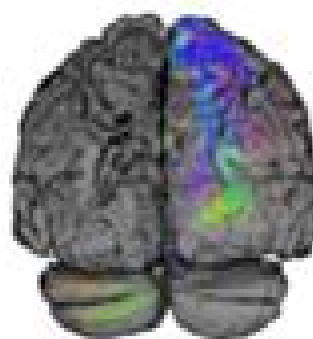


Data-driven

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Neurons and microcircuits

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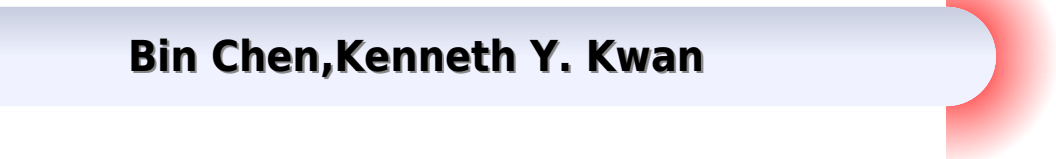
Detailed microcircuit models

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Modeling Neural Development

Bin Chen, Kenneth Y. Kwan



Modeling Neural Development:

Modeling Neural Development Arjen Van Ooyen, 2003 An important collection showing how computational and mathematical modeling can be used to study the complexities of neural development Model Systems to Study the Mechanisms of Neural Development and Disease Parthiv Haldipur, Paula Alexandre, Sumru Bayin, **Modeling Neural Development** Arjen Van Ooyen, 2003-08-01 This original and timely collection is one of the first books to study neural development using computational and mathematical modeling Modeling provides precise and exact ways of expression which allow us to go beyond the insights that intuitive or commonsense reasoning alone can yield Most neural modeling focuses on information processing in the adult nervous system Modeling Neural Development shows how models can be used to study the development of the nervous system at different levels of organization and at different phases of development from molecule to system and from neurulation to cognition The formal models described can give structure and meaning to complex phenomena and data create and explore new hypotheses and guide further research The book's fourteen chapters follow loosely the chronology of neural development Chapters 1 and 2 study the very early development of the nervous system discussing gene networks cell differentiation and neural tube development Chapters 3-5 examine neuronal morphogenesis and neurite outgrowth Chapters 6-8 study different aspects of the self organization of neurons into networks Chapters 9-12 cover refinement of connectivity and the development of specific connectivity patterns Chapters 13 and 14 focus on some of the functional implications of morphology and development The science of studying neural development by computational and mathematical modeling is relatively new this book as Dale Purves writes in the foreword serves as an important progress report in the effort to understand the complexities of neural development **Molecular Mechanisms of Neural Development and Insights into Disease**, 2021-03-09 Neural Development and Disease Volume 142 in the Current Topics in Developmental Biology series highlights new advances in the field with this new volume presenting interesting chapters by one or more members of an international board of authors Sections in this new release cover The role of primary cilia in neural development and disease Mechanisms of axon guidance receptor regulation and signaling Synaptic recognition molecules in development and disease The regulation of cortical neurogenesis Axon guidance in the developing spinal cord The role of astrocytes in synapse formation and maturation Development of motor circuits Molecular mechanisms that mediate dendrite morphogenesis and more Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Current Topics in Developmental Biology series **Model Neural Networks and Behavior** Allen Selverston, 2013-06-29 The most conspicuous function of the nervous system is to control animal behavior From the complex operations of learning and mentation to the molecular configuration of ionic channels the nervous system serves as the interface between an animal and its environment To study and understand the fundamental mechanisms underlying the control of behavior it is often both necessary and desirable to employ biological

systems with characteristics especially suitable for answering specific questions In neurobiology many invertebrates have become established as model systems for investigations at both the systems and the cellular level Large readily identifiable neurons have made invertebrates especially useful for cellular studies The fact that these neurons occur in much smaller numbers than those in higher animals also makes them important for circuit analysis Although important differences exist some of the questions that would be technically impossible to answer with vertebrates can become experimentally tractable with invertebrates

