perfumes to honour the hostess, and leave honoured in return by the hostess, whose social prestige is enhanced by the pleasant smells she imparts to her guests. The ritual also promotes a feeling of bonding and unity, in that guests arrive differently-scented, but by the end of the visit are bound together by a shared fragrance.

In many cultures, the gift of perfume is an honour worthy of the gods, as well as one’s guests. Aromatic shrines or other media, offering up scents for the pleasure of the gods, are an integral part of the rituals of most religions.

The Tzotzil people of Mexico dedicate scented candles and incense to their deities, which they call ‘cigarettes for the gods’, while the Dakota of the Western Plains burn sweet-smelling grass to send smoke-signals to their gods. Hindu temples are scented with sandalwood, and the altars of the Nigerian Songhay are drenched with perfumes.

The Chewong of the Malay Peninsula consider odour as the primary means of communication with ‘good spirits’, who are attracted by nightly offerings of incense - and the most effective means of deterring evil spirits, who are repulsed by the pungent odour of wild ginger.

Rites of passage, which mark our transitions from one physical, social or economic condition to another (such as the rituals of birth, puberty, marriage and death), also involve the symbolic use of odours in many cultures.

Among the Colombian Desana, for example, a shaman must blow strong-smelling tobacco smoke over a girl on the occasion of her first menstruation, to initiate her as an acceptable member of the civilised, adult community.

At weddings in Northern Sudan, both the bride and the other women attending the ceremony are ritually perfumed with fragrant incense containing a blend of ‘cold’, masculine, scents and ‘hot’, feminine aromas, to symbolise marital unity and promote fertility.

Personal odour

The complexities of personal odour, of which the average Westerner is largely unaware, are the subject of sophisticated classification systems in many other cultures. The average member of the Amazonian Desana community, for example, will readily explain that an individual’s unique odour - *oma seriri* - is a combination of natural personal odour, odours acquired through the food he or she eats, odours caused by emotions and periodic odours related to fertility. Not only is their assessment of the components of personal body odour scientifically accurate, but, unlike Western scientists, the Desana are able to describe each of the smells involved in minute and vivid detail.

In other parts of the Amazonian region, however, 60,000 Avon ladies are busily engaged in the hut-to-hut selling of deodorants and perfumes. In remote villages, only accessible by canoe, these products are often exchanged for local produce: two dozen eggs

buys you a Bart Simpson roll-on deodorant, and for 20 pounds of flour, you can buy a bottle of perfume called ‘Charisma’.