



**Living  
well  
with  
your**

**sense of smell**

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**Smell is a  
potent wizard  
that transports  
us across  
thousands  
of miles and  
all the years  
we have lived.  
The odors of  
fruits waft me  
to my southern  
home, to my  
childhood frolics  
in the peach  
orchard. Other odors,  
instantaneous and fleeting,  
cause my heart to dilate joyously or  
contract with remembered grief.  
Even as I think of smells, my nose  
is full of scents that start awake  
sweet memories of summers gone  
and ripening fields far away.**



**Helen Keller**

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# **i**ntroduction

**Throughout history, mankind's perceptions of the sense of smell have evolved from ignorance to sophistication.**



In 1982, for the first time in olfactory history, the sense of smell was thrust into the spotlight of scientific investigations. This was a direct result of the creation of the Sense of Smell Institute, (formerly known as Olfactory Research Fund) the only tax-exempt, charitable organization in the world dedicated to the support of trailblazing research related to unraveling the mysteries and importance of the sense of smell and to identifying the psychological benefits of fragrance.

Compared to our other senses, relatively little was known about our sense of smell and it was certainly the one most taken for granted. Though most of us rarely think about it, our sense of smell, nevertheless, goes about its critical business of helping us in every facet of our lives.

Throughout history, mankind's perceptions of the sense of smell have evolved from ignorance to sophistication.

In recent years, interest in olfaction has dramatically increased, and great strides have been made in our understanding of the sense of smell and its impact on our lives.

We've known for a long time about the psychological role that odors play in our daily lives.

**Breaths come in pairs, except at two times in our lives – the beginning and the end. At birth, we inhale for the first time, at death, we exhale for the last. In between, through all the lather of one's life, each breath passes air over our olfactory sites.**

**Each day, we breath about 23,040 times and move around 438 cubic feet of air. It takes us about five seconds to breathe – two seconds to inhale and three seconds to exhale – and, in that time, molecules of odor flood through our systems. Inhaling and exhaling, we smell odors. Smells coat us, swirl around us, enter our bodies, emanate from us. We live in a constant wash of them.**

Diane Ackerman<sup>1</sup>

A Natural History of the Senses

However, until recently, this knowledge has been anecdotal.

Is it possible to relieve insomnia with a whiff of jasmine? Could the simple scent of lavender help reduce tension and stress? Can the odor of peppermint increase alertness and performance in the workplace? Would patients undergoing

complex medical tests find anxiety relief by sniffing the scent of vanilla? Can fragrance enhance our personal and social relationships? The answer to these questions and more are being investigated by research scientists, many of whom are supported by the Sense of Smell Institute, who are delving into the exciting field of olfactory science: Aroma-Chology\*.

The term "Aroma-Chology," coined by the Sense of Smell Institute combines clinical and psychological studies and the latest advances in technology to explore the effects of fragrance and odor on a variety of specific feelings such as relaxation, sensuality, happiness and personal fulfillment.

Today, we find ourselves on the brink of sensory revelations that will allow us not only to expand the pleasures of the sense of smell, but to use this neglected sense as an instrument to open the way to greater awareness of the potential of our bodies and minds. As we move into and through the technological revolution, our heightened sensory awareness will help us improve how we perform and relate to one another as human beings.

"Living Well with Your Sense of Smell" highlights the important research findings reported by scientists who are studying Aroma-Chology today. It puts the phenomenal strides of our modern sensory achievements into perspective by tracing the sense of smell through the centuries, its role in our own modern culture as well as that of other countries around the world. The picture is completed with an exploration of the physiology of smell (how and what we smell when we sniff an odor) and a sniff of the future.

Annette Green  
Chairman, Sense of Smell Institute



\*Service mark of the Sense of Smell Institute.

## smell... the social sense



It was generally assumed in days long gone that everyone smelling the same thing perceived it the same way. Once humans

were able to express their innermost feelings and observations, they discovered that their odor impressions were quite different. This caused attitudes about olfaction to change from generation to generation. Except for the pleasures of flowers and fragrances, the nose and its nuances were often forgotten.

Most of us don't realize that we each have a unique odor-identity, or smell fingerprint. Every part of the body – ears, mouth, underarms, feet, hands, genitalia – has its own particular smell. Determining factors for our

**What happens to the sense of smell when boy meets girl?**

unique odor-identity and sense of smell may be any of the following: genes, skin type (light, dark, dry, oily), hair color, diet (low or high fat), age, physical and mental conditions (different illnesses, medications, hormonal levels and bio-rhythms), anxiety, fear, happiness and even weather.

What happens to the sense of smell when boy meets girl? Or stranger meets stranger? We make our sensory decisions about each other a few seconds after we meet. Deep friendship and romantic alliances are dependent upon what scientists identify as "olfactory bonding." Studies show that fragrances make a considerable impact on social relationships. Indeed, a study conducted by Drs. John Nezlak<sup>2</sup> and Glenn Shean<sup>3</sup>, showed that when people believed their fragrances were pleasing to others, they felt more confident in their social interactions. Fragrances were also more important in opposite-sex social interactions than in same-sex associations. Furthermore, greater appreciation

of fragrances seemed to be associated with greater appreciation of and skill in social interaction.

