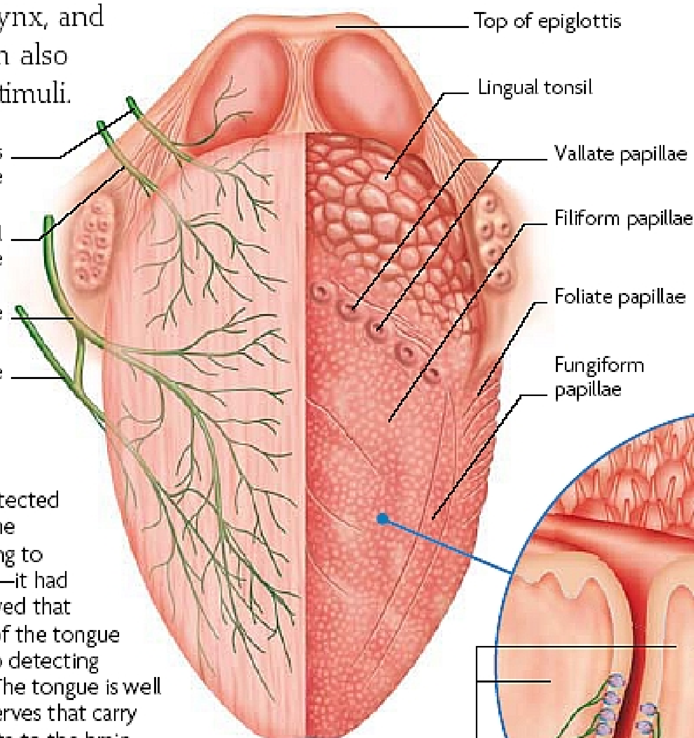
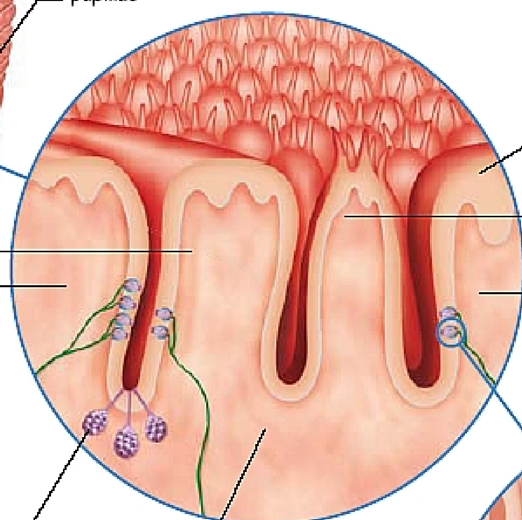
THE TONGUE

The tongue is the main sensory organ for taste detection. It is the body's most flexible muscular organ, as revealed by its work in both nutrition and communication. It has three interior muscles and three pairs of muscles connecting it to the mouth and throat. Its surface is dotted with tiny, pimplelike structures called papillae. Other parts of the mouth, such as the palate, pharynx, and epiglottis can also detect taste stimuli.



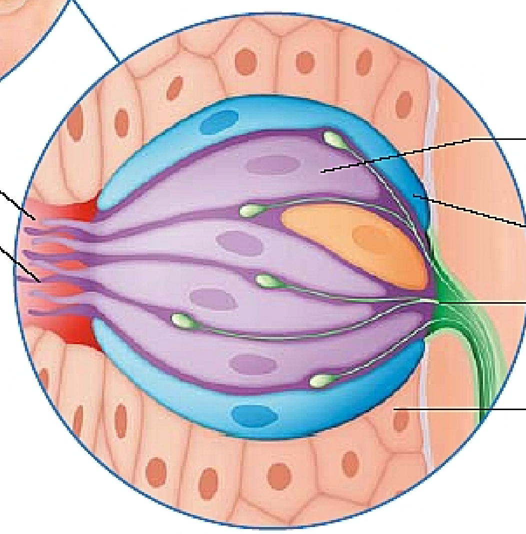
THE TONGUE

All tastes are detected equally across the tongue, according to recent research—it had long been believed that different parts of the tongue are dedicated to detecting specific tastes. The tongue is well supplied with nerves that carry taste-related data to the brain.



PAPILLAE

Papillae contain taste buds and are distributed across the tongue. Four types of papillae have been distinguished—vallate, filiform, foliate, and fungiform. Each type bears a different amount of taste buds. Fungiform and filiform are the smallest papillae, and vallate are the largest, and together form a V-shape across the rear of the tongue.

