1.	Record Nr.	UNINA9910300108103321
	Autore	Holcman David
	Titolo	Asymptotics of Elliptic and Parabolic PDEs : and their Applications in Statistical Physics, Computational Neuroscience, and Biophysics / / by David Holcman, Zeev Schuss
	Pubbl/distr/stampa	Cham : , , : Springer International Publishing : , , : Imprint : Springer, , 2018
	ISBN	3-319-76895-6
	Edizione	[1st ed. 2018.]
	Descrizione fisica	1 online resource (XXIII, 444 p. 103 illus., 56 illus. in color.)
	Collana	Applied Mathematical Sciences, , 0066-5452 ; ; 199
	Disciplina	515.353
	Soggetti	Differential equations, Partial Mathematical physics Physics Biomathematics Biophysics Partial Differential Equations Mathematical Applications in the Physical Sciences Numerical and Computational Physics, Simulation Mathematical and Computational Biology Mathematical Methods in Physics Biological and Medical Physics, Biophysics
	Lingua di pubblicazione	Inglese
	Formato	Materiale a stampa
	Livello bibliografico	Monografia
	Nota di contenuto	Part I. Singular Perturbations of Elliptic Boundary Problems -- 1 Second-Order Elliptic Boundary Value Problems with a Small Leading Part -- 2 A Primer of Asymptotics for ODEs -- 3 Singular Perturbations in Higher Dimensions -- 4 Eigenvalues of a Non-self-adjoint Elliptic Operator -- 5 Short-time Asymptotics of the Heat Kernel -- Part II Mixed Boundary Conditions for Elliptic and Parabolic Equations -- 6 The Mixed Boundary Value Problem -- 7 THe Mixed Boundary Value Problem in R2 -- 8 Narrow Escape in R3 -- 9 Short-time Asymptotics of the Heat Kernel and Extreme Statistics of the NET -- 10 The Poisson–Nernst–Planck Equations in a Ball -- 11 Reconstruction of Surface Diffusion from Projected Data -- 12 Asymptotic Formulas in Molecular

and Cellular Biology -- Bibliography -- Index.

Sommario/riassunto	This is a monograph on the emerging branch of mathematical biophysics combining asymptotic analysis with numerical and stochastic methods to analyze partial differential equations arising in biological and physical sciences. In more detail, the book presents the analytic methods and tools for approximating solutions of mixed boundary value problems, with particular emphasis on the narrow escape problem. Informed throughout by real-world applications, the book includes topics such as the Fokker-Planck equation, boundary layer analysis, WKB approximation, applications of spectral theory, as well as recent results in narrow escape theory. Numerical and stochastic aspects, including mean first passage time and extreme statistics, are discussed in detail and relevant applications are presented in parallel with the theory. Including background on the classical asymptotic theory of differential equations, this book is written for scientists of various backgrounds interested in deriving solutions to real-world problems from first principles.