

Preface

The notion that neurons in the living brain can change in response to experience is denoted by the term “plasticity,” which has become a major conceptual theme in basic research as well as a practical focus in the fields of neural rehabilitation and neurodegenerative diseases. Much of the early work in this field dealt with plasticity of the developing brain using a model systems approach. Such studies aptly demonstrated that sensory experience plays a critical role in the normal development of certain fundamental attributes of a given sensory system. As the plasticity field evolved, two broader research themes emerged. One of these concerns plasticity of the adult brain, and indeed, this is one of the hottest areas of current research. The other major focus is the search for underlying mechanisms. Here the challenge is to explain the cellular, molecular, and epigenetic factors controlling plasticity throughout the normal lifespan as well as in response to injury or disease. The prevalent thinking today is that if we can attain a fundamental understanding of what underlies neuronal plasticity, we can ultimately make use of this information in devising strategies for the repair of injuries rendered by myriad neurological disorders and, potentially, even improve the learning capabilities of the normal brain.

The chapters in this volume cover all three of these approaches to the study of cerebral plasticity. A number of chapters deal with issues of normal development and the influence of various environmental manipulations. Others are concerned with cerebral plasticity at maturity. Most chapters also consider underlying mechanisms of plasticity, with some focused primarily on this important topic. The reader will note a rather wide diversity of neuronal systems encompassed in this volume, reflective of the field of cerebral plasticity. Moreover, some chapters do not deal with the topic of plasticity *per se*; rather, they present an organizational framework upon which future studies of plasticity could be formulated.

Lamberto Maffei, to whom this volume is dedicated, has been a major figure in brain plasticity research for nearly half a century, particularly renowned for his studies of the plasticity of the visual system. The idea for this book originated during a meeting in a villa near Lucca, Lamberto’s birthplace, organized by his former students. The invited participants to this meeting were leading researchers in their respective fields who have had a long personal and professional association with Lamberto. It seemed natural to build on this talented group by inviting additional individuals to provide up-to-date accounts of their research topics. Thus originated

Cerebral Plasticity, a volume that we believe will be of interest to students and colleagues in diverse specialties within neuroscience ranging from fundamental neural mechanisms to professional fields such as neurosurgery, neurology, rehabilitation medicine, and computer science.

On behalf of the editors, I would like to express sincere gratitude to the authors that contributed a chapter to this volume. I would also like to thank Robert Prior, Executive Editor of MIT Press, for his keen advice in the planning stages for this volume, as well as Andrea Chalupa for her expert editorial assistance.