

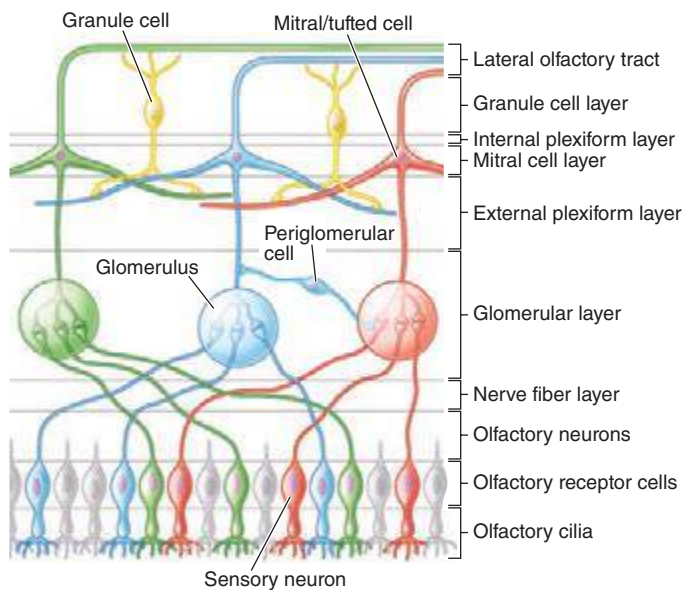
**FIGURE 42-1** Anatomy of the olfactory neural pathways, showing the distribution of olfactory receptors in the roof of the nasal cavity. (Copyright David Klemm, Faculty and Curriculum Support [FACS], Georgetown University Medical Center; used with permission.)

amygdala, hippocampus, and hypothalamus help to explain the intimate associations between odor perception and cognitive functions such as memory, motivation, arousal, autonomic activity, digestion, and sex.

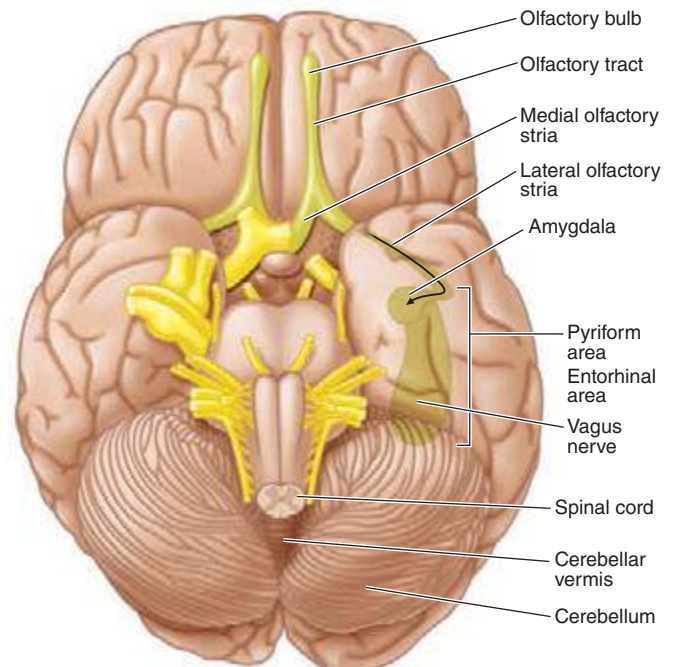
**Taste System** Tastants are sensed by specialized receptor cells present within taste buds—small grapefruit-like segmented structures located on the lateral margins and dorsum of the tongue, roof of the mouth, pharynx, larynx, and superior esophagus (Fig. 42-4). Lingual taste buds are imbedded in well-defined protuberances, termed fungiform, foliate, and circumvallate papillae. After dissolving in a liquid, tastants enter the opening of the taste bud—the taste pore—and bind to receptors on microvilli, small extensions of receptor cells within each taste bud. Such binding changes the electrical potential across the taste cell, resulting in neurotransmitter release onto the first-order taste neurons. Although humans have ~7500 taste buds, not all harbor

taste-sensitive cells; some contain only one class of receptor (e.g., cells responsive only to sugars), whereas others contain cells sensitive to more than one class. The number of taste receptor cells per taste bud ranges from zero to well over 100. A small family of three G-protein-coupled receptors (GPCRs), namely T1R1, T1R2, and T1R3, mediate sweet and umami taste sensations. Bitter sensations, on the other hand, depend on T2R receptors, a family of ~30 GPCRs expressed on cells different from those that express the sweet and umami receptors. T2Rs sense a wide range of bitter substances but do not distinguish among them. Sour tastants are sensed by the PKD2L1 receptor, a member of the transient receptor potential protein (TRP) family. Perception of salty sensations, such as induced by sodium chloride, arises from the entry of  $\text{Na}^+$  ions into the cells via specialized membrane channels, such as the amiloride-sensitive  $\text{Na}^+$  channel.

Recent studies have found that both bitter and sweet taste-related receptors are also present elsewhere in the body, most notably in the



**FIGURE 42-2** Schematic of the layers and wiring of the olfactory bulb. Each receptor type (red, green, blue) projects to a common glomerulus. The neural activity within each glomerulus is modulated by periglomerular cells. The activity of the primary projection cells, the mitral and tufted cells, is modulated by granule cells, periglomerular cells, and secondary dendrites from adjacent mitral and tufted cells. (From [www.med.yale.edu/neurosurg/treloar/index.html](http://www.med.yale.edu/neurosurg/treloar/index.html).)



**FIGURE 42-3** Anatomy of the base of the brain showing the primary olfactory cortex.