

The Physics of Living Systems (Undergraduate Lecture Notes in Physics)

Fabrizio Cleri



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This book starts from the macroscopic world, namely the thermodynamics of the Sun-Earth system and biosphere, and, via such diverse subjects as the greenhouse effect and energetics of metabolism, steps into to the microscopic world (physics of bacteria and unicellular life, cells and tissues, biomolecules); eventually, the perspective moves again upwards in length- and time-scales, to the physics of organs and whole organisms, to end up with subjects in zoology (e.g., simplified aerodynamics of insect flight, energy budget for the survival and reproduction of a flock of animals), and planetary ecology (species competition in the Biosphere, limits of ecosystems).

Physics in its many aspects, thermodynamics, mechanics, electricity, fluid dynamics, is the guiding light in this fascinating journey, providing ideas, examples and stimulating reflections for undergraduate students in physics or chemistry, as well as to anyone interested in the frontiers between physics and biology. The idea of this book is not to introduce much new physics for young students, but rather use their recently acquired academic knowledge of basic physics, to start seeing the physics behind the biology. As an undergraduate textbook in introductory biophysics, it contains the necessary background and tools, including exercises and Appendices, to form a progressive course. In this case, the chapters can be used in the order proposed, possibly split between two semesters.

The book is also a pleasant read for researchers in the life sciences who wish to revive or go deeper into physics concepts, glanced in their early years of scientific training. The less physics-oriented reader might skip the first chapter, as well as all the "grey boxes" containing the more formal developments, and create his/her own menu of chapters, more or less á la carte.

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