Dr. Margaret Mead, the late, great anthropologist reported that, in primitive cultures, tribes actually went to war because they were antagonized by each other's smells. And, when you think about it, you could never have a relationship with someone whose odor you did not like. You may even remember occasions when one person's smell personality made you feel antagonistic, while another, romantic.

When it comes to the sense of smell, a woman typically outperforms a man. However, her sensitivity changes over the menstrual cycle. These changes are influenced by hormones, which heighten smell acuity in the first half of a woman's menstrual cycle. Coincidentally, acuity peaks at a time when women are most fertile and most sexually responsive. There also may be a basic biological difference between genders; newborn females also have a keener sense of smell than newborn males.



**In a nation-wide survey by The New York Times, conducted in 1995, it was found that 79% of women surveyed agreed that smells can lead to romance and 86% of men surveyed believed the same thing. 55% of the surveyed population consider smells very important in their relationships with their spouses or significant others.**



## **f**ragrance and relaxation

**Can our sense of smell help cope with the anxiety and stress we encounter in our daily lives?**

All of us have experienced stress in our daily lives in one form or another. Many investigators are trying to find ways to alleviate everyday stress in various ways, but has anyone thought of using our nose as a means to relaxation? Two researchers investigated how scents can be used to help cope with the anxiety and stress we encounter in our daily lives. In one, conducted by Dr. Susan Schiffman<sup>4</sup>, people were trained to relax in the presence of a faint pleasant odor and after a few weeks of training, the presence of that odor alone induced a significant relaxation of the frontalis muscles (over the forehead) as measured by electromyographic recordings of muscle activity. This is an important finding since tension in the frontalis muscles can contribute to the onset of "stress headaches." In a separate study, Dr. Gary Schwartz<sup>5</sup>, asked subjects stressful questions such as "What kind of person makes you angry?" to subjects while they were

smelling either a spicy floral or apple scent. Dr. Schwartz found that these subjects had lower blood pressure, lower heart rate and even breathed slower compared to control subjects who had not been given any odorants to smell.

How do you relieve the stress and anxiety of undergoing certain medical procedures? Tests to detect diseases, donating blood and even something as routine as sitting in a dental office, are examples of stressful medical situations. Recent research has shown that scents can help reduce anxiety and stress levels of patients who find themselves in these anxiety provoking situations. For example, an investigation by Dr. William Redd<sup>6</sup> and Dr. Sharon Manne<sup>7</sup> of the world-famous Memorial Sloan-Kettering Cancer Center in New York, illustrated that when a vanilla-like fragrance was administered to patients undergoing MRI scans, they were significantly less anxious/stressful and were able to complete the MRI scan.

There are few of us out there who can claim that we've never experienced any stress in our lives, but if we did, it is comforting to know that we can count on our nose to help us relax!



## the fragrance memory connection



**The memories evoked by fragrance are generally associated with events involving closeness and social events.**

It is rare not to have experienced an unexpected wave of nostalgia after encountering a whiff of a certain scent. Without a word of warning, it can transport us back to another moment in time...mother's kitchen filled with the rich smells of cookies baking...a father's coat redolent with the smoky insistence of tobacco...a childhood adventure in the woods...a lover's heady embrace.

The memories evoked by fragrance are generally associated with events involving closeness and social events.

These memories are directly linked to the emotions we felt the first time we encountered the fragrance. Remembering a scent also recalls the emotions involved with the original occurrence...how something looked, felt, sounded and tasted. If our experience is pleasant, the odor will be remembered as good. If it is unpleasant, the odor will be remembered as bad. In fact, Dr. Rachel Herz<sup>9</sup> has found through her research that memories evoked by our sense of smell are more emotional than memories evoked by our other senses, including sight, sound and touch. According to Dr. Herz, there are anatomical reasons for the unique relationship between odors and emotion in memory. She explains the fact that our odor memory bank is housed in the brain's limbic system, which also controls or modifies our emotional and sexual response, hunger and thirst responses, artistic abilities, perceptions of space, body temperature regulators and cognition. It receives and stores information experienced by all the other senses. The electrical signals released by the sense of smell may trigger our strongest memories of the past. Just as with music, we can recognize a familiar scent because the memory portion of our brain is able to store not only a great variety of sound configurations but odor variations as well.

Researchers have even found that our ability to recall a specific scent surpasses even our ability to recall what we've seen. Dr. Trygg Engen<sup>8</sup> found that people recall smells with

a 65% accuracy after a year; by contrast, it is estimated that visual recall of photos sinks to about 50% after only four months!

While some fragrances may be universally appealing or repellent, our reactions to most odors are highly personal depending upon our own personal and unique odor/memory associations.



## **f**ragrance and alertness

**A subtle hint  
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incorporated  
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performance,  
and attitudes  
toward their jobs.**



A whiff of peppermint may be better than a cup of coffee to jog us into a state of alertness. Drs. Joel Warm<sup>10</sup>

and William Dember<sup>11</sup> discovered that job performance and the state of alertness of workers who received occasional whiffs of peppermint and muguet while they were performing sustained attention tasks improved significantly.

