

[Scott, Alwyn](#)

Neuroscience. A mathematical primer. (English) Zbl 1018.92003
New York, NY: Springer. xx, 352 p. (2002).

This monograph summarizes the development and current state of the art of neural mathematical modelling. It starts with a chapter on the structure of nerve cells, the dynamics of the nerve impulse and the current understanding of the structure of the human brain. It further outlines the mathematical theories, models and problems of a single neuron, synapse transmission and neural membranes.

A central topic is the Hodgkin-Huxley model of axon potential propagation, including modifications such as leading-edge models and recovery models (FitzHugh-Nagumo and Markin-Chizmadzhev models). The theory of myelinated nerves is presented in a separate chapter accompanied by biological considerations on frog and other vertebrate motor neurons and some evolutionary perspectives. A chapter is dedicated to the modeling of ephaptic coupling in the F-N model and myelinated nerve models and the ensuing neurological implications.

Further, the book progresses to the modeling of neural networks, information processing, constructive brain theories and neuronal assemblies. A chapter on the hierarchical nature of brain dynamics concludes the book. The book covers all aspects of neural modelling and is of interest to biomathematicians, biophysicists and theoretical neurobiologists.

Reviewer: [Tanya Kostova-Vassilevska \(Livermore\)](#)

MSC:

- [92C20](#) Neural biology
- [92-01](#) Introductory exposition (textbooks, tutorial papers, etc.) pertaining to biology
- [92-02](#) Research exposition (monographs, survey articles) pertaining to biology

Cited in **30** Documents

Keywords:

[neural dynamics](#); [Hodgkin-Huxley model](#); [brain dynamics](#); [travelling waves](#); [stability](#)