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# From Neuron To Brain

Astrocytes were the original neuroglia that Ramón y Cajal visualized in 1913 using a gold sublimate stain. This stain targeted intermediate filaments

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that we now know consist mainly of glial fibrillary acidic protein, a protein used today as an astrocytic marker. Cajal described the morphological diversity of these cells with some ast- cytes surrounding neurons, while the others are intimately associated with vasculature. We

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start the book by discussing the heterogeneity of astrocytes using contemporary tools and by calling into question the assumption by classical neuroscience that neurons and glia are derived from distinct pools of progenitor cells. Astrocytes have

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long been neglected as active participants in intercellular communication and information processing in the central nervous system, in part due to their lack of electrical excitability. The following chapters review the “nuts and bolts” of astrocytic physiology; astrocytes

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possess a diverse assortment of ion channels, neurotransmitter receptors, and transport mechanisms that enable the astrocytes to respond to many of the same signals that act on neurons. Since astrocytes can detect chemical transmitters that are released from neurons and can

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release their own extracellular signals there is an increasing awareness that they play physiological roles in regulating neuronal activity and synaptic transmission. In addition to these physiological roles, it is becoming increasingly recognized that astrocytes play critical

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roles during pathophysiological states of the nervous system; these states include gliomas, Alexander disease, and epilepsy to mention a few.

The hippocampus , the Greek word for seahorse, is one of the most fascinating and intriguing regions of the mammalian

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brain. It is a bilateral incurved seahorse-shaped structure of the cerebral cortex. The hippocampus has a highly distinctive morphology. It is composed of two regions, the dentate gyrus (DG) and the Cornu Ammonis (CA). The nerve cells of the main layer of the DG and CA regions, the



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granule cells and pyramidal cells respectively, are organised in a tri-synaptic lamellaire circuit. The granule and pyramidal cells are glutamatergic excitatory. The granule cells elicit unique histological, biochemical, developmental, physio- and

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pathological features. The hippocampus is also an area of the brain that elicits a high degree of plasticity, like synaptic and phenotypic plasticity. It is also one of the few regions of the brain where neurogenesis, the generation of new nerve cells, occurs throughout adulthood.

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The hippocampus is involved in physio-and pathological processes, like learning and memory. Neurotransmitters, Drugs and Brain Function aims to link basic aspects of the activity of neurotransmitters at the receptor and synaptic level with their role in normal

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brain function, disease states, and drug action. Thus, the material considers to what extent our knowledge of the central synaptic action of certain drugs can explain their possible roles in the cause of diseases and in the modes of action of drugs effective in those conditions. It

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offers a working explanation of drug and neurotransmitter action in CNS function, with a clear, comprehensive, and challenging style of writing. The authors review the chemical basis for drugs and the conditions they treat. It also, includes numerous illustrations and schematic

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This is an introduction to spiking neurons for advanced undergraduate or graduate students. It can be used with courses in computational neuroscience, theoretical biology, neural modeling, biophysics, or neural networks. It focuses

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on phenomenological approaches rather than detailed models in order to provide the reader with a conceptual framework. No prior knowledge beyond undergraduate mathematics is necessary to follow the book. Thus it should appeal to students or

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researchers in physics, mathematics, or computer science interested in biology; moreover it will also be useful for biologists working in mathematical modeling.

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*study of neural networks, the author presents the fundamentals without the full mathematical apparatus. All aspects of the field are tackled, including artificial neurons as models of their real counterparts; the geometry of network action in pattern*

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*space; gradient descent methods, including back-propagation; associative memory and Hopfield nets; and self-organization and feature maps. The traditionally difficult topic of adaptive resonance theory is clarified within a hierarchical*

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*description of its operation. The book also includes several real-world examples to provide a concrete focus. This should enhance its appeal to those involved in the design, construction and management of networks in commercial environments and who*

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*and professionals, in  
cognitive science,  
psychology, computer  
science and electrical  
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*An argument that the  
complexities of brain  
function can be  
understood  
hierarchically, in  
terms of different  
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*molecular and cellular biological techniques, and behavioral studies on the nervous system, from simple reflexes to cognitive functions. Lines of research are followed from the inception of an idea to new findings being made in laboratories and clinics today. A*



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*major change is that this edition begins with the anatomy and physiology of the visual system, from light receptors in the retina to the perception of images. This allows the reader to appreciate right away how nerve cells act as the building blocks for perception.*

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*Detailed mechanisms of signaling are then described in later chapters. All chapters have been rewritten, and new chapters added. From Neuron to Brain will be of interest to anyone, with or without a specialized background in biological sciences,*

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*who is curious about  
the workings of the  
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cells go about their  
business of  
transmitting signals,  
how the signals are  
put together, and how,  
out of this integration,  
higher functions*

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*emerge. The emphasis, as before, is on experiments, and on the way they are carried out. Elements of format and presentation have been changed -- more headings have been introduced, the paragraphs are shorter, and the illustrations, now in*

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*Astrocytes in*

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ages, yet it is  
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brain can  
produce a  
myriad of  
thoughts and  
can store  
seemingly  
endless  
memories. All  
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the outside  
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undergraduates,  
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Similarly,  
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