The implications of this research are vast, but perhaps the most important

application will be in the office of the future. As the workplace is becoming more automated and computerized, workers often find their alertness and attention drooping as they sit in front of their computer screens after a few hours spent at tedious tasks using this equipment. A subtle hint of peppermint scent incorporated into the office environment may help to relieve this problem by increasing both employee alertness, performance, and attitude about their job.

Many Japanese companies are already putting these findings to work by providing appropriate aromas for their workers via a computerized odor delivery system built into commercial air conditioning/ventilation equipment. These fragrance systems are reported to increase efficiency of workers performing routine jobs and may ultimately lead to a safer more personally gratifying workplace.

Long-distance truck drivers who participated in a study by Drs. Warm and Dember also found that a subtle, pleasant scent could keep them awake and alert at the wheel for the long haul. Automobile manufacturers are exploring the possibility of developing a fragrancing system for vehicles that would improve highway safety by keeping drivers attentive.



## **S**weet dreams

### **Is our sense of smell active while we sleep?**

Is our sense of smell active while we sleep? Dr. Peter Badia<sup>12</sup> has discovered that our sense of smell definitely does function when we're asleep. While there's an obvious safety benefit to this – awakening if we smell smoke or gas – there may be other potential benefits as well. Scientists have experimented with various scents to see which, if any, had any effects on sleep. It was found that most of the scents (whether they were considered to be relaxing or stimulating) did tend to have an effect on subjects when they were asleep. Scientists found that the olfactory receptors were stimulated when an odor was present and that the brain was receiving the odor stimulation. Even people who reported that they couldn't smell the test odor while they were awake were unconsciously affected by the odor while they were sleeping. The idea that scents can unconsciously affect us while we are sleeping is a remarkable discovery that may offer insight to scientists that are studying our sleeping habits, how sleeping can be enhanced,

and, perhaps, even eliminate our nightmares.

Dr. Susan Schiffman has shown that this research may be most applicable for hearing-impaired individuals since they are unable to respond to auditory signals usually used in warning devices (such as a fire alarm). Odors and sounds share several characteristics that make them good warning signals. Odorant molecules and sound waves travel through darkness and can bend around corners thus allowing both odors and sounds to alert individuals to dangers that are not directly within the line of vision.

There is an endless list of possibilities that would be unimaginable to us without the innovative research that has been done on the effects of odors and sleep and continues to be explored today.



## **s** mell, taste and diet

Have you  
ever wondered  
about the  
special  
relationship  
that your  
taste buds  
share with  
your sense  
of smell?



Have you ever wondered about the special relationship that your taste buds share with your sense of smell? All the nuances of flavor that discriminate between apples and oranges, or milk and water, come from aromas you experience as you drink or eat. If you were blindfolded and pinched your nose while you were eating, you would find it hard to distinguish what you were actually

"tasting". This is also evidenced by the observation that food does not "taste" the same when you have a cold.

Smell stimulates receptors in the nose; however, you receive most food aromas not through the front of the nose but through the back of the throat by what is called retronasal olfaction. What we call the "taste" of food is mostly smell. Without the sense of smell we vastly limit ourselves only to true taste sensations - sweet, salty, sour and bitter. But our very discriminating nose can differentiate between many thousands of different scents and flavors and can do it very quickly.

Dr. Susan Schiffman has found that one of the main characteristics that distinguishes overweight people from their leaner counterparts is simply that they want and need more intense and varied aromas from their foods. Unfortunately, many highly flavored foods in the U.S. also contain high levels of fat. These people do not necessarily have an "overweight personality," only a heightened sensory pleasure in eating. That is, they have an exaggerated odor/flavor set point. Addition of flavors (odors) to low fat foods improves adherence to a low fat diet and improves weight loss. Research has determined that overweight people can be satisfied with less volume as long as they continue to receive the taste and odor impact they desire.

People who have used flavor amplifiers and sprays report that enhancers give

a perception of having ingested more food. Imagine a chocolate spray administered to the back of the tongue and the nasal area to cure your cravings for actual chocolate. Just think of the calories you could save!

Our sense of smell is always on the alert to heighten our appetites. If you can't smell, your ability to enjoy food is dramatically diminished. Smell increases our appreciation of even the most subtle culinary accomplishments while at the same time it is prepared to warn us if food is tainted or stale.



# **t**he sense of smell through the ages and stages of our lives



**Unlike  
sight and  
our other  
senses, the  
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mature at birth.**

Unlike sight and our other senses, the human olfactory system is fully mature at birth. In fact, smell is one of the first senses that a newborn baby experiences. It provides survival information, helping to identify the mother and the location of the food she provides. In tests, newborns react

positively to pleasant odors, and screw up their faces in response to unpleasant ones. Even before birth, scientific studies reveal a baby's movements may change in response to odor signals received through the mother's body. As soon as two days after its birth, a baby can recognize its mother by its sense of smell.

