

1. Record Nr.	UNINA9910452690803321
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Titolo	Physical principles in sensing and signaling [[electronic resource]] : with an introduction to modeling in biology / / Robert G. Endres
Pubbl/distr/stampa	Oxford, : Oxford University Press, 2013
ISBN	1-283-85621-2 0-19-165428-0
Descrizione fisica	1 online resource (158 p.)
Disciplina	571.43 571.634
Soggetti	Biology - Simulation methods Biology - Mathematical models Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references and index.
Nota di contenuto	Cover; Contents; 1 Introduction; Chapter summary; Further reading; 2 Chemotaxis in bacterium Escherichia coli; 2.1 Chemical gradient sensing; 2.2 "Nose and brain": the receptor cluster; 2.3 E. coli chemotaxis pathway; 2.4 Experimental approaches; 2.5 Time-course data and dose-response curves; Chapter summary; Further reading; 3 Physical concepts; 3.1 Diffusion; 3.2 Boltzmann distribution; 3.3 Ligand-receptor binding; 3.4 Fluctuation-dissipation theorem; Chapter summary; Further reading; 4 Mathematical tools; 4.1 Ordinary differential equations; 4.2 Kinetic laws; 4.3 Master equation 4.4 Poisson distribution4.5 Waiting-time distribution; 4.6 Langevin small-noise approximation; 4.7 Information theory; Chapter summary; Further reading; 5 Signal amplification and integration; 5.1 Cooperativity by allostery; 5.2 Emergence of allostery from microscopic details; 5.3 Two-state equilibrium receptor model; 5.4 Monod-Wyman-Changeux model for receptor signaling; 5.5 Alternative Ising model for receptor cluster; Chapter summary; Further reading; 6 Robust precise adaptation; 6.1 Energy-landscape picture of adaptation; 6.2 Dynamics of adaptation; 6.3 Chemotactic response function 6.4 Integral-feedback control6.5 Assistance neighborhoods; Chapter

summary; Further reading; 7 Polar receptor localization and clustering; 7.1 Trimer of dimers; 7.2 Elastic cluster-membrane model; 7.3 Polar receptor clustering; Chapter summary; Further reading; 8 Accuracy of sensing; 8.1 Perfectly absorbing sphere; 8.2 Perfectly monitoring sphere; 8.3 Sensing with cell-surface receptors; Chapter summary; Further reading; 9 Motor impulse response; 9.1 Impulse response; 9.2 Time and frequency domains; 9.3 Minimal pathway model; 9.4 Linear response approximation; 9.5 Noise power spectra Chapter summary Further reading; 10 Optimization of pathway; 10.1 Optimal receptor-complex size; 10.2 Optimal adaptation dynamics; Chapter summary; Further reading; 11 "Seeing like a bacterium"; 11.1 Typical chemical gradients; 11.2 Weber's law; 11.3 Perception; 11.4 Fold-change detection; 11.5 Matching relations; 11.6 Predicting typical stimuli; Chapter summary; Further reading; 12 Beyond E. coli chemotaxis; Chapter summary; Further reading; Appendix More techniques; A.1 Derivation of the fluctuation-dissipation theorem; A.2 Variational principles and the Euler-Lagrange equation A.3 Gillespie simulations A.4 Fokker-Planck approximation; A.5 Derivation of the Langevin noise; A.6 Time versus frequency domain; A.7 Model fitting to data; A.8 Principal component analysis; Chapter summary; Further reading; Index; A; B; C; D; E; F; G; H; I; L; M; N; O; P; Q; R; S; T; V; W

Sommario/riassunto

Although invisible to the bare eye, bacterial cells are large enough to make complex decisions. Cells are composed of thousands of different molecular species including DNA, proteins, and smaller molecules, allowing them to sense their environment, to process this information, and to respond accordingly. Such responses include expression of genes or the control of their movement. Despite these properties, a living cell exists in the physical world and follows its laws. Keeping this in mind can help answer questions such as how cells work and why they implement solutions to problems the way they
