The brain has a remarkable ability to adapt in the event of damage — in many cases shifting responsibility for specific cognitive functions to other non-damaged brain regions. This ‘plasticity’ can be crucial in aiding recovery from stroke, trauma, and peripheral damage such as eye or ear damage. Over the past thirty years our view of cortical plasticity has evolved greatly. Early studies suggested that changes to cortical function due to peripheral lesions could only occur during development and that these plastic changes were specific to a particular temporal window or ‘critical period’. Over time, it has been demonstrated that cortical modifications as a consequence of either peripheral or central lesions can induce adaptive, or beneficial, changes in cortical function in an effort to preserve or enhance function. More recently, studies have identified that many of these adaptive changes, once thought only possible in the developing brain, are also possible in the mature or developed brain. At present, many laboratories are defining the beneficial capabilities of cerebral cortex plasticity, upon which many proactive and therapeutic strategies may be developed in order to maximise the ‘reprogramming’ capabilities of the cerebrum. This book describes these exciting studies and examines adaptive cortical plasticity in a variety of systems (visual, auditory, somatomotor, cross-modal, language, and cognition).
This chapter reviews adult plasticity as a consequence of peripheral lesions, experience, and aging. It also describes the role of the neuromodulator acetylcholine in the plasticity process. It illustrates that the environment, and specifically the behavioral importance and interactions with the environment, have a strong effect on the functional organization of a cortical field. This chapter shows that different neuromodulators have a strong influence on adult auditory cortical plasticity. It suggests that acetylcholine play a key role in cortical plasticity.