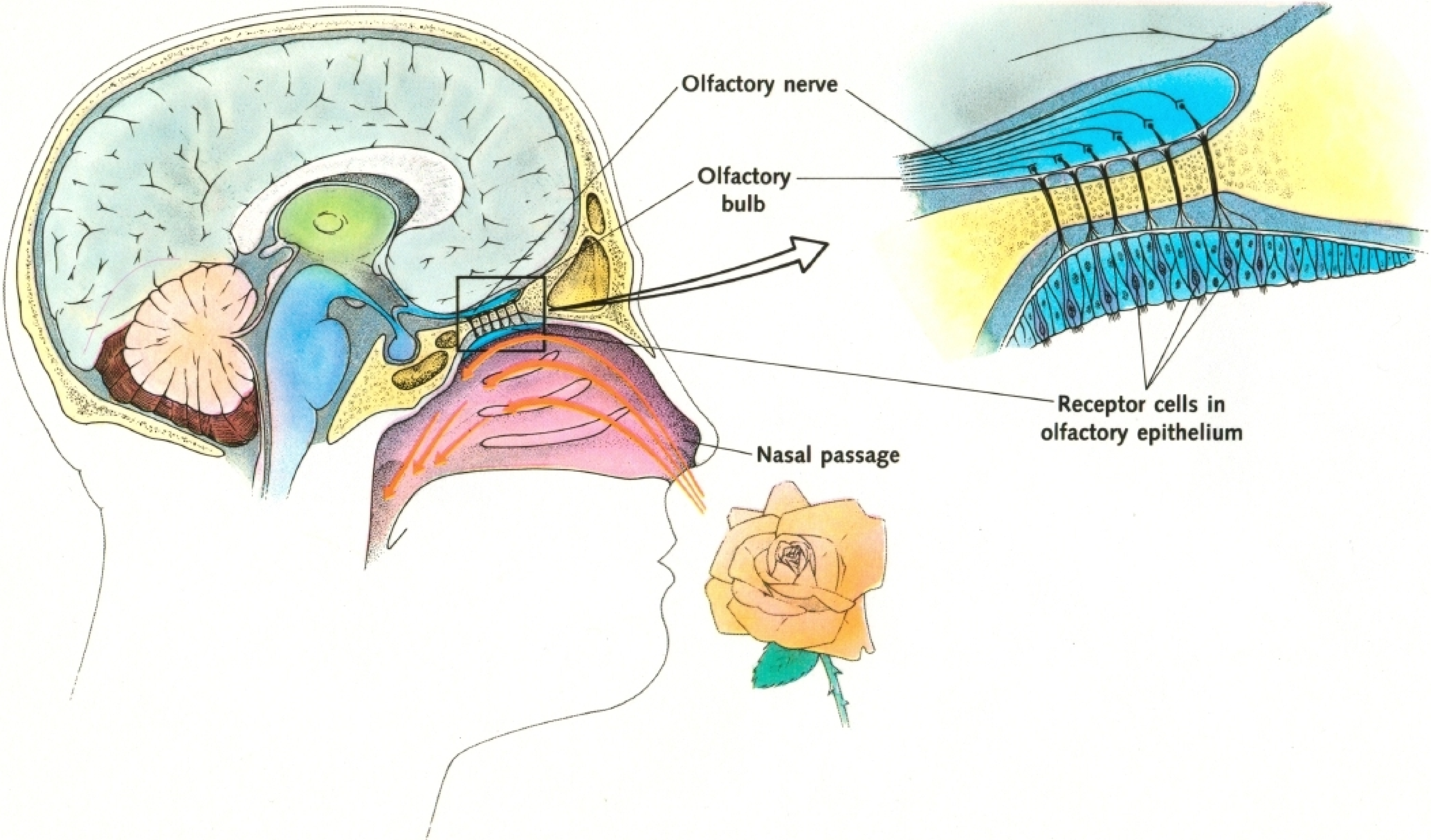


TASTE BUDS

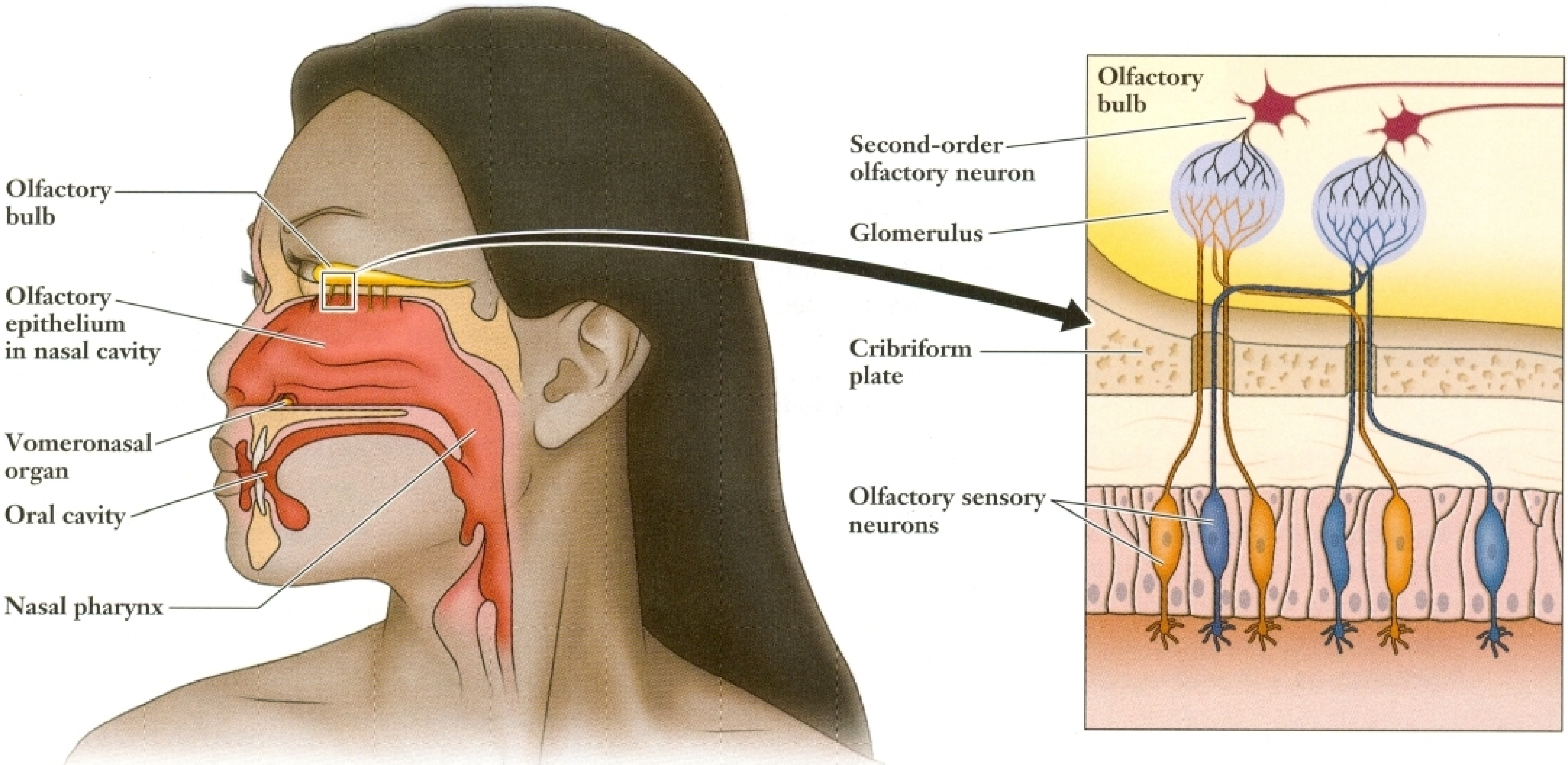
A taste bud is composed of a group of about 25 receptor cells alongside supporting cells, layered together much like a bunch of bananas. The tips of the cells form a small pore, through which taste molecules enter and contact receptor molecules. These are borne on taste hairs (tiny projections called microvilli) that extend into the pore.

