



# Modeling in the Neurosciences: From Biological Systems to Neuromimetic Robotics

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Computational models of neural networks have proven insufficient to accurately model brain function, mainly as a result of simplifications that ignore the physical reality of neuronal structure in favor of mathematically tractable algorithms and rules. Even the more biologically based "integrate and fire" and "compartmental" styles of modeling suffer from oversimplification in the former case and excessive discretization in the second. This book introduces an integrative approach to modeling neurons and neuronal circuits that retains the integrity of the biological units at all hierarchical levels.

With contributions from more than 40 renowned experts, **Modeling in the Neurosciences, Second Edition** is essential for those interested in constructing more structured and integrative models with greater biological insight. Focusing on new mathematical and computer models, techniques, and methods, this book represents a cohesive and comprehensive treatment of various aspects of the neurosciences from the molecular to the network level. Many state-of-the-art examples illustrate how mathematical and computer modeling can contribute to the understanding of mechanisms and systems in the neurosciences. Each chapter also includes suggestions of possible refinements for future modeling in this rapidly changing and expanding field.

This book will benefit and inspire the advanced modeler, and will give the beginner sufficient confidence to model a wide selection of neuronal systems at the molecular, cellular, and network levels.

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