Dr. Ira Lott<sup>13</sup> discovered a link between a baby's sense of smell and an early ability to learn. In this study a lemon-scented Q-tip was placed near a baby's nose. As the infant inhaled the odor, his body was gently stroked much like a mother would do as she holds her baby. Dr. Lott reports that touching enhances the ability of the baby to remember the odor and concludes that this type of touch-smell learning enables newborn babies to recognize their mothers by smelling them.

This study further suggests that an infant's sense of smell may offer a clue to potential learning disabilities as odors are processed in the brain's temporal lobe, a part of the brain that is responsible for the development of basic learning skills. Data indicates that memories of a mother's odor could be one of the first tests of those learning skills...an infant that doesn't remember could be prone to learning disorders.

Dr. Hilary Schmidt<sup>14</sup> discovered that gender differences in responsiveness to odors appear to have origins in early infancy, suggesting that genetic differences underlie the olfactory sex differences documented in adults.

Female infants participating in this study paid more attention to odorized rattles than non-odorized rattles when offered a choice, while males did not. When offered a choice between pleasantly and unpleasantly scented rattles, male infants exhibited a strong preference for the pleasantly scented rattles, females responded with equal interest in both.

Young children also evaluate the odors around them. They experience odor quality in adult-like fashion; but it isn't until they begin to perceive the world through grown-up eyes that they publicly express adult-like odor value judgements.

As adults, our sense of smell is most acute between the ages of 20 and 40, but over the course of our entire lifetime, it helps to determine our food preferences, warns of danger, helps us make decisions about products, places and people, and enhances our sense of well-being.

In 1979, Dr. Susan Schiffman surveyed a group of women, from the age of 13-80 years on the reasons for fragrance use. A clinical evaluation of the interviews showed there were five distinct fragrance ages and stages which women pass as they age and mature: 1) teenage years to age eighteen, 2) late teens to age thirty, 3) the thirties, 4) the forties, and 5) postmenopausal years. The reasons women reported for fragrance use in each of these five age groups were found at that time to have distinct characteristics. A broad range of

reasons was reported, among them were self-identity in early teen years, attracting the opposite sex in the twenties and thirties and the socially appropriate thing to do in the post-menopausal years. A follow-up survey of an additional group of 140 women was completed in 1991. This study found that while the subjects' responses fell into the same five ages and stages, in addition to the reasons for fragrance use reported in the original study, there has been a distinct increase in using fragrance for a wider range of emotional reasons (e.g. improves self-concept, relaxation, mood enhancer) with special emphasis on therapeutic effects.

Scientific investigation indicates that, in general, there is a significant decrease in olfactory functioning with increased age. The reported losses include a decline in the ability to detect odors, a reduction in the perceived strength of odors that are detected and a decreased ability to identify odors. As one grows older, there may not be a physiological loss of sense of smell per se, but an overall loss of acuity is experienced possibly as a result of an overall aging of other bodily functions. Furthermore, these losses become apparent in group comparisons, but the boundaries between young and old are at best fuzzy. There are many octogenarians whose sense of smell would rival that of twenty year olds.

Decreases in smell perception can result from normal aging as well as a variety of disease states including

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neurological, nutritional, endocrine and viral disorders. For example, the loss of smell may be an early symptom of Alzheimer's or Parkinson's disease. The brain regions affected by Alzheimer's disease are those that receive primary nerve connections from the olfactory bulb. Exposure to certain drugs can affect our sense of smell as well. Actual loss of the sense of smell may affect some 3 million Americans. Such loss can seriously compromise the quality of one's life and at times be life-threatening. Indeed, many elderly people who die in house-fires, or fall prey to ailments complicated by malnutrition, may in fact be the victims of an inability to smell.

According to Dr. Marian Diamond<sup>15</sup>, author of "Enriching Heredity," we do not have to sit back and accept a diminished sense of smell as we age. She theorizes, that if we challenge not just our sense of smell, but all our senses throughout our lifetime, we will increase our chances of maintaining a keen sensory awareness. She states that, "passive observation is not enough; one must interact with the environment. One way to be certain of continued enrichment is to maintain curiosity throughout a lifetime. Always asking questions of yourself or others and in turn seeking out the answers provides continual challenge to nerve cells."



## h ow do we smell?

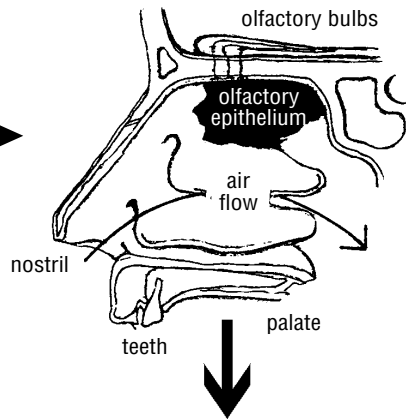
It is important to understand that throughout every day and night of our lives we smell a wide variety of odors without being aware of them at all. We go busily about our activities, breathing in and out with each breath, as a myriad of chemical molecules interact subliminally with our odor receptors. Only when an odor irritates, pleases, triggers a warning or jogs a memory do we pause to take notice. Well, how do we actually smell? What does our nose do and how does it do it?!

