Nicholls From Neuron To Brain

From Neuron to Cognition via Computational NeuroscienceFrom Neuron to BrainFrom Neuron

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a comprehensive integrated and accessible textbook presenting core neuroscientific topics from a computational perspective tracing a path from cells and circuits to behavior and cognition this textbook presents a wide range of subjects in neuroscience from a computational perspective it offers a comprehensive integrated introduction to core topics using computational tools to trace a path from neurons and circuits to behavior and cognition moreover the chapters show how computational neuroscience methods for modeling the causal interactions underlying neural systems complements empirical research in advancing the understanding of brain and behavior the chapters all by leaders in the field and carefully integrated by the editors cover such subjects as action and motor control neuroplasticity neuromodulation and reinforcement learning vision and language the core of human cognition the book can be used for advanced undergraduate or graduate level courses it presents all necessary background in neuroscience beyond basic facts about neurons and synapses and general ideas about the structure and function of the human brain students should be familiar with differential equations and probability theory and be able to pick up the basics of programming in matlab and or python slides exercises and other

ancillary materials are freely available online and many of the models described in the chapters are documented in the brain operation database bodb which is also described in a book chapter contributors michael a arbib joseph ayers james bednar andrej bicanski james j bonaiuto nicolas brunel jean marie cabelguen carmen canavier angelo cangelosi richard p cooper carlos r cortes nathaniel daw paul dean peter ford dominey pierre enel jean marc fellous stefano fusi wulfram gerstner frank grasso jacqueline a griego ziad m hafed michael e hasselmo auke ijspeert stephanie jones daniel kersten jeremie knuesel owen lewis william w lytton tomaso poggio john porrill tony j prescott john rinzel edmund rolls jonathan rubin nicolas schweighofer mohamed a sherif malle a tagamets paul f m j verschure nathan vierling claasen xiao jing wang christopher williams ransom winder alan l yuille

in the 25 years since from neuron to brain was first published the authors aim has remained constant to describe how nerve cells go about their business of transmitting signals how the signals are put together and how out of this integration higher functions emerge the new fourth edition while maintaining this focus has been completely reformatted and updated intended for use in upper level undergraduate graduate psychology and medical school neuroscience courses from neuron to brain will be of interest to anyone with or without a specialized background in biological sciences who is curious about the workings of the nervous system it presents a readable and coherent account of how cellular and molecular approaches can provide insights into the workings of the brain

from neuron to brain fourth edition describes how nerve cells go about their business of transmitting signals how the signals are put together and how out of this integration higher functions 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 full color have been clarified intended for use in upper level undergraduate psychology and medical school neuroscience courses this book will be of interest to anyone who is curious about the workings of the nervous system

list of members in each volume

a highly original theory of how the mind brain works based on the author's study of single neuronal cells in i of the vortex rodolfo llinas a founding father of modern brain science presents an original view of the evolution and nature of mind according to llinas the mindness state evolved to allow predictive interactions between mobile creatures and their environment he illustrates the early evolution of mind through a primitive animal called the sea squirt the mobile larval form has a brainlike ganglion that receives sensory information about the surrounding environment as an adult the sea squirt attaches itself to a stationary object and then digests most of its own brain this suggests that the nervous system evolved to allow active movement in animals to move through the environment safely a creature must anticipate the outcome of each movement on the basis of incoming sensory data thus the capacity to predict is most likely the ultimate brain function one could even say that self is the centralization of prediction at the heart of llinas s theory is the concept of oscillation many neurons possess electrical activity manifested as oscillating variations in the minute voltages across the cell membrane on the crests of these oscillations occur larger electrical events that are the basis for neuron to neuron communication like cicadas chirping in unison a group of neurons oscillating in phase can resonate with a distant group of neurons this simultaneity of neuronal activity is the neurobiological root of cognition although the internal state that we call the mind is guided by the senses it is also generated by the oscillations within the brain thus in a certain sense one could say that

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reality is not all out there but is a kind of virtual reality

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