

Preface

Contemporary understanding of brain organization and function follows the neuronal doctrine, which places the nerve cell and neuronal synaptic contacts at the very centre of the nervous system. This doctrine considers glia as passive supportive cells, which are not involved in the informational exchange, and therefore secondary elements of the nervous system.

In the last few decades, however, our perception of the functional organization of the brain has been revolutionized. New data forces us to reconsider the main postulate of the neuronal doctrine – that neurones and synapses are the only substrate of integration in the central nervous system. We now learn that astroglial cells, which are the most numerous cells in the brain, literally control the naissance, development, functional activity and death of neuronal circuits. Astroglial cells are in fact the stem elements from which neurones are born. They also create the compartmentalization of the CNS and integrate neurones, synapses, and brain capillaries into inter-dependent functional units. Furthermore, astroglial cells form a functional syncytium, connected through gap junction bridges, which provides an elaborate intercellular communication route. This allows direct translocation of ions, metabolic factors and second messengers throughout the CNS, thereby providing a sophisticated means for information exchange. In a way the binary coded electrical communication within neuronal networks may be considered as highly specialized for rapid conveyance of information, whereas astroglial cells may represent the true substance for information processing, integration and storage. Will this truly heretical theory which subordinates neurones to glia be victorious at the end? Forthcoming years hold the answer.

When writing this book we have attempted to create a concise yet comprehensive account of glial cells and their role in physiology and pathology of the nervous system. We hope very much that this account may help the reader to discover a fascinating world of brain 'secondary' cells, which in fact are essential elements of the nervous system, whose functions and importance are yet to be fully appreciated.

Alexei Verkhratsky
Arthur Butt