A smell has its origins as a chemical. Normal perception of odors, fragrance and aromas would not be possible if chemicals did not first enter your nose. When you sniff, currents of air swirl up through the nostrils, over the bony turbinates, to a "sheet" about the size of a small postage stamp, which contains millions of receptor cells. This is the olfactory epithelium. Each current of air contains odor molecules,

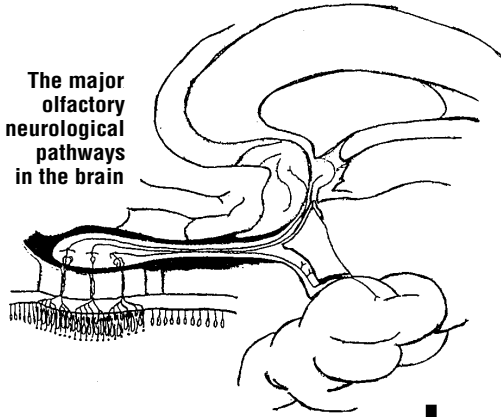
### Inhalation



### Structure of the nasal cavity



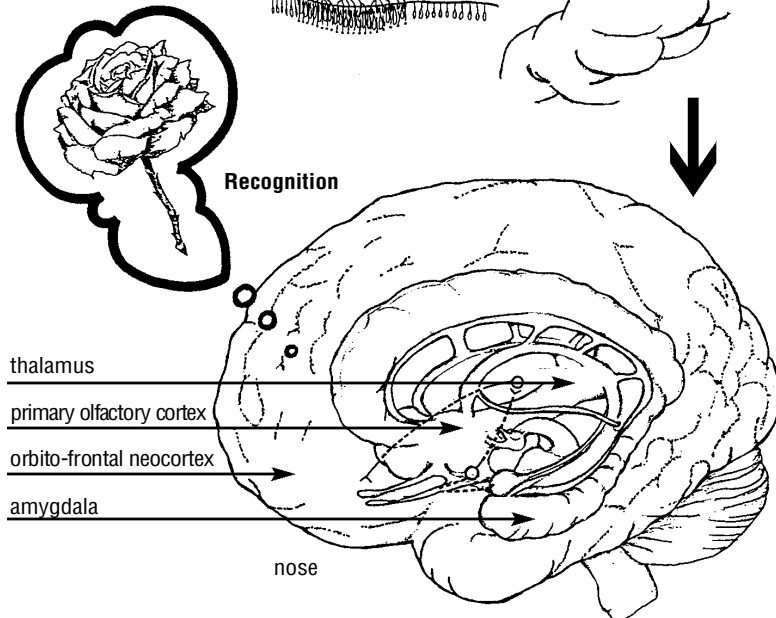
### The major olfactory neurological pathways in the brain



### How olfaction works

Diagram adapted from original provided by International Flavors and Fragrances

### Recognition



those molecules encounter extensions of the receptor cells, but they do so in an intricate sort of marriage. Each of the millions of sensory (receptor) cells has minuscule filaments (cilia) extending from protrusions of the cell (olfactory knobs, located at the tip of an elongation of the nerve). These tender cilia extend beyond the surface of the epithelium, into the environment of the watery mucus that bathes the epithelium. On these cilia are located proteins that comprise the actual molecular receptors. These proteins grasp for fragrance molecules, or portions of them, as they float in the watery covering. Not every cilia interacts with the fragrance molecules - each has only a limited set of receptor proteins that seek a very special intercourse. If, however, the appropriate molecule and receptor fuse, a sequence of events is initiated. The sensory cell is excited and a rush of electrical activity whelms from within. Ultimately the perception of an odor emerges.

Each of the sensory nerves also has a long filament (axon) on the end opposite the olfactory knob. This axon travels to the brain through special passages and makes connections with other nerve cells in the brain. This linkage is accomplished within the olfactory bulb, which has the appearance of a protracted balloon lying on its side, struggling, but failing, to maintain a cylindrical form in response to a hulking weight (the rest of the brain) that lay on its entirety. Around its

circumference, the millions of axons converge on the outer layer of cells. From these millions, a pattern of activity materializes, depending upon which cell's cilia were successful in capturing the fragrance molecule. Scientists now think that it is this pattern of activity that is interpreted as a unique smell. Bananas have a pattern that is different from roses, which in turn is different from perfume, which in turn differs from skunk, which in turn....

Information about this odor pattern is conveyed from the olfactory bulbs to other regions of the brain. The hypothalamus and other limbic system structures, the cortex, and many other sites receive this information to coordinate and manage our abilities to learn, to think, to remember, to respond, to contemplate, and to be. Just as eyesight and hearing may diminish as we grow older, so may the sense of smell. As we age, the numbers of receptor cells and olfactory bulb nerve cells decrease. Elderly people may have only one-third the numbers of cells as young people. Perhaps this is the reason why some people's sense of smell diminishes with age. Current research, however, reveals that constant, creative, conscious use of all of our senses can keep them at peak performance well into old age, allowing our odor memory to remain intact.

