The organs subserving the sense of taste are located in the region of the oral cavity, in particular on the tongue. In discussing the sense of taste it seems useful to turn first to the structure of these organs and their connections with the CNS. We shall see that the receptor organs, the taste buds, are mounted on papillae (folds in the skin of the tongue) of three different forms. The taste buds and the sense cells they contain, however, cannot be grouped into particular morphologic types. Of the basic dimensions of the taste sensation, two — quality and intensity — will be discussed in detail (Sec. 8.1). There are four basic sensations: sweet, sour, salty, and bitter. In the second section (8.2) it is shown that the ability to discriminate these categories may well be derived from the specificity of receptor molecules. But there are no quality-specific receptor types; quality and concentration are apparently encoded by the graded response of large numbers of receptors.

8.1 Morphology of the Organs of Taste; Subjective Taste Physiology

Orientation and structure of the taste buds. The surface of the human tongue is covered with a mucous membrane, folded at many points to form little peglike projections called papillae. Figure 8–1 is a diagram of the distribution of the three types of papillae — vallate, foliate, and fungiform — over the tongue’s surface.

The three types differ in their distribution. Only the fungiform papillae are scattered over the entire surface. The vallate papillae, of which there are only 7–12 in humans, appear from above to be round structures 1–3 mm in diameter; they are restricted to a zone across the back of the tongue near its base. The third type, the foliate papillae, are arranged as closely packed folds along the back edges of the tongue. They are well developed in children, but are very much less prominent and numerous in adults.

The filiform papillae, which cover the remaining surface of the tongue, are not shown in Figure 8–1 because they bear no taste buds. The term “bud” refers to the shape of these organs (drawn in red in Fig. 8–2). Their location on the papillae varies; in the case of vallate and foliate papillae, there are many taste buds in the side walls but none on top. In the fungiform papillae, the taste buds are limited to the surface of the “cap” of the “mushroom”, which may be as much as 1 mm in diameter.
**Fig. 8–1.** Diagram summarizing the distribution of gustatory papillae, their innervation, and the regions of maximum sensitivity to the different qualities, on the human tongue. The dense array of fungiform papillae on the edges and tip of the tongue has been omitted for clarity. Sensitivity to “salty” is greatest in the anterolateral third of the tongue; that to “sour” may extend beyond the indicated area, to the base of the tongue.

**Fig. 8–2.** Position of the taste buds (red) on the three types of gustatory papillae.

A single taste bud is about 70 μm high, with a diameter of about 40 μm. A human has about 2,000 taste buds, roughly half of which are on the vallate papillae. Each taste bud contains 40–60 individual cells.