Smell Encyclopedia Article

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Smell—technically called olfaction—is one of a human being's five senses. Described as "sensitivity to substances in a gaseous phase," smell is closely related to taste, both of which are perceived and regulated by the process of chemoreception. When the sense of smell is defective, the ability to taste is greatly reduced. Unless there is a genetic deficiency, the sense of smell is present at birth. Humans smell with their noses; however, some animals and insects smell with their tongues, feet, or antennae: a snake picks up chemical odor molecules from the air by flicking its tongue; a butterfly senses sweetness with its feet and detects pheromones of the opposite sex with its antennae.

Smell is a highly complex processes which, in humans, begins when odor molecules are drawn up the nostrils. These molecules stimulate the approximately 50 million chemoreceptors concentrated in the olfactory epithelium--a tiny three-to-five centimeter region in the mucus membrane located at the very top of the nasal cavity. Stimulation of these neurons creates action potentials which travel along the axon of the neurons which are fibers of olfactory nerves. These fibers pass through minute openings in the criboform plate to synapse with second-order cells, the axons of which travel to the olfactory bulbs located on either side of the ethmoid bone. Here, a "taste identity card" is created. The coded messages are transmitted along the olfactory tracts to the olfactory cortex located in the frontal lobes of the brain where they are decoded. Olfactory neurons allow us to distinguish a huge spectrum of fragrances and odors--perhaps as many as 2000. Researchers believe that special genes may code specific receptor proteins creating more than 1000 different receptors, each individually coded to respond to a specific type of odor molecule. Olfactory neurons are unique among neurons in that new ones are continuously being generated to replace those which die.

Smell plays a large role in forming life experiences and influencing our moods; odors associated with a pleasant experience instantly bring back fond memories while those associated with an unpleasant experience trigger negative emotions. Research also indicates that memory and learning can be enhanced by certain fragrances, giving credence to aroma therapy--the use of specific aromas to energize, relax, and provoke different moods. Interestingly, however, perception of an odor or fragrance decreases over time with continuous exposure. This phenomenon is called "adaption."