Today's latest innovative technology now enables researchers to examine

**"Literally, you have some of your brain out here [nose] and what's remarkable about this part of the brain is that it regenerates.**

**...And if we understood how that worked it might well be that we could understand ways to make other parts of the brain regenerate, which might be the most fundamental of all bio-medical achievements in the 21st century."**

Excerpt from remarks made by Gary Beauchamp, Director & President -Monell Chemical Senses Center at Summit 2000 Think Tank sponsored by The Fragrance Foundation (Wharton, November 1991)

how the brain responds to stimulation of the olfactory sense. Dr. Tyler Lorig<sup>16</sup> studied the brain's response to odor by measuring electrical patterns in the brain when subjects smelled an odorant. The responses to odor stimuli are called chemosensory event-related potentials (CSERPs). Drs. Hong-Ming Cheng<sup>17</sup> and Bruce Wexler<sup>18</sup> both used functional

magnetic resonance imaging (fMRI), a new imaging technology that produces highly detailed maps of metabolic activity in the brain to chart areas of the brain involved in our perception of odor. Both teams of researchers found that there were olfactory-specific brain activation in the various parts of the brain, areas which have all been previously implicated in the processing of sensory information from the nose.

These studies demonstrate that there is indeed a brain behind the nose. Understanding how the brain receives and processes olfactory cues will add a new dimension to the mystique of the sensory experience.



**In pockets of traditional culture, odor remains an intrinsic part of everyday life.**



## **1** **he history and anthropology of smell**

Smell united the scattered cells that inhabited our watery beginnings. As multiple-cell creatures evolved to inhabit the dark oceans of the world sight and speech had not yet been developed. They depended solely on the ability to detect chemicals. Smell was the first and only existing sense. The nervous system organized as animals evolved to develop a smell brain, the prime functions of which was to increase individual fitness, find

food, detect the presence of enemies and to identify mates. Other systems evolved over the millennium, but smell in its primitive form was retained. Interestingly, our sense of smell utilizes similar regions of the brain as it did from the beginning, which is why smell is often referred to as our most primitive sense. In response to evolutionary pressures, however, the limbic system expanded its functions beyond that of a smell organ to become the seat of our emotions, sexuality, creativity and memory.

As daily life became less intimidating, and people no longer had to spend so much time and effort on just

surviving, they began to notice and enjoy nature: its flowers, woods, resins and herbs. When our ancestors became ill, they turned to the healing qualities of herbs and spices. They were inhaled, ingested, and worn as protective amulets. Egyptian priests of Cleopatra's time burned aromatics to help heal the sick, and when the Hebrews left Egypt, they took with them the formulae for producing their aromatic medicines. Fragrance was also incorporated into religious ceremonies. Sweet odors and perfumes became associated with a life-regenerating cycle. There was rarely a period when odors have not been important to the care of the body and mind. In fact, many of the

**"Nature gave birth to the sense of smell because there was evolutionary pressure for members of the animal kingdom to recognize environmental compounds that were necessary for survival. Animals need the sense of smell to recognize members of their own species in order to mate and thus propagate their own kind. In addition, animals use their sense of smell to recognize their homes (or nests). Humans, like their biological ancestors, are also sensitive to the odors of their own species and those odors that signify home such as trees, flowers and foods. The ability to smell these wonderful odors is our biological heritage. It is these odors designed by nature -- floral, wood, and erotic smells -- that are found in fragrances. Thus they are the very odors that our sense of smell evolved to detect." Dr. Susan Schiffman**

essential oils that were thought to heal, soothe and stimulate our ancestors are ingredients that herbalists and perfumers still use. (See "aromatherapy" in glossary)

In modern times, the sense of smell has lost its predominance in most western cultures. We have become a highly visual society, thus we tend to describe and define our surroundings and ourselves in visual terms. Western civilization is ruled by what anthropologists Dr. Anthony Synnott<sup>19</sup> and Dr. David Howes<sup>20</sup> call the "tyranny of vision."

However, even in modern times, there are parts of the world and pockets of traditional culture that are dominated by the olfactory sense. In these areas, odor remains an intrinsic part of everyday life in these cultures. It encompasses their social activities, religious rituals and medical folklore.

To highlight the contrast in a visual vs. an olfactory culture, Synnott and Howes observe that the identity of the individual in North American society is established by visual means such as photographs on driver's licenses, signatures on checks, fingerprints, and even, footprints to identify babies on birth certificates. While in other less visually oriented societies, identity is often established by odor. For example, natives of Senegal believe every newborn infant is the reincarnation of a recently departed relative...the proof of this lies in the similarity of their (the infant's and the ancestor's) body odor. The Temiar of Malaysia also believe body odor is integral to

**"The foundations of a civilization rest not in the mind but in the senses, and unless we can use the senses, educate the senses, we shall never have the biological conditions for human survival let alone human progress." Herbert Read**

the identity of the individual and consider the "odor soul" as one of the six components of a person.

