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| 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<br>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<br>6.4 Integral-feedback control6.5 Assistance neighborhoods; Chapter |

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 thisin mind can help answer questions such as how cells work and why they implement solutions to problems the way they