Development of Neural Circuitry, 2009-05-07 The nervous system is highly complex both in its structural order and in its ability to perform the many functions required for survival and interaction with the environment understanding how it develops has proven to be one of the greatest challenges in biology Such precision demands that key events at every developmental stage are executed properly and are coordinated to produce the circuitry underlying each of the adult nervous system's functions This volume describes the latest research on the cellular and molecular mechanisms of neural circuitry development while providing researchers with a one stop overview and synthesis of contemporary thought in the area Reviews current research findings on the development of neural circuitry providing researchers with an overview and synthesis of the latest contemporary thought in the cellular and molecular mechanisms that underlie the development of neural circuitry Includes chapters discussing topics such as the guidance of nerve growth and the formation of plasticity of synapses helping researchers better understand underlying mechanisms of neural circuit development and maintenance that may play a role in such human diseases conditions as depression anxiety and pain Chapters make use of a variety of human and animal models allowing researchers to compare and contrast neural circuitry development across a wide spectrum of models

Brain Organoids: Modeling in Neuroscience Cristina Cereda, Alysson Renato Muotri, Anna Maria Di Giulio, 2020-12-18 This eBook is a collection of articles from a Frontiers Research Topic Frontiers Research Topics are very popular trademarks of the Frontiers Journals Series they are collections of at least ten articles all centered on a particular subject With their unique mix of varied contributions from Original Research to Review Articles Frontiers Research Topics unify the most influential researchers the latest key findings and historical advances in a hot research area Find out more on how to host your own Frontiers Research Topic or contribute to one as an author by contacting the Frontiers Editorial Office frontiersin.org about contact

Principles of Computational Modelling in Neuroscience David Sterratt, Bruce Graham, Andrew Gillies, Gaute Einevoll, David Willshaw, 2023-10-05 Learn to use computational modelling techniques to understand the nervous system at all levels from ion channels to networks

Neurodevelopmental Disorders Bin Chen, Kenneth Y. Kwan, 2020-05-24 Neurodevelopmental Disorders the latest release in the Comprehensive Developmental Neuroscience series presents the most thorough coverage available addressing all aspects on how the nervous system and its components develop This book brings together the latest research in this rapidly evolving field with section editors discussing the technological advances that are enabling the pursuit of new research on brain development This volume

focuses on neurodevelopmental disorders in humans and experimental organisms Particular attention is paid to the effects of abnormal development and on new psychiatric neurological treatments being developed based on our increased understanding of developmental mechanisms Features leading experts in various subfields as section editors and article authors Presents articles that have been peer reviewed to ensure accuracy thoroughness and scholarship Covers disorders of the nervous system that arise through defects in neural development Neural Plasticity and Cognitive Development Joan Stiles, Judy S. Reilly, Susan C. Levine, Doris A. Trauner, Ruth Nass, 2012-05-24 The advent of modern neurobiological methods over the last three decades has provided overwhelming evidence that it is the interaction of genetic factors and the experience of the individual that guides and supports brain development Brains do not develop normally in the absence of critical genetic signaling and they do not develop normally in the absence of essential environmental input The key to understanding the origins and emergence of both the brain and behavior lies in understanding how inherited and environmental factors are engaged in the dynamic and interactive processes that define and direct development of the neurobehavioral system Neural Plasticity and Cognitive Development focuses on children who suffered focal brain insult typically stroke in the pre or perinatal period which provides a model for exploring the dynamic nature of early brain and cognitive development In most though not all of the cases considered the injuries affect substantial portions of one cerebral hemisphere resulting in patterns of neural damage that would compromise cognitive ability in adults However longitudinal behavioral studies of this population of children have revealed only mild cognitive deficits and preliminary data from functional brain imaging studies suggest that alternative patterns of functional organization emerge in the wake of early injury Neural Plasticity and Cognitive Development posits that the capacity for adaptation is not the result of early insult Rather it reflects normal developmental processes which are both dynamic and adaptive operating against a backdrop of serious perturbation of the neural substrate

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