Synnott and Howes go on to relate these "olfactory" beliefs back to our own culture by observing that perhaps one reason for the pervasiveness of the "identity crises" suffered by Americans at all stages of life is that, unlike the Temiar, we deprive ourselves of an olfactory identity through our constant use of deodorants. The effect of this is that we are reduced to visual means for defining our sense of self. Since a person's visual appearance is always changing, but their body odor remains relatively constant, perhaps we would be better off to think of our identity in olfactory terms to provide a more realistic and integrated sense of self.

While olfactory customs and practices of other societies are too many and too varied to discuss here, we have included the following illustrations

which exemplify them:

- In the Middle East, intermediaries arranging a marriage for a third party sometimes turn women down because of their odor.
- When the plagues raged through the 17th Century Europe, it was beset by unsanitary conditions. Hollow, fragrance-filled walking sticks and pomanders were carried to be continuously inhaled to ward off unpleasant odors and to protect against air-borne infections.
- A commonly held belief by many cultures was that the odors of menstruating women were harmful to the rest of their communities and so the women were placed in temporary confinement.
- The symbolic use of odors is extensive in the culture of the Northern Sudan. Here odors are classified as hot or cold and associated with a series of fundamental concepts such as pollution and purity. The primary function of perfumes and incense is to attract beneficial spirits and ward off evil and illness.
- The Dassentech of Southwest Ethiopia believe odors are essential to the cycles of nature and the establishment of social boundaries.
- The Yaka tribe of Zaire consider "correct" social and physical relations as an interchange of odors. Both illness and social transgressions are thought to produce foul odors. In this society, both the hunter and the diviner need keen senses of smell: the former in order to track down prey, and the latter

in order to ascertain the social and moral state of a person.

- Body odor is so uncommon among the Japanese that there was a time when its existence could disqualify a man from military service.
- Incense is an important component of Malay ritual. It is believed to help appease the gods and render them favorable to the wishes of the petitioner.
- The use of fragrant baths to protect and purify the body is common in Brazil, particularly in the region of the Amazon and among the population of African descent.
- Smelling the head is a traditional form of greeting in parts of India. It is believed that through the act of smelling one fills oneself with the presence of the other.
- The Warao of Venezuela conceive of the inside of the body as a sort of gas pressure chamber, where all sorts of olfactory reactions take place. Medical diagnosis in this culture is made by smell rather than x-rays or chemical analysis of blood samples.
- In the Ongee culture of Little Andaman Island in the Pacific, the act of giving and receiving odor serves to establish an olfactory and social equilibrium. The Ongee equivalent of "How are you?" is "when/why/where is the nose to be?" If a person indicates he is "light" (deficient of odor), the inquirer takes that person's hand and blows on it...shifting smells from one to the other.



## a nose for the future

In recent years the available body of knowledge about our sense of smell has expanded rapidly and continues to do so at a quick pace. These olfactory revelations will undoubtedly lead to many new developments in the least understood of all our senses; the sense of smell. Once it is clearly understood how odor is perceived, differentiated and transmitted, the door will open for improving and intensifying almost all our olfactory experiences... indeed, we will be able to manage odors to obtain the maximum beneficial effect we desire.

As the 21st century dawns, consumers will reap the benefits of current research. When the results of today's Aroma-Chology research are applied to the health and beauty aid products of the future, they will deliver the added benefit of an enhanced sense of well-being. Fragrance will be more than a glamorous fashion accessory or statement of personal style, it will routinely be used to:

- Promote relaxation and reduce stress
- Improve work performance
- Elevate mood and reduce depression
- Modify sleep and dreams
- Enhance self-image
- Retrieve memories
- Enhance sexuality
- Improve social relationships

Our newfound comprehension of the psychological and physiological effects of fragrance will result in scientific and medical applications as well:

- Doctors will use scents to reduce anxiety during stressful medical testing such as MRI scans. (Memorial Sloan-Kettering Cancer Center in New York)
- Doctors and Sensory Psychologists may be able to cure functional anosmia, the inability to smell, when it is not due to nerve damage. (Monell Chemical Senses Center, Philadelphia)
- People on weight loss diets may use flavor enhancers & sprays (of food odors) to satisfy their food craving in lieu of the actual fattening foods. (Duke Medical Center, Duke University)
- Our aging population, with diminished sense of taste and smell due to the aging process, may be able to re-stimulate these functions with fragrance and exercises (University of California)
- Women going through menopause may use fragrances to alleviate related depressions and mood swings. (Duke Medical Center, Duke University)
- An infant's early ability to recognize and respond to smells may be used to

diagnose potential learning disabilities later in life. (University of California at Irvine)

A group of urban planners at the National Aviation and Transportation Center (NAT Center) at Dowling College, led by Dr. Clifford Bragon, have been studying the role of sensory stimulation in the built environment. They have observed that, today, our sensory world is primarily driven by the visual sense and propose that, as society enters the 21st century, it should strive for a harmonic balance of the senses which the Japanese call *Kansai*.

The NAT Center researchers are aggressively exploring the strategically planned use of aroma-chology in public spaces (e.g. airports, train stations, hotels and amusement parks), which they believe will enhance behavior and create a more positive environment, which will translate into improved health and welfare for the population as a whole.

