

1. Record Nr.	UNINA9910150448703321
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Titolo	Simple Mathematical Models of Gene Regulatory Dynamics // by Michael C. Mackey, Moisés Santillán, Marta Tyran-Kamiska, Eduardo S. Zeron
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2016
ISBN	3-319-45318-1
Edizione	[1st ed. 2016.]
Descrizione fisica	1 online resource (XIV, 124 p. 20 illus. in color.)
Collana	Lecture Notes on Mathematical Modelling in the Life Sciences, , 2193-4797
Disciplina	511.8
Soggetti	Molecular genetics Biomathematics Bioinformatics Mathematics Differential equations Probabilities Molecular Genetics Mathematical and Computational Biology Computational and Systems Biology Applications of Mathematics Differential Equations Probability Theory
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Introduction -- Part I Deterministic Modeling Techniques -- 1.Generic deterministic models of prokaryotic gene regulation -- 2.General dynamic considerations -- Part II Dealing with Noise -- 3.Master equation modeling approaches -- 4.Noise effects in gene regulation: Intrinsic versus extrinsic -- Part III Specific Examples -- 5.The lactose operon -- 6.The tryptophan operon -- 7.The Lysis-Lysogeny Switch -- Index -- References.
Sommario/riassunto	This is a short and self-contained introduction to the field of

mathematical modeling of gene-networks in bacteria. As an entry point to the field, we focus on the analysis of simple gene-network dynamics. The notes commence with an introduction to the deterministic modeling of gene-networks, with extensive reference to applicable results coming from dynamical systems theory. The second part of the notes treats extensively several approaches to the study of gene-network dynamics in the presence of noise—either arising from low numbers of molecules involved, or due to noise external to the regulatory process. The third and final part of the notes gives a detailed treatment of three well studied and concrete examples of gene-network dynamics by considering the lactose operon, the tryptophan operon, and the lysis-lysogeny switch. The notes contain an index for easy location of particular topics as well as an extensive bibliography of the current literature. The target audience of these notes are mainly graduates students and young researchers with a solid mathematical background (calculus, ordinary differential equations, and probability theory at a minimum), as well as with basic notions of biochemistry, cell biology, and molecular biology. They are meant to serve as a readable and brief entry point into a field that is currently highly active, and will allow the reader to grasp the current state of research and so prepare them for defining and tackling new research problems.
