

BOOK REVIEW

Physics and Biology: from Molecules to Life

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Physics and Biology: from Molecules to Life edited by Jean François Allemand and Pierre Desbiolles, World Scientific, Singapore, 2015, pp. xv + 182. Scope: edited book, £50, ISBN 978-9814618922 (Hardcover). Level: general physicists, undergraduates, postgraduates.

It has long been appreciated that Physics is essential to the understanding of many aspects of biology. As Jacques Prost points out in his Preface to *Physics and Biology*, the explosion of research activity at the interface between the two subjects over the last twenty years has led to investment on an unprecedented scale. The outstanding successes of this work deserve a wider audience than just specialists, and so a major aim of the book is to make the results more widely accessible. For obvious reasons the editors, Jean François Allemand and Pierre Desbiolles, have needed to be selective in their choice of topics to be addressed.

The nine chapters are all by different authors or co-authors. The first one seems designed specifically for physicists, and also includes an introduction to the book as a whole. It covers biological basics and its goal is “to facilitate the discovery of what could be for a new reader a new world: biology”. Starting from an elementary level, it covers cells and their internal machinery, DNA and its replication and translation, RNA, proteins, and genes. This provides the conceptual foundation needed to understand the other eight chapters, which cover fluorescence microscopy, single-molecule mechanical studies, molecular motors, cellular mechanics and motility, photon studies of neuronal activity, the physics of hearing, texture perception, and intermittent search strategies. The chapter on molecular motors is contributed by the editors themselves. Chapters 2–9 are effectively stand-alone essays. They do not depend much on each other and so, with Chapter 1 as the basis, they can be read separately and independently.

The choice of topics seems, in a sense, rather arbitrary. Presumably it reflects the editors’ own enthusiasms and judgement of what is most important, coupled with the availability of first-class scientists who were willing to write. The chapter on the physics of hearing is very detailed and absolutely fascinating, but it seems slightly odd not having a matching chapter on the physics of vision. Personally, I would have included a chapter on the physics of biological oscillations, whose nonlinear interactions manifest almost universally in living systems, on all scales from the sub-cellular up to population dynamics; and there is nothing on the physics of ion channels. But of course these are just personal enthusiasms of my own. Given that selection was unavoidable, the editors have in fact done an excellent job in picking topics that are strongly physics-focused, diverse and wide-ranging, exemplifying the huge contributions of physics to biological problems.

The level is appropriate for non-experts, with physical scientists particularly in mind. In principle, given the presence of Chapter 1, no prior knowledge of biology is needed. So the material should be suitable for a very wide readership ranging from from undergraduates to research scientists.

The book conveys vividly the excitement and importance of the subject, and I learned a lot that I did not know, or only half-remembered from presentations at interdisciplinary conferences, but it is by no means an easy read. Each of the chapters packs in important ideas at high density and an immense amount of information that can be daunting at times, even though almost everything is carefully explained. Inevitably, given the structure, there is a certain amount of repetition e.g. about DNA between Chapter 1, and Chapter 3 on mechanical studies of single molecules. This probably does not matter very much, and can sometimes be helpful, when it saves one from having to refer back. Of more significance, however, the book is a translation from the French. Although the English usage is almost always correct and the material is basically very well-written, the choice of words is sometimes unexpected and the text lacks the cadences and rhythms that native speakers instinctively use to bring out their intended emphasis, which again detracts slightly from ease and speed of understanding. But these drawbacks should be considered minor.

Physics and Biology deserves to be widely read, especially by physicists, to whom it can very warmly be recommended.

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