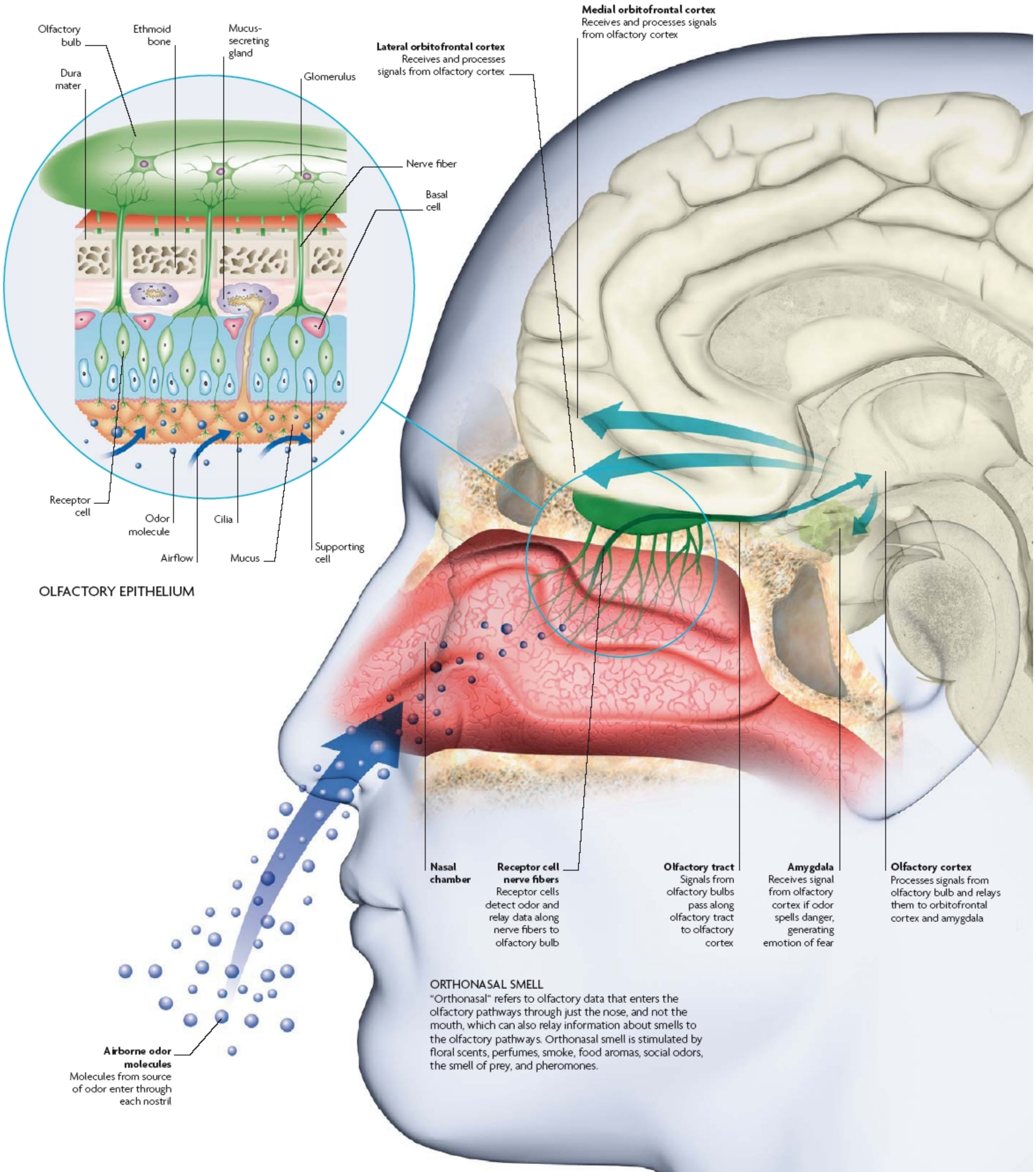
THE FIVE BASIC FLAVORS	
NAME	**DESCRIPTION**
Sweet	Often linked to energy-rich, high-calorie foods.
Sour	May be a danger sign, signaling unripe or "off" foods.
Salty	Most chemical salts, including sodium chloride, taste salty.
Bitter	May be linked to natural toxins, and is best avoided.
Unami	Savory ("unami" means "delicious" in Japanese).

