Progress in research on the human thalamus has been relatively slow for several reasons. For example, modern anatomical techniques such as retrograde tracing with horseradish peroxidase (HRP), autoradiography, and immunohistochemistry are certainly not applicable to the human in the living state. Moreover, suitable normal and pathological human brain tissue is often difficult to obtain. Given these constraints, data presented in this chapter are collected mainly from the previous descriptions by anatomists, especially of Hassler (1982) and of Van Buren and Borke (1972), and from physiological observations obtained during stereotactic interventions. The human thalamus, which is located under the lateral ventricles, is a symmetric, oval-shaped mass of gray matter sandwiching the third ventricle.

The rostrocaudal dimension of the thalamus is about 30 mm, the width (for one side) about 20 mm, and the height about 20 mm. Anatomists divided this nuclear mass according to cyto- or myeloarchitecture into several nuclei. The name of each nucleus is usually derived from its geographical location within the thalamus.

The human thalamus has been divided into 50–60 subnuclei. Each nucleus consists of a characteristic, rather homogeneous group of neurons: large, medium, or small in size and oval, fusiform, triangular, etc. in shape (Figure 9-1). Each anatomically defined thalamic nucleus has its own characteristic afferent and efferent connections, and these affiliations provide some clues in the understanding of function.

The thalamus is apparently of great significance for the appreciation of pain and temperature, but how it is involved is not known. It should be reemphasized, however, that pain stimuli do reach several thalamic
regions, including the intralaminar nuclei, which are important in behavioral arousal and EEG activation.

To what extent the perception of pain and temperature requires the cerebral cortex is not clear. Although clinical studies of patients with cortical lesions indicate that the cerebral cortex is not essential for conscious appreciation of pain, it is probably a mistake to think that the cortex is of no importance in pain mechanisms. Accurate localization is dependent on the cerebral cortex, and there are significant pathways both from the VPL-VPM (nucleus ventralis posteromedialis, nucleus ventralis posterolateralis) and the posterior thalamic nuclei to the cerebral cortex. Fibers from the VPL and VPM project through the posterior limb of the internal capsule to the first somatosensory area, SI, in the postcentral gyrus (Brodmann's areas 3, 1, and 2) and the second somatosensory area, SII, in the superior lip of the lateral fissure. Further, pathways descending from the cerebral cortex to the thalamus and different levels of the brain stem and spinal cord are likely to modify the transmission of pain impulses.

The spinothalamic fibers terminate primarily in the ventral postero-lateral nucleus (VPL) and in the nearby posterior nuclei of the thalamus. The intralaminar thalamic nuclei also receive significant contributions