Scientists predict that "virtual reality," a technology which immerses you in a computer-generated experience in which you use your body in a natural way to interact with graphic objects and creatures, promises to be a culture-defining technology that will change how we interact with each other and machines, in the next century. Virtual reality systems will allow you to see, hear, touch and smell the simulated world and the adventures within it.

Without a doubt, the sense of smell will increasingly play a prominent and positive role in improving our daily lives and in expanding our sensory experiences as we enter the 21st century.



## Glossary

**Aroma-Chology:** A concept, established by the Sense of Smell Institute, dedicated to the study of the interrelationship between psychology and the latest in fragrance technology to elicit, a variety of specific feelings and emotions... relaxation, exhilaration, sensuality, happiness and well-being...through odors via stimulation of olfactory pathways in the brain, especially the limbic system.

**Aromatherapy:** The therapeutic use of pure essential oils and herbs in body massage, the result of which is described by proponents as "healing, beautifying and soothing" the body and mind, has its roots in the folk medicine practiced in primitive cultures. The history of aromatherapy stretches as far back as 6,000 years ago in ancient Egypt. It wasn't until the 1920's, however, when the term was actually coined by a French chemist, R.M. Gattefosse.

**Anosmia:** The medical term describing the loss of the sense of smell. It may be caused by a cold, head-injury, nasal disorders, allergies, a virus or perhaps other maladies. People who have lost their sense of smell also lose the ability to detect many pleasurable aspects of food. Tests reveal that a loss in sexuality may accompany anosmia. If one's sense of smell has always been dormant, it would be impossible to realize how important the sense of smell is to one's enjoyment. But, if anosmia occurs later, the absence of the sense of smell can have a most detrimental effect on how we function in all of life's situations.

**Axon:** The part of a nerve cell that conducts impulses away from the body of the cell.

**Bony turbinates:** The thin, scroll-like, bony plates extending from the walls of the nasal chambers.

**Cilia:** Short, hairlike cytoplasmic processes projecting from the free surface of certain cells. They are constantly in a state of motion.

**Cortex:** The outer layer of gray matter of the brain.

**Dysosmia:** A distortion or perversion of the sense of smell. It may occur with hyposmia (a relative loss of the sense of smell) or it may occur alone.

**Essential Oils:** The "essence" of plants or the fragrant, volatile extracts obtained from flowers, grass, stems, seeds, leaves, roots, bark, fruits, tree moss and tree secretions. They are obtained by various means including distillation, expression and extraction.

**Hyposmia:** The most common type of smell loss experienced by humans, it may occur following an influenza-like illness, a blow to the head, nasal allergies or from unknown causes. Hyposmia has been classified into two major types: Type I Hyposmia represents an impairment of smell at the olfactory epithelia area. Vapors cannot be recognized but can still be detected; Type II Hyposmia represents a quantitative impairment of smell. Vapors can be detected and recognized but at higher than normal concentrations.

**Hypothalamus:** The portion of the brain that coordinates responses of the autonomic nervous system, e.g. body temperature control; food and fluid intake; hormonal shifts at puberty, over females' cycles, and during and after pregnancy; sexual behavior.

**Limbic system:** The portion of the brain that controls our moods and emotions and contains the apparatus for the formation, storage and retrieval of memories.

**Odor or Odour:** Chemicals that stimulate the sense of smell. The characteristic smell of something.

**Odoriferous:** Emitting an odor.

**Olfactory:** Relating to, or concerned with, the sense of smell.

**Olfactory bulb:** The first region of the brain to receive sensory inputs from the olfactory epithelium. The olfactory bulb presents the initial input and communicates via multiple pathways with numerous other regions of the brain, e.g. limbic system, hypothalamus and cortex.

**Olfactory Epithelium:** Layer of sensory cells in the upper-rear portion of the nose. Each side of the nose contains roughly 15 million sensory cells in the epithelium.

**Pheromone:** Chemical substance secreted by animals (including perhaps humans) to produce a response by other members of the same species. Sexual attractants are the most widely studied and described.

**Receptor Cell:** Located in the olfactory epithelium, each cell has microscopic hairs (cilia) extending into the mucus. Odoriferous substances are thought to bind chemically to specific sites on these cilia. This chemical event is translated into an electrical message that is transmitted along the olfactory nerves to the olfactory bulb.

**Retronasal olfaction:** Stimulation of the olfactory receptor cells by chemicals that originate in a our mouth (most often during eating) and travel to the olfactory epithelium via the nose-pharynx during exhalation.

**Temporal lobe:** Lateral portions of the brain containing, among other regions, olfactory cortex and, a bit deeper, portions of the limbic system.

1. Diane Ackerman, Author, "A Natural History of the Senses," Random House, Inc., New York, copyright 1990.
2. John B. Nezelek, Ph.D. Professor of Psychology, College of William and Mary; "Fragrance and Social Behavior"
3. Glenn Shean, Ph.D. Professor of Psychology, College of William and Mary; "Fragrance and Social Behavior"
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The Sense of Smell Institute, (SOSI) is a leading global resource relating to the sense of smell and its importance to human psychology, behavior and quality of life. We encourage exploration into the broader multisensory context of smell, including its interplay with taste.

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