Olfaction: The Sense of Smell



Olfaction: The Sense of Smell





ORTHONASAL SMELL

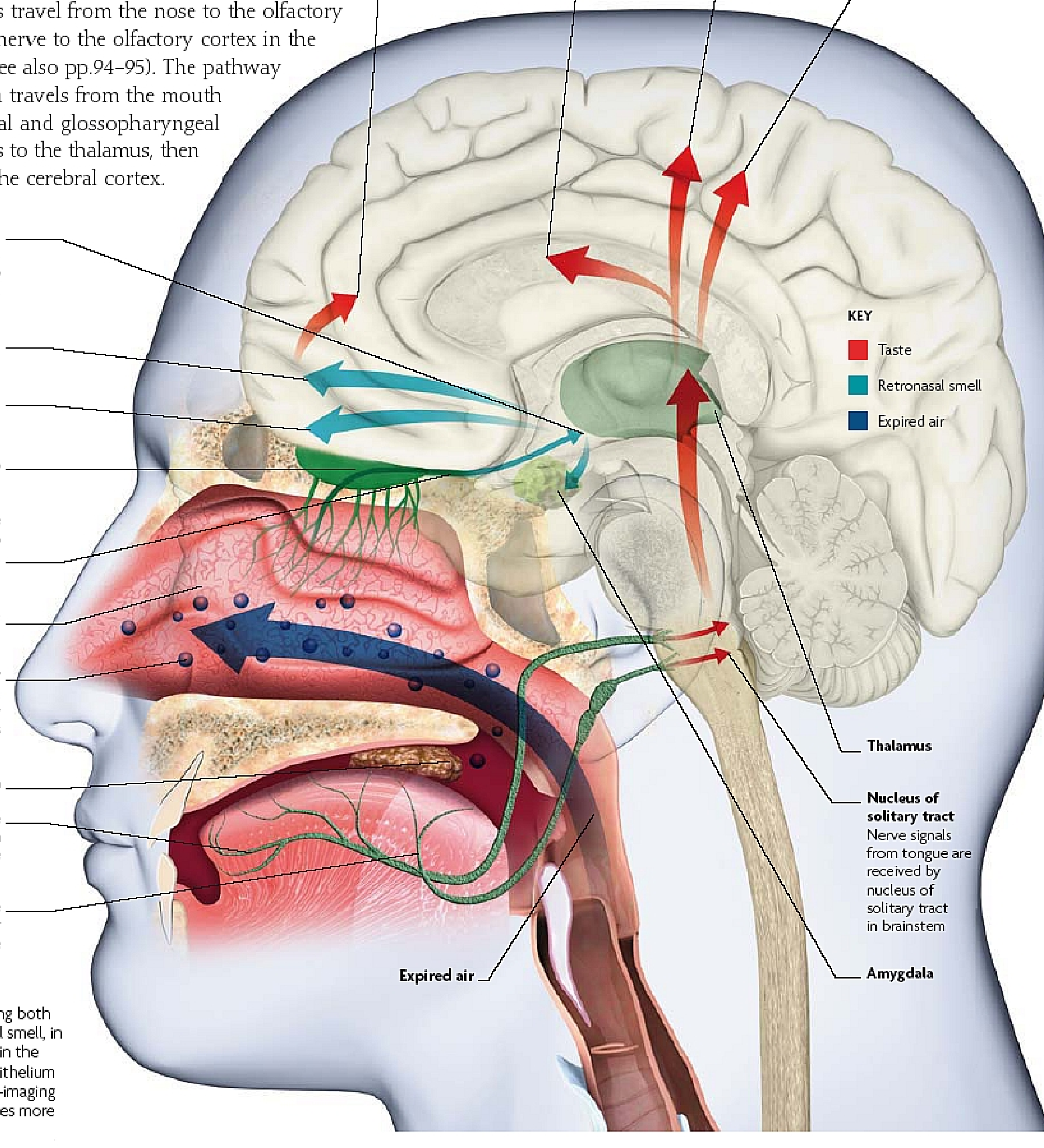
"Orthonasal" refers to olfactory data that enters the olfactory pathways through just the nose, and not the mouth, which can also relay information about smells to the olfactory pathways. Orthonasal smell is stimulated by floral scents, perfumes, smoke, food aromas, social odors, the smell of prey, and pheromones.

SMELL ACROSS SPECIES

SPECIES	NUMBER OF OLFACTORY RECEPTOR CELLS	AREA OF OLFACTORY EPITHELIUM
Human	12 million	1½ square in (10 square cm)
Cat	70 million	2 ¼ square in (21 square cm)
Rabbit	100 million	Data not available
Dog	1 billion	26 ½ square in (170 square cm)
Bloodhound	4 billion	59 square in (381 square cm)

TASTE AND SMELL BRAIN AREAS

Taste and smell are both chemical senses–receptors in the nose and mouth bind to incoming molecules, generating electrical signals to send to the brain. Both sets of signals pass along the cranial nerves. Smell-related (olfactory) signals travel from the nose to the olfactory bulb, then along the olfactory nerve to the olfactory cortex in the temporal lobe for processing (see also pp.94–95). The pathway of taste-related (gustatory) data travels from the mouth along branches of the trigeminal and glossopharyngeal nerves to the medulla, continues to the thalamus, then to primary gustatory areas of the cerebral cortex.



TASTE AND RETRONASAL SMELL

The brain forms perceptions of flavor using both taste and a type of smell called retronasal smell, in which volatile molecules from food held in the mouth are pumped past the olfactory epithelium by air being expired from the lungs. Brain-imaging studies show that retronasal smell activates more areas of